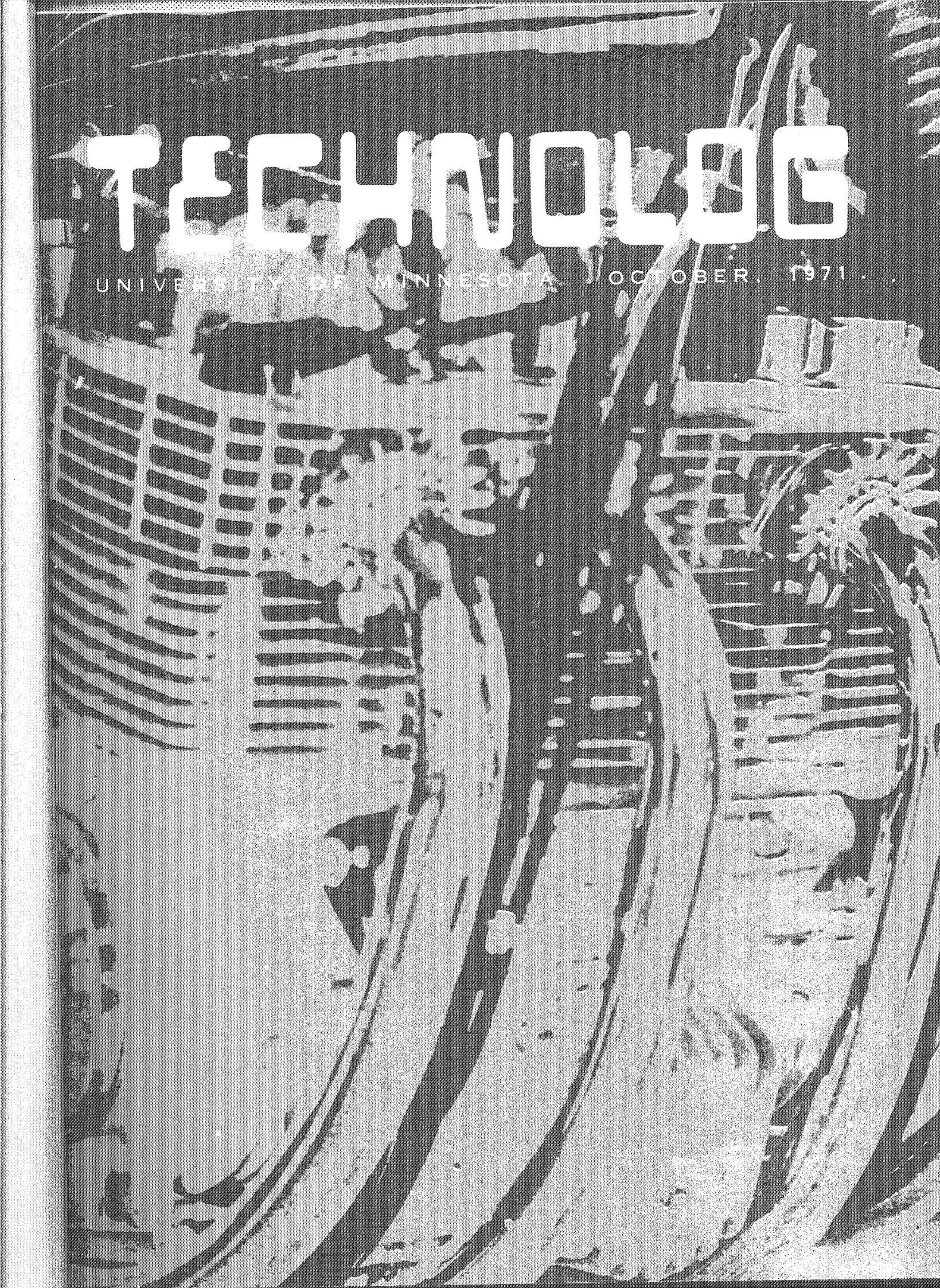
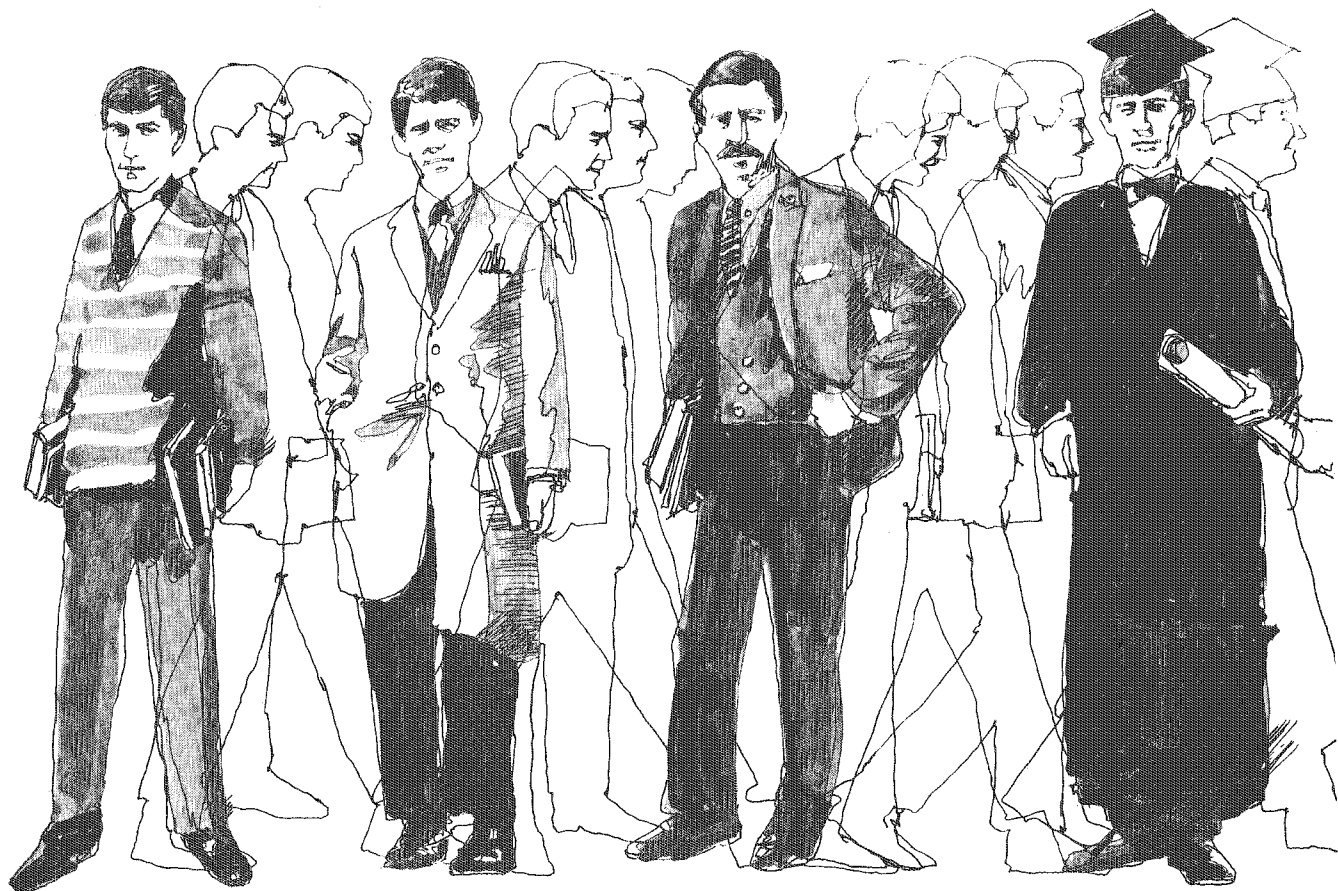


# TECHNOLOG

UNIVERSITY OF MINNESOTA    OCTOBER, 1971





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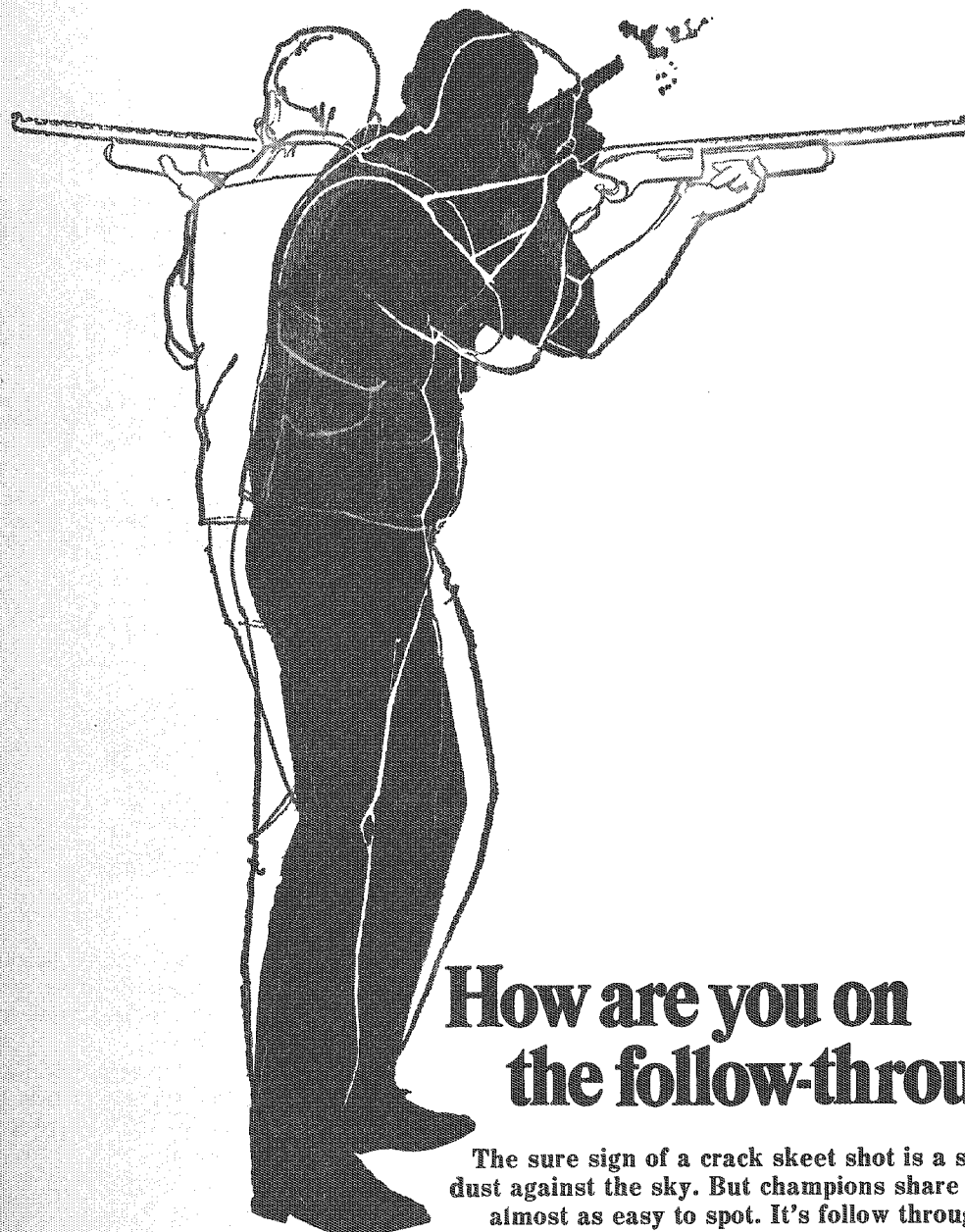
If you can't wait for the recruiter, write today to George Garvey, Westinghouse Education Center, Pittsburgh, Pa. 15221. An equal opportunity employer.

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Then write to our Manager of College Relations. And tell him you'd like to take a shot at it. The Timken Company, Canton, Ohio 44706. Timken® bearings are sold all over the world. Manufacturing in Australia, Brazil, Canada, England, France, South Africa and the U.S.A.

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**"An Equal Opportunity Employer"**

**"The  
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Midwest  
grows  
on us"**



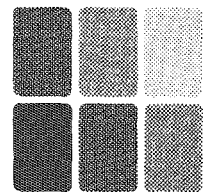
During the last ten years the population of this great land NSP serves grew by close to 21%.

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*a brighter life for you*



# TECHNOLOG

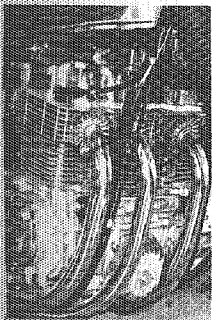
VOL 52; NO. 1

Official Student Publication of the Institute of Technology, University of Minnesota

OCTOBER, 1971

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## THIS MONTH'S COVER

This month's cover is a tone separation of a Honda engine. Photo by Bruce Wright.

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Published monthly, October through May. Second class postage paid at Minneapolis, Minnesota. Office: Room 2, Mechanical Engineering Building, University of Minnesota, Minneapolis, Minnesota 55455. Telephone: 373-3298. Printer: Aircraft Press, 425 South Fifth Street, Minneapolis, Minnesota 55415. Publisher's National Representative: Littell-Murray-Barnhill, Inc., 60 East 42nd Street, New York, N. Y. 10017. Publisher's State and Local Representative: University Engineering Magazine Advertising, F. P. McGrath, Manager, Box 14026 University Station, Minneapolis, Minnesota 55455. Telephone: 612-225-0708. Member of the Engineering College Magazines Associated, Chairman: Donald L. Griffen, Iowa State University. Subscription rate: \$4.00 per year, single copies 50¢. Advertising rates upon request. Any opinions expressed herein are not necessarily those of the Institute of Technology or of the University of Minnesota. Copyright © 1971 by the Minnesota Technological Board. All rights reserved. Reproduction in whole or in part without written permission is prohibited.

# FORUM

## Editorial

With the beginning of the new school year, the *Technolog* has once again changed editors, business managers, and other staff positions. As a result, the magazine will contain numerous changes in style and tone reflecting the character of the new staff.

Unique this year is the *Technolog's* change of production method. "Letterpress", a method the 'Log has used for eons, has given way to "offset" — a newer and more versatile method. Through offset, more pictures and better use of graphics and layout are possible.

But the most important change is the purpose of the *Technolog*. It has broken a long tradition by aiming not at the engineer as an engineer, but to the engineer as a human being.


Throughout our college career, we are taught how to use technology and the magic sliderule to solve nearly every problem within our selected fields. But what about problems that our sliderules have no scales for? Problems like pollution, poverty, war. As an engineer we will have a great influence on the solutions to such problems whether we are aware of it or not; but only if we are aware of the

social repercussions of our decisions can we use our influence to society's advantage.

The *Technolog* hopes to get the I.T. student more involved with his world through articles on controversial subjects that affect us as a person. Those articles which are not controversial will be informational rather than "technical". (True technical journals can do a much better job on technical articles than the 'Log can anyway.) The new department "Reverb" is yours to express your opinions on previous articles or other issues of today. (See this month's "Reverb" for the address and policies.) Thus through "Reverb" and other innovations such as "Next month" (a preview of the features of the coming issue) and improved use of graphics we, the staff, have completely changed the look and spirit of the *Technolog* to help you, the reader, to get a look at the real world through technical yet human eyes.

Your part in all this is to try to realize the social impact of your technical problems, question us on our views, express your opinions, and determine which decisions will best benefit all of us./RR,BJ

**MIDWEST FEDERAL MADE \$4,298,728.11\* WORTH OF**

**EDUCATION**  **N**

**POSSIBLE LAST YEAR!**

**... BUT THAT WAS LAST YEAR.**

**SEE US TODAY  
FOR ONE OF MANY  
COLLEGE LOANS OPEN FOR YOU.**

\*Figure Taken From Midwest Federal Statement of Condition, Dec. 1969 - Dec. 1970.



# Can you make this part without a drawing?

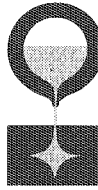
Casting is so versatile that a designer can often develop complex components that are almost too difficult to draw . . . That's why many prototype steel castings are developed directly from models.

Take this high-speed refrigerator impeller. Worthy of a sculptor's efforts, it not only looks good, but must perform faultlessly . . . And it does, at 12,500 rpm in subzero temperatures.

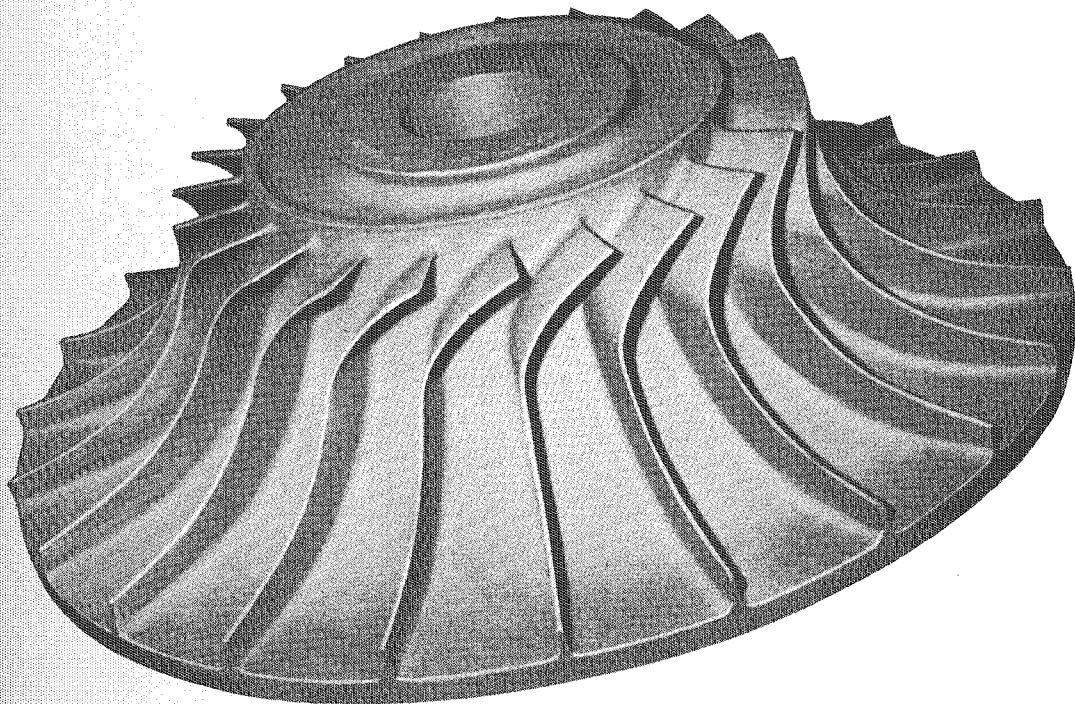
*Cast-steel* permitted the designer to choose the right composition for maximum toughness at low temperatures, without com-

promising for machinability or weldability. Cast in a ceramic mold, the impeller has fine surface finish and close dimensional tolerances, thus eliminating costly machining.

Want to know more about *cast-steel*? We're offering individual students free subscriptions to our quarterly publication "CASTEEL". Clubs and other groups can obtain our sound film "Engineering Flexibility." Write Steel Founders' Society of America, Westview Towers, 21010 Center Ridge Road, Rocky River, Ohio 44116.

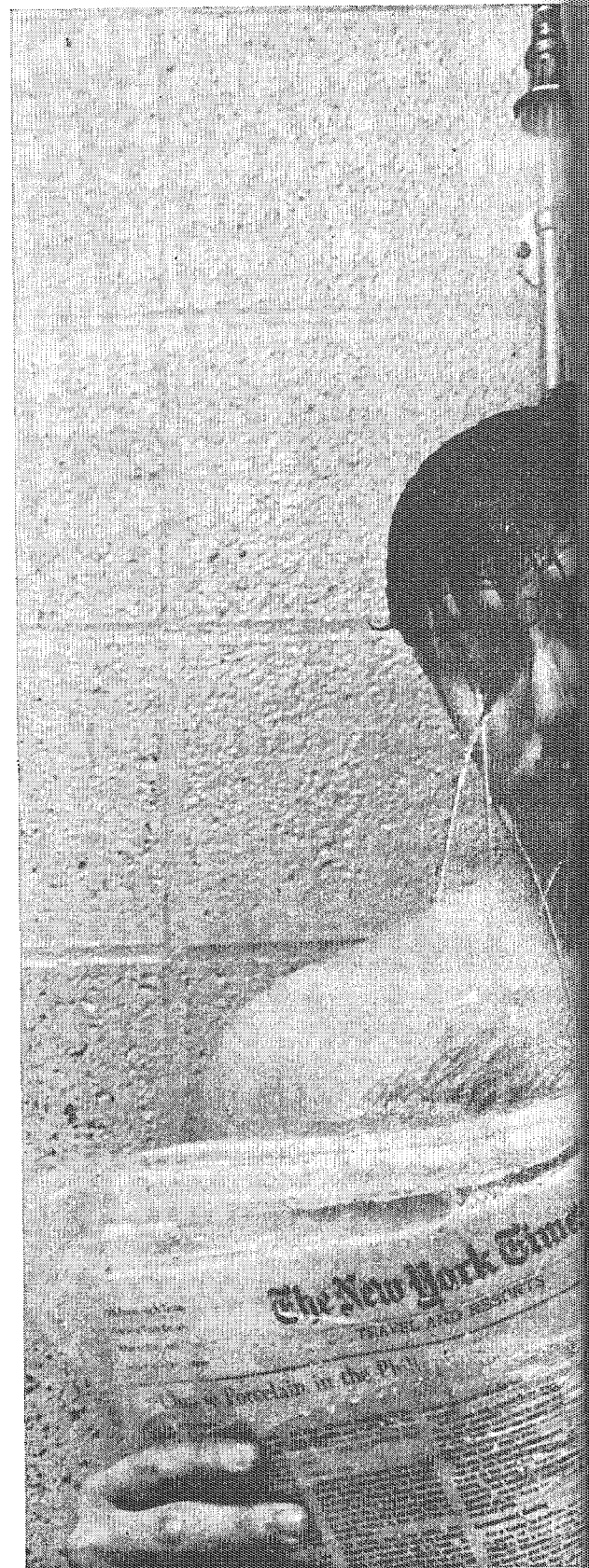


## STEEL FOUNDERS' SOCIETY OF AMERICA

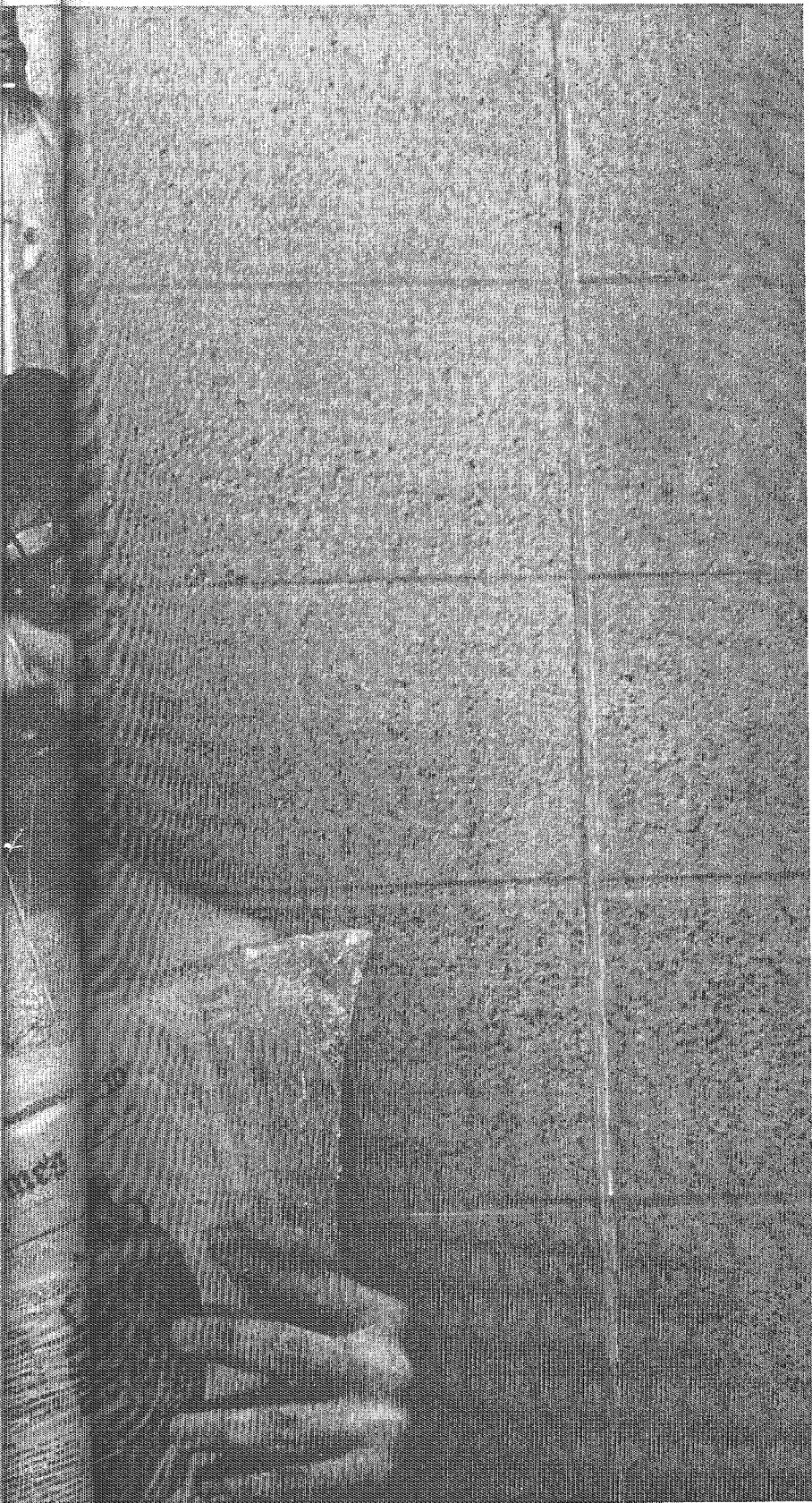


***Cast-Steel  
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**We keep  
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Each Saturday night *The New York Times* wraps up the news.

Then FMC wraps up *The New York Times*.

Thanks to a mechanized system we designed, built, and installed, the country's largest Sunday edition is mailed the world over, carefully protected from the elements by a see-through wrapper.

This is just one of many unusual jobs taken in stride by FMC.

If you want to carry it, warehouse it, package it, or whatever, chances are FMC has handled a similar job.

You may still recall by tomorrow that we're into machinery; but how in the world can we get you to remember that we're also a very large chemical company, too?

Or that we are a major factor in alleviating the world's food problems through our involvement in every phase of agriculture: pumps and irrigation systems, pesticides and fertilizers, food processing and packaging equipment, even seeds.

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**You'd be surprised  
at all the things we do.**

# Man and Machine



They are impractical, they are dangerous, they are foolish, and yet there is something about them. Something about feeling the wind in your face, hearing the steady pounding of the engine, being a split second away from broken bones. Something about the backlands, lands where no car could go but you can, and you can close down your machine and feel life around you. That's what it's all about, freedom, danger, and a union; you and your machine.

Two hundred and eighty one years ago it started. "Since the Chinese rockets were propelled by gunpowder," a young inventor asked, "Why can't I propel a larger vehicle with gun powder?" He was buried, at least what was found of him, a few days later.

Then in 1770, the first turpentine engine was introduced, demonstrating the need for an efficient fire fighting team. These failures disillusioned engineers for seventy-nine years; until 1859 when the first gasoline-air mixture engine was introduced. Then, in 1874, Dr. N. A. Otto made the first successful selfpropelled motorcycle. In 1892 the Otto engine became mass-produced in Munich, Germany by the Hildebrand brothers. The name Otto was scratched and the engines were aptly named four cycle.

(Continued on page 20)



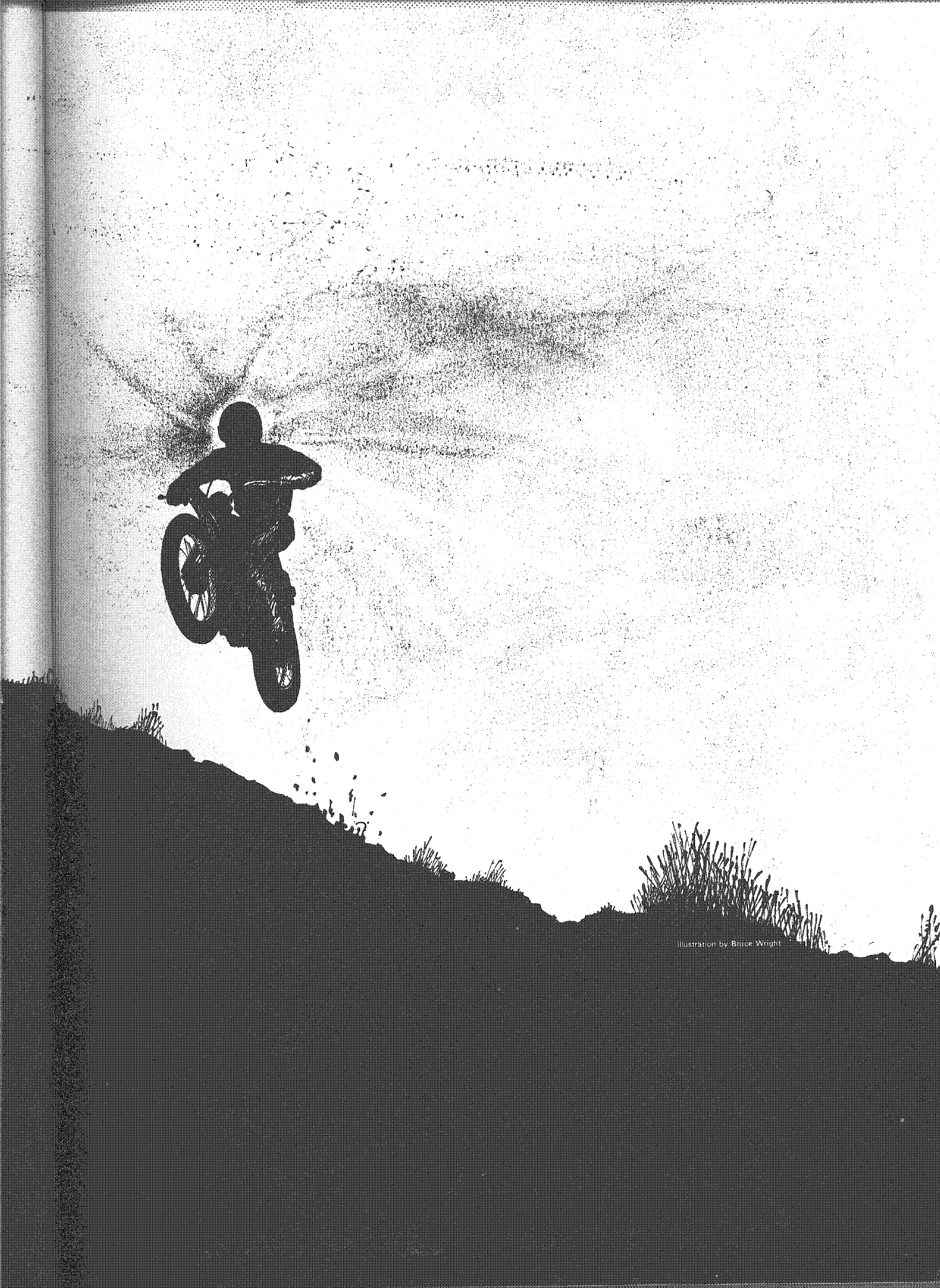


Illustration by Bruce Wright

# REVERB

## Reverb is intended for you!

All letters received will be considered for publication.

All letters received become the property of the *Minnesota Technologist*.

Send letters by U.S. or campus mail to:

Editors  
Minnesota Technologist  
2 Mech. Eng.  
University of Minnesota  
Minneapolis, Minnesota 55455

### From the Establishment: (Dean's Office)

#### 1. Tutoring Programs:

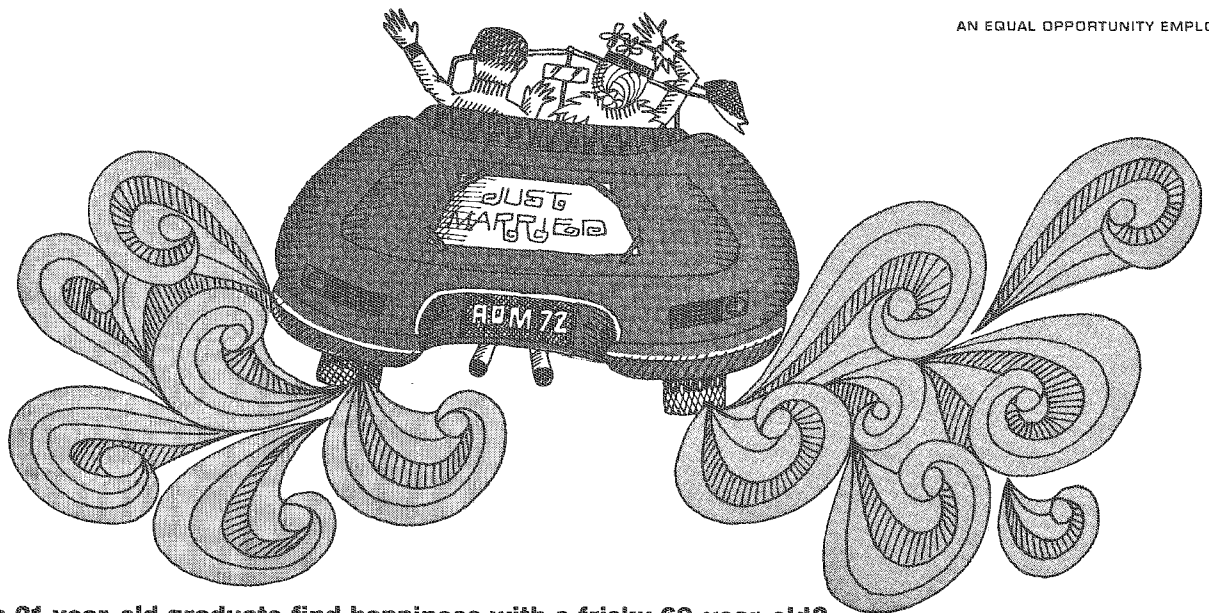
- a. Dormitory tutoring is available in Frontier, Territorial and Comstock Halls.
- b. Tutoring is available for commuter students at St. Paul Johnson, Minneapolis Washburn, and Moundsview High Schools and Normandale Junior College on Monday and Tuesday evenings from 7-

9 P.M.

- c. In addition, several departments have tutoring programs.

Students interested in more information should check with 105 or 105 Main Engineering. Remember, these programs are available at no charge to students!

2. Professional counseling for students seeking assistance for career guidance, test score interpretation and personal problems is available in 104 Main Engineering.
3. Students should make appointments as soon as possible in the fall quarter to meet their advisors and discuss their academic programs. Students should check with their major departments for problems concerning their advisor assignment.
4. Cancel-adding of courses is permitted during the first two weeks of the quarter only. This includes any changes in A/F and P/N grading. Students are able to cancel a course and receive an official grade of "W" up to Study Day,



AN EQUAL OPPORTUNITY EMPLOYER

### Can a 21-year-old graduate find happiness with a frisky 69-year-old?

Can he find real joy with a company posting over \$600 million annual sales . . . with 80 plants, offices, and elevators . . . some in foreign lands?

Can he find himself professionally in an environment of unlimited growth potential in the areas of production engineering, sales, merchandising, marketing and research?

Can he accept the challenge offered by a position requiring imagination, innovation, and

creativity? Does he wish to become a member of a family of believers involved in helping solve problems relative to the domestic and world food supply? Is he readily attracted to a company which radiates enthusiasm from activities related to refined oils, soy protein products, commodity trading and logistics systems?

Can he enjoy living in areas where recreational and civic opportunities abound?

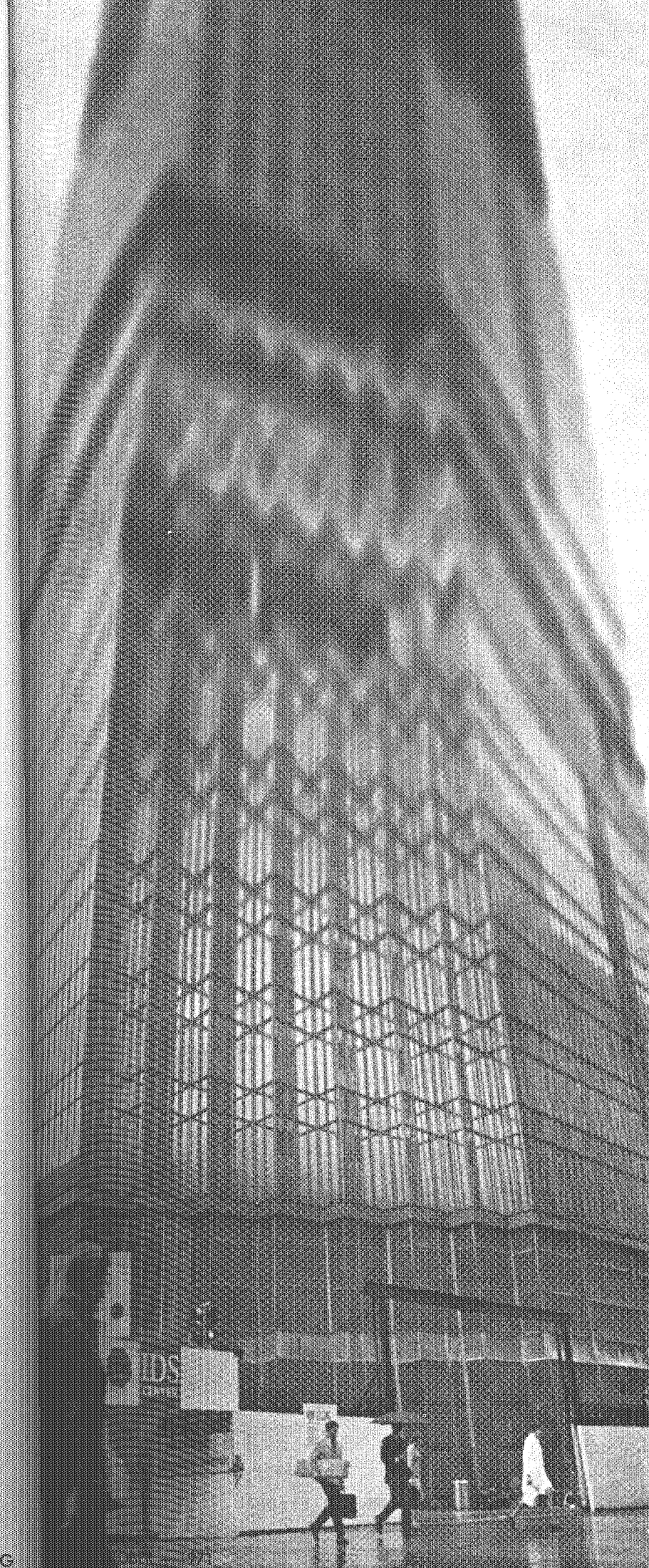
If we interest you, let your resume serve as a proper introduction. Write now to Manager of Employment, or contact your placement office to arrange a campus interview. It might lead to a beautiful marriage.



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## Technology Creates New City Wonders

### Record Breakers

By Bruce Wright

Ascending above the people like a modern-day Gothic spire, the new IDS Center in downtown Minneapolis is out to make a name for itself. When completed, the tower will be the tallest building between Chicago and the West Coast.

Minneapolis has had considerable national attention in recent years for two salient features. One, the Mall, a tree-lined, pedestrian-oriented, ten-block extension of Nicollet Avenue. The other, the partially completed sky-way system, is a series of enclosed walkways that bridge streets at the second story level, connecting various commercial buildings over a 12-block downtown area.

Now the IDS Center, a multi-structure complex utilizing a full block in the center of the city, brings the Mall indoors to a courtyard and adds new dimensions to the skyway-level system.

Down the street from the "Center", Minneapolis is breaking more records with the erection of a new Federal Reserve Bank. It is the first completely new home office for a Reserve Bank since the original twelve reserve banks were built in the 1920's.

Continued

Bruce Wright

*Scurrying from the rain, pedestrians are unaware of the towering IDS center behind them.*

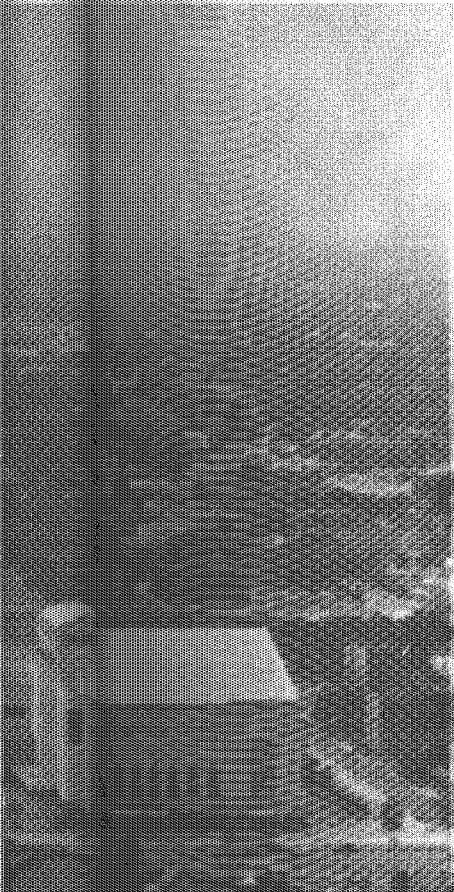




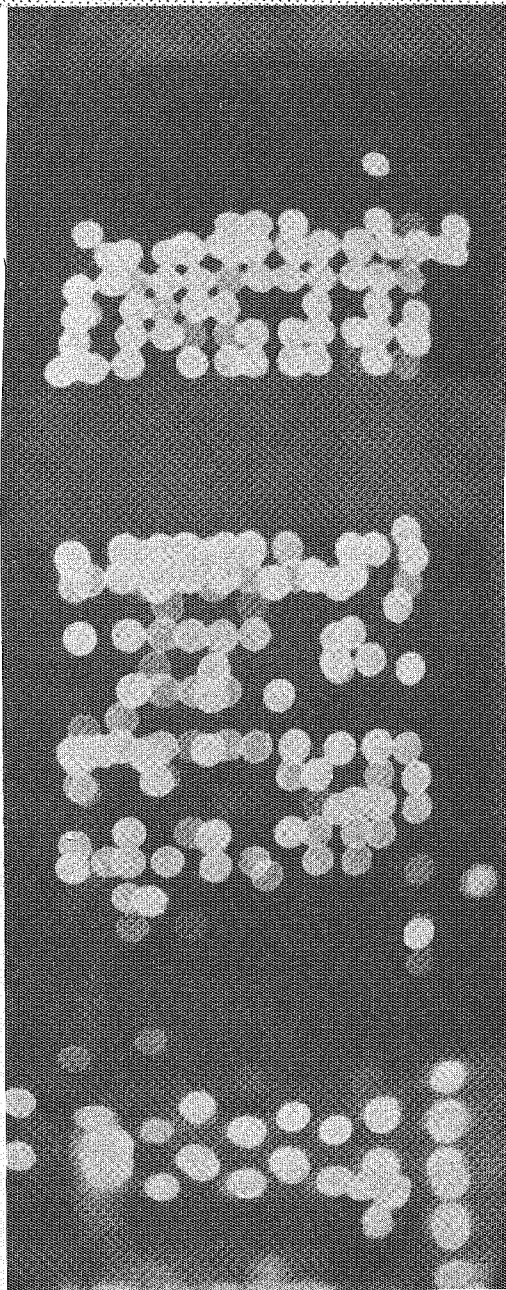
## One Could Live A Whole Life Span Within This "City Within A City" And Not Leave Once

From an observation floor at the top of the 57-story pillar of the IDS Center, visitors, on a clear day, will be able to see a 35-mile panorama of the Twin Cities metropolitan area. When completed, the skyscraper will soar 225 feet above the Foshay Tower and more than 370 feet higher than the highest building in St. Paul. Designed by Philip Johnson and John Burgee (New York) and Edward F. Baker of Minneapolis, the Center will include the octagon shaped office tower, an eight story "annex" to the tower, a hotel and banking building, a two story retail store and a central glassed-in court, called the "Crystal Court", to pull it all together.

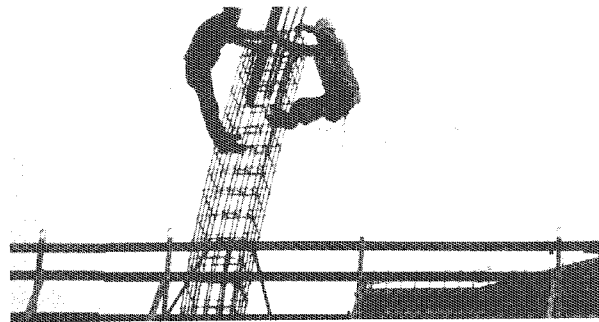
In what IDS officials hope will become a year-round activity spot, the central plaza is perhaps the one redeeming element for a complex of such super human dimensions.



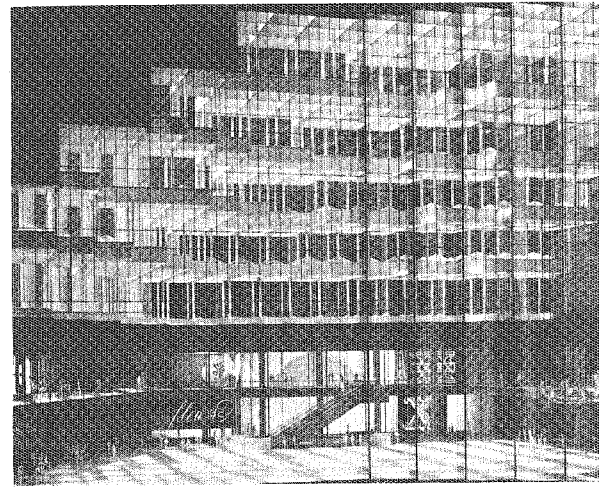
Don Neel



Bruce Wright



Bruce Wright

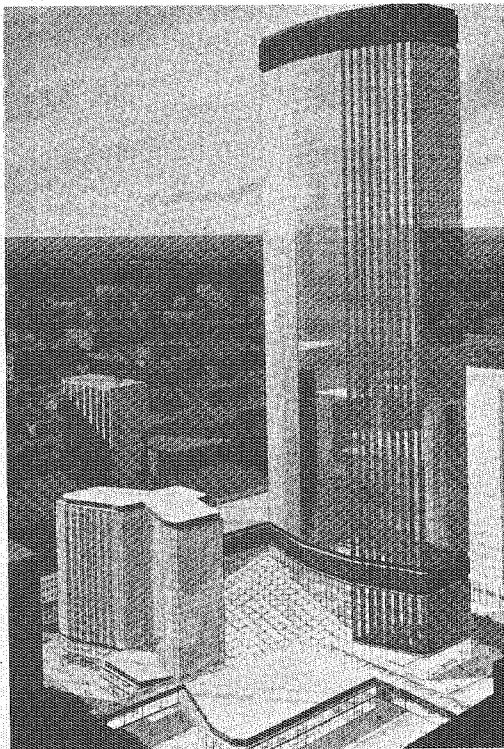


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Along with the innovative features of the courtyard and the record-breaking height, the IDS project also houses the largest steel columns ever rolled by any domestic steel mill. The columns range from 22 to 24 tons in weight and from 26 to 41 feet in height.

Public parking is provided in the main center for about 525 cars these levels below grade. However, most of the needed parking and public access will not be part of the project.

With all of the planned services, you could live a whole life span within this "city within a city" and not have to leave once. Welcome, Minneapolis, to the benefits of the "big-city" league.

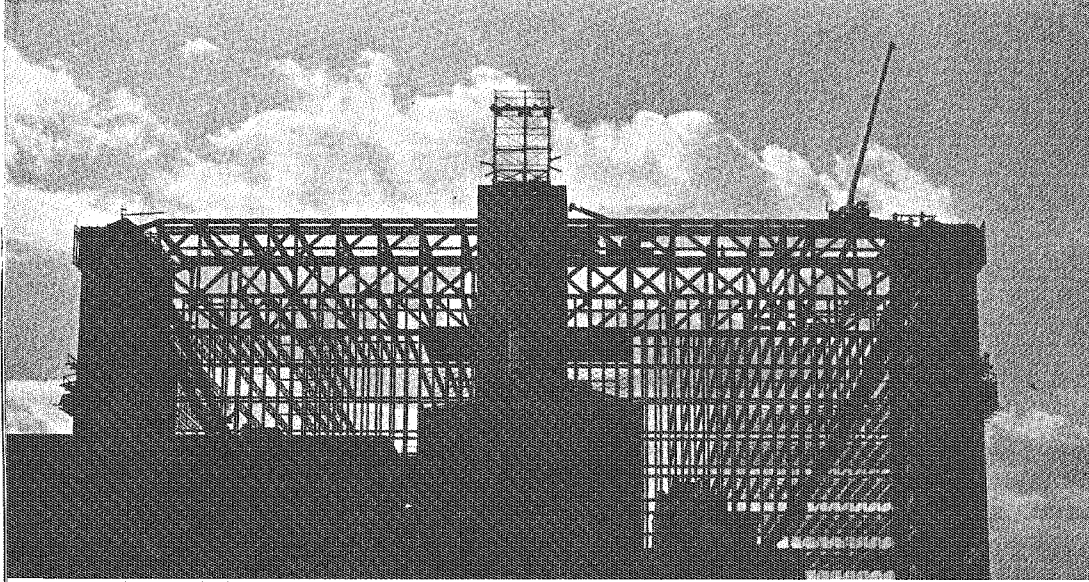


From the 51st floor observation desk of the center, one will be able to see 35 miles in any direction. (upper left) Lit up like a mammoth christmas tree, the IDS tower (above center) can be seen any night as construction workers aim for a spring '72 deadline. In what appears to be a game of construction see-saw, two workers add reinforcing bars to a column. (above right) An interior view of the planned "crystal court" and (left) the architects rendering of the entire complex.



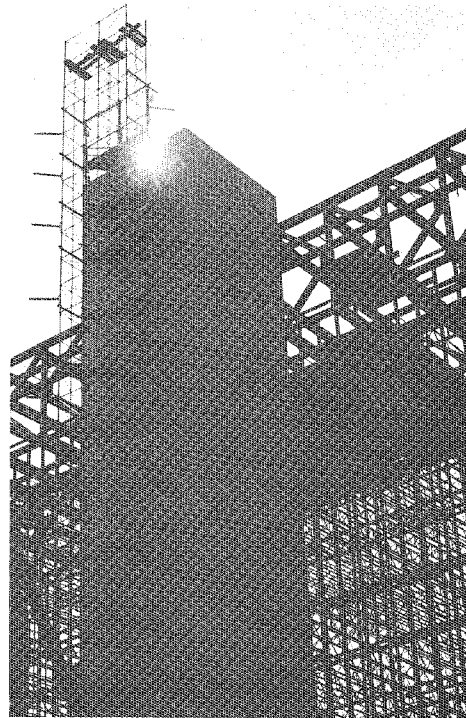
# An Urban Renewal Project That Aims For Public Participation

Located in the Gateway Redevelopment area of Minneapolis, this new Federal Reserve Bank (left), occupying an entire city block, can claim world fame to being the first structure having a column free span of 275 feet. The office structure



Mary Lee Slettehaugh

**A** self-supporting column (right) the elevator shaft connects the upper and the lower sections of the bank complex, touching only at floor levels. Construction workers lower a few of the many thousand marble slabs to be used in the plaza (above right) as concrete is being poured on one of the main supports (opposite page).



Mary Lee Slettehaugh

“hangs” thirty feet above a plaza and is supported by cables encased in steel beams and hung from the towers at each end of the building.

The building will have two distinct types of activities; administrative clerical work and the custody of large amounts of money and securities. Because of this, architect Gunnar Birkerts (Detroit) designed the building in two separate parts — (A) a three level secure area (entire block) hidden under the sloping plaza and (B) an eleven story office structure suspended over the site. The two units are connected only by a free standing elevator tower at the rear and two end supports.

Two 90-ton steel weldments are placed on each support to anchor the catenary shaped cables (right). A steel truss erected across the top of the building acts as a resisting force against the tendency of the pillars to pull together.

The plan is being developed as a public area for various outside activities, such as concerts, exhibits or flea markets, and will attempt to be more of a public space than the conventional plaza surrounding an office building.

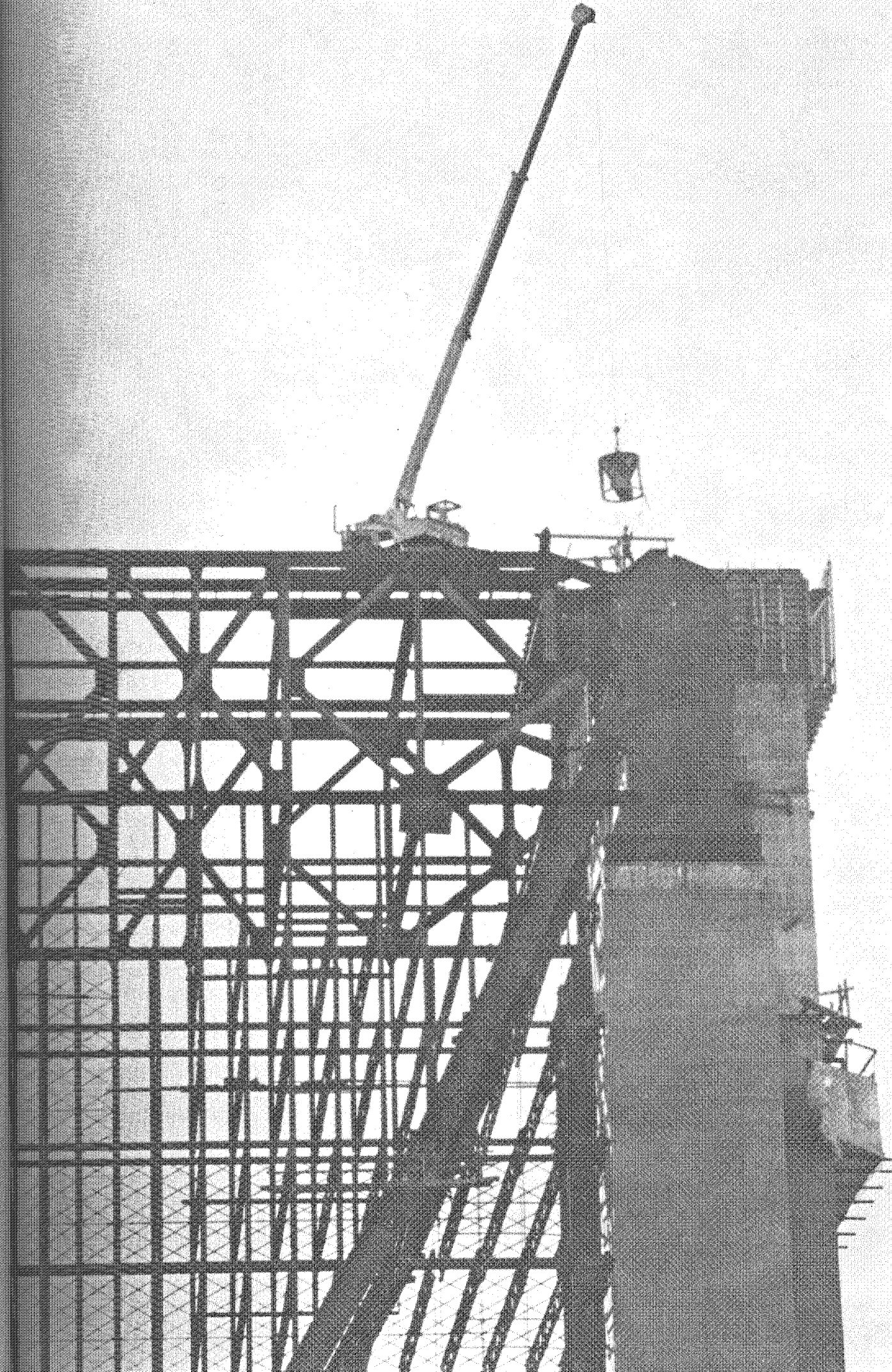


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Brace Wright

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# THERE ARE 30,000 "UNINVITED

**Barnacles. They're  
uninvited—and expensive.  
So a new hull is being tested  
that could keep them at  
bay. And nickel's helping  
make it happen.**

Shrimp boats are a-comin'—out of a harbor at San Juan del Sur, Nicaragua. And one of them is unlike any other work vessel in the world.

It has a new kind of experimental hull designed to fend off barnacles and other drag-producing marine growth *permanently*.

The Copper Development Association, sponsor of the project, estimates that the new hull material could reduce fuel consumption by as much as 15 to 20 percent. And, by totally eliminating hull scraping and painting, could slash maintenance costs up to 80 percent.

Most impressive of all, though, may be the savings that come through improved efficiency. At present, for example, a slowdown of even one knot because of bottom fouling can cost a big tanker as much as \$4,000 a month. And the loss of five profitable working days for a layover in drydock can mount up to \$100,000 or more.



# ED GUESTS" ON THIS BOAT.

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The new hull is a time-proven marine alloy of copper and nickel. It's the copper, really, that's anathema to the barnacles. The 10 percent of nickel is there to make the metal easier to weld and form, to give it the necessary strength, and to help protect it from pitting and corrosion.

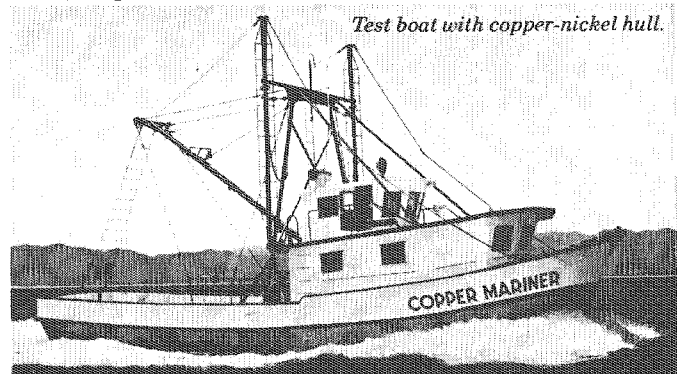
Just as our metal is a strong helper, one that improves the performance of other metals, so International Nickel is a helper.

We assist dozens of different industries all over the world in the use of metals. We offer technical information. And the benefit of our experience. Often, Inco metallurgists are actually able to anticipate alloys that will be needed in the future, and to set about creating them.

This kind of helpfulness, we figure, will encourage our customers to keep coming back to us.

And that helps all around.

The International Nickel Company, Inc., New York, N.Y. The International Nickel Company of Canada, Limited, Toronto. International Nickel Limited, London, England.



INTERNATIONAL NICKEL HELPS



# WHAT'S NEW

Edited by Kiki Koras

## WASTE PAPER INTO WOOD

Almost two thousand years ago the Chinese learned how to turn wood into paper — and now so much waste paper is produced that Americans would like to learn how to turn paper back into wood.

Several engineers are working on an answer: they have used seven pounds of shredded newspapers in making a "wooden" cabinet, only the framework of which is natural wood.

The simulated wood is made from the newspapers, together with an equal weight of an industrial waste material, urea-formaldehyde flash, which is scrap resulting from the manufacture of such things as plastic wall plates, switches and receptacles.

The researchers heated the mixture to about 300 degrees Fahrenheit and squeezed it with a pressure of almost

one tone per square inch, thus turning the wastes into an inexpensive hardboard, a wood-like material ordinarily made from sawdust and a binding chemical.



## SILICONES

A new line of room temperature curing silicone adhesive/sealants and liquid rubber compounds for general purpose industrial use has been introduced.

The GP line, as it is designated, is directed at industrial maintenance problems as well as design and production problems for the original equipment manufacturer. Specifically, the new GP line offers the advantages of silicones to markets traditionally served by non-silicones such as epoxies, polyurethanes, polysulfides and polyesters.

The GP line consists of: GP-1, a room temperature curing silicone adhesive/sealant and GP-2, an easy-to-mix two part room temperature curing silicone available in both pourable and paste consistencies. Also available is GP-2X, an extra high-strength silicone for making flexible molds and casting rubber parts.

Useful over a temperature range of -65F to 500F, these new GP products offer outstanding electrical properties in common with other silicone rubber, are easy to use, cure at room temperature with virtually no shrinkage and no exotherm, retain their rubber-like properties, and will not dry out or crack due to sunlight or aging.

## GARBAGE AND OIL SPILLS

A group of engineers have proposed a double-barreled answer to two problems — getting rid of garbage and cleaning up oil spills that threaten coastlines.

Their answer: Use the garbage to mop up the oil.

They have performed laboratory experiments and sea trials showing that composted household refuse is oleophilic — oil loving — and can be spread over oil slicks to soak them up cheaply.

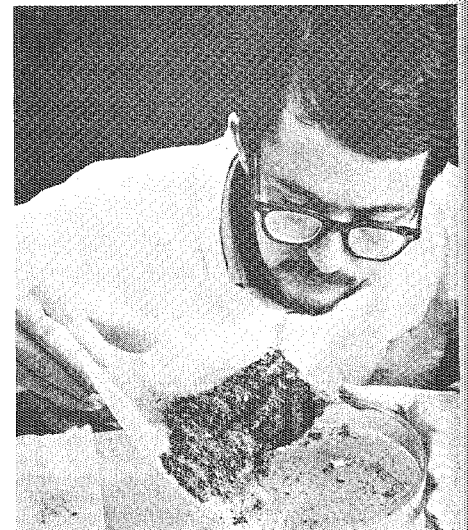
Compost is made commercially by removing metals, glass and other non-degradable materials out of trash, and then grinding it and letting it heat for five days. Normally used as a soil conditioner, compost is a peat-like material with an earthy odor.

A snowblower could be used to spread compost on the ocean, where it will float and soak up oil. It is estimated that 78 tons of compost would take care of 1000 barrels of spilled oil.

The oil-soaked compost could then be gathered up with a purse seiner or other large scoop, and the oil could be recovered by pressing it out. The used compost could be burned cleanly for fuel, buried or plowed into farmland.

Or the compost could be sunk by agitation or hosing down, or it could even be left alone; it would gradually disperse and decompose without releasing any oil or harming wildlife.

An untreated film of oil on water can not be burned, but, if required, the oil-soaked compost could even be burned on the ocean surface. ■



# The Changing of the Guard

By Becky Phillipps

The Institute of Technology starts this quarter under the guiding hand of a new Dean. Dean Cheston has left the campus for the Chicago Circle campus of the University of Illinois. There, he will serve as chancellor, a position similar to president. The Chicago Circle campus is a relatively new campus. It will be a challenging experience for Dean Cheston, as he works to establish an all commuter, urban university. His experience here should be useful, since the U of M is an urban, predominantly commuter campus. The new Dean is Richard Swalin.

In an interview taken shortly before he left, Dean Cheston stated that one of the most pressing problems facing

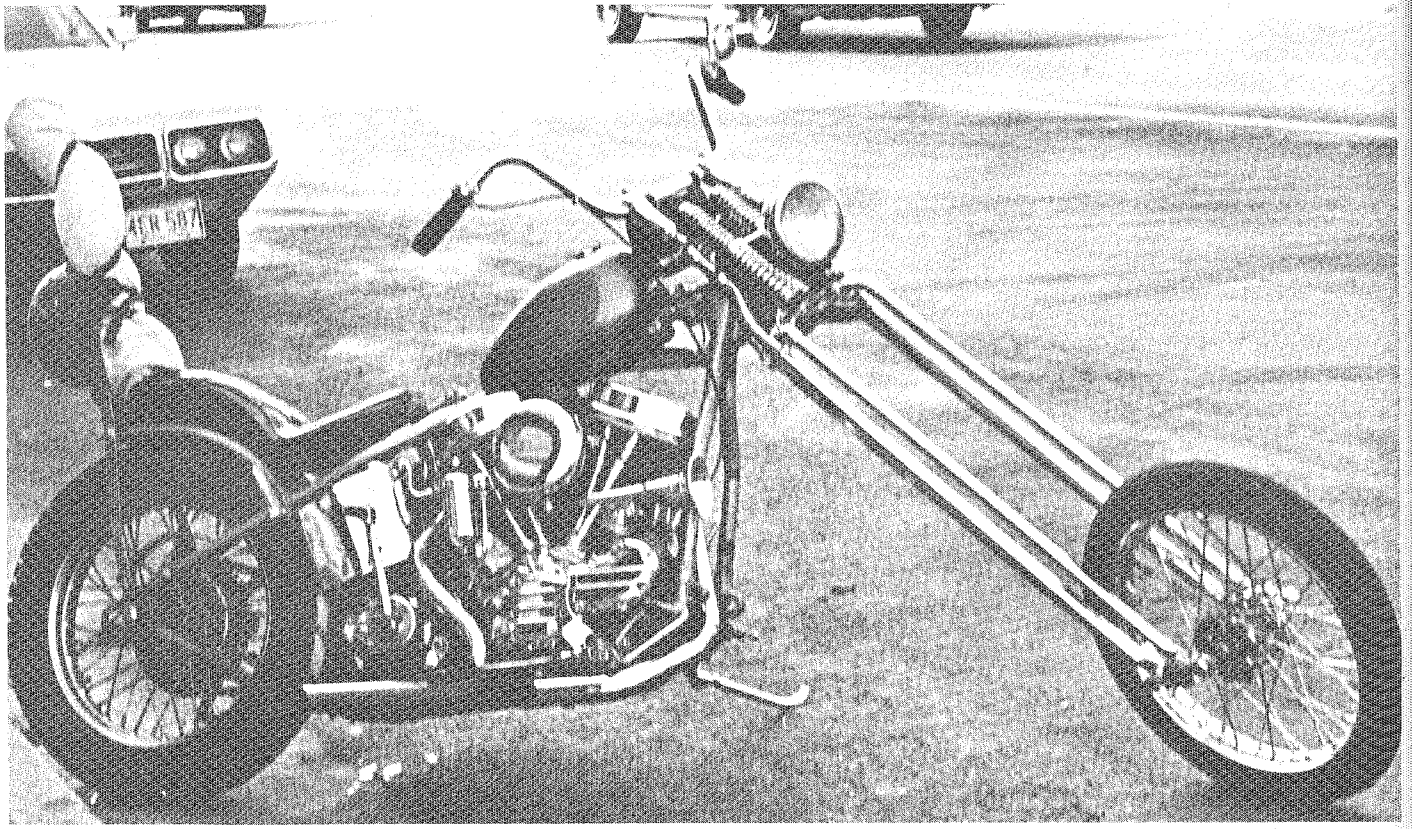
his successor would be maintaining the level of education at I.T. under continuous budget cuts. He felt that his successor must have a great deal of "drive and imagination" to meet this difficulty. Dean Swalin, on first impression, seems to meet these needs. He acknowledges the fact, that state aid has been decreased 5% this year, and that federal aid to individual projects will not be increasing as it has been. However federal aid will be increasing to multi-discipline projects. This is where, according to Dean Swalin, our compact, urban university has an advantage. The closeness of our various colleges and the inherent lack of space, which for years has been a disadvantage, is transformed into an asset. It will facilitate the organization of multi-discipline projects. Considering the budget cuts ordered by the state; Dean Swalin would like to review the educational system, and cut out any inefficiencies. By reappportioning spending and cleaning up any inefficiencies, Dean Swalin hopes to maintain the level of education in I.T. There is a possibility, that if the emphasis is applied correctly and priorities set appropriately — the student could gain.

One of Dean Cheston's consistent worries was the lack of participation by students in their education at I.T. He knew that getting students involved on a predominantly commuter campus requires some student-oriented space (something I.T. is sorely lacking). Along with this comes the problem of the lack of communication between students and faculty — especially severe in the area of advising. This problem is magnified as I.T. undergraduate requirements are loosening. This allows more choice for the student, but also necessitates more thoughtful advising. Dean Swalin acknowledges the difficulties that exist in the areas of student participation and faculty — student communication. However, he is a realist. He knows that there is just no space for an I.T. student union in the buildings that now exist. He knows, he cannot command the faculty to communicate with the students. Dean Swalin places the greater part of the burden for change on the students. They must state a need and request student-oriented space in any new buildings. They must make an effort to get the faculty interested in them. Dean Cheston acknowledged the fear, that if the students do not assert themselves; either nothing will get done, or the administration will be forced to take action in an area in which it really has no jurisdiction.

A project that was initiated in Dean Cheston's term and has become a reality for Dean Swalin is the UNITE program. (UNiversity Industry Television for Education.) This is a television system, with FM reply capabilities. It allows University professors to teach a class at the University, that will be broadcast live to various Minnesota industries. Courses will be conducted on Physics, Mechanical Engineering, Geophysics, Electrical Engineering and Computer Information and Control Sciences. The classes will be taught by regular University professors, as an ordinary class only with an extraordinary audience. Current participants in the program are IBM, Univac, Honeywell, NSP and the U.S. Bureau of Mines Research Center. (More information on the UNITE program will be in the next issue.) This program is financed completely through contracts with the participating industries, which explains why it could be

(Continued on page 31)





Ron Reichenberger

## Customizing

There she sits. Cleaned, gleaming in the sun. Ah yes, just like 10,000 other bikes. But you want her to be all yours, right? O.K. Then we begin customizing. Customizing takes on two forms, that which needs changing for the sake of comfort, driver's needs, speed, etc. Or that which makes your bike look better.

Usually the easiest to do is to add a sissy-bar. Now don't go off half-cocked. Sit down and ask, "Do I want a sissy-bar for looks, or for support?" If it's for comfort and support you have to get a bar that is heavy enough to support your weight under acceleration. You must also get a pad. Anyone who has ridden with just the bar vibrating against their back will tell you it's like having an itch you can't scratch.

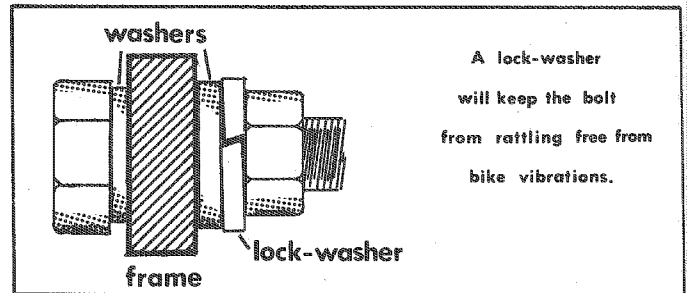
Check the mount on the sissy-bar. Are there brackets, or is the end of the bar all you have? Mounting well-braced sissy-bars usually entails customizing braces for your own bike. If you have brackets, cut the end and smooth the jagged edges. Now cut a hole in the bracket that is a little bigger than the bolt that you are using to attach the bracket to the frame. Whenever you attach a piece, use a washer on each side and a lock washer on the outside, next to the nut. Since all this sounds more complicated than a crash course in parital differentiation for freshmen, our kindly log artist has drawn a diagram to help clear matters up.

The next thing you will want to customize is the handle bar. Looks easy doesn't it? It's rougher than registering. First pick the length and design bar you want.

Are they longer than the bars you already have? They are? Well then, you'd better get wire, a soldering gun, solder, and some patience. If you get larger bars, you will need longer wires and cables. Most bars have wires running within them. Disconnect them. (In Hondas the connections are in the headlight.) Now disconnect all the original cables. (Break, clutch, acceleration) Now you can remove the bars.

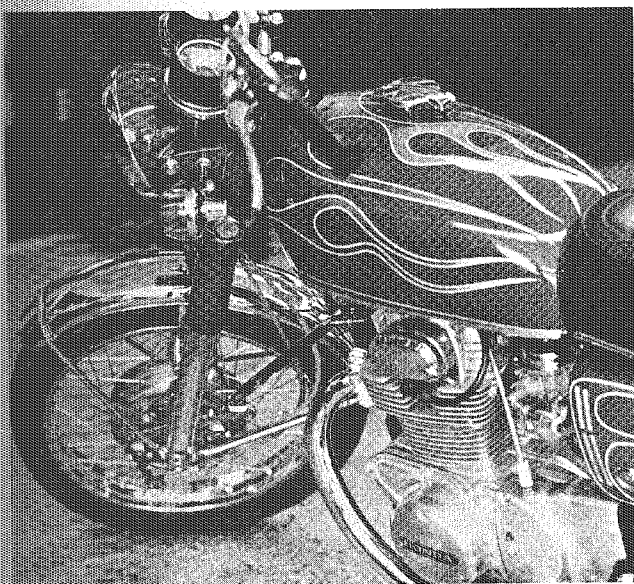
You will probably have to drill your own holes in the new bars so use the old ones for guides. Be precise! The frustrations you save may be your own. Make sure you drill the holes in the new bars not only in the same place, but also the same size. It's very maddening to try and fit a  $\frac{3}{4}$  inch wad of wires into a  $\frac{5}{8}$  inch hole.

You've got your new bars drilled, and you're ready for the next step, right? O.K. Sit down at the work bench, turn on the radio, grab a coke, plug in the soldering gun, get your solder, a tape measure, electrical tape, a knife (not for suicide) and wire cutters. Find the difference between the length of the two bars. That is the amount of wire you will need to splice in. When you cut your wires, do not cut them off all at the same point but stagger them instead.



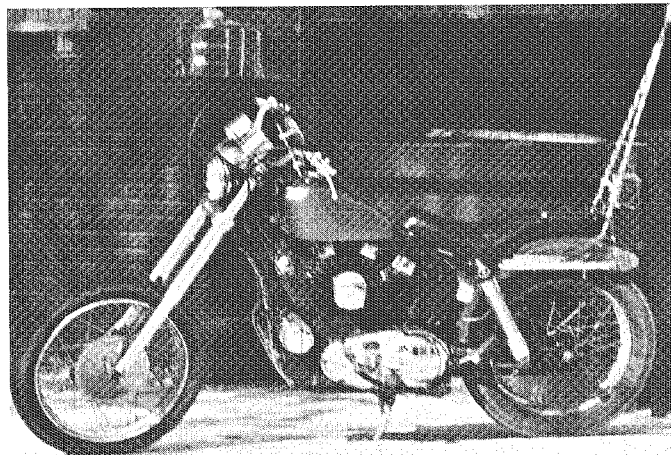
Once you've finished this you must thread the wire through the new bars, attach the new bars on the bike, re-attach the cables and finally hook up the wires. If you must put on new cables do it one at a time. Take out the old clutch cable and put in a new one. That way you will remember the proper order and you don't have to play "guess who" with four dozen nuts, bolts, washers, gaskets, and weebers that may be lying on the ground.

Now comes any number of things; perhaps a custom paint job. Here you have three alternatives. One, the old do-it-yourself. This involves using either paint stripper or hand sanding. Don't sand blast because it will take the metal away with the paint. When sanded to bare metal, you can do the body work. Using the filler, sanding, and shaping, you should be able to do an adequate job. With patience and know-how, a more than adequate job. Next comes metal conditioning. Wipe the parts to be painted with a weak acidic liquid. This makes the primer stick a little better. Now apply the primer. It is usually best to use lacquer primer, it's more popular than enamel because of its advantages. Sand the primer down to remove high spots. Slop on the base coat, (that usually comes in silver, gold, or pearl.) Silver and pearl will make for a lighter shade of the color you choose. Gold will make it darker.



Bruce Wright

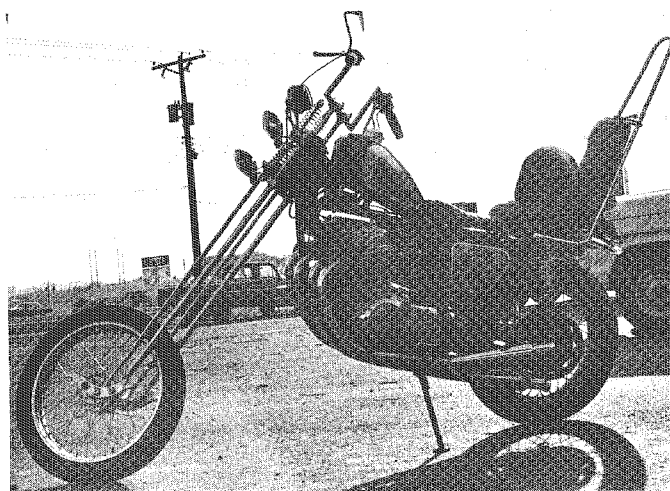
Now you put on two coats of color sealer and sand again. Use fine sand paper (very, very fine) in all your work. (You don't want to sand everything off again.) Now you can flake it, paint it, fog it, spider web, or lace it. This is up to you. If you want pinstripping add it over a fog, flake, etc. The choice is yours; as is the number of coats of paint to use. Remember, there is a minimum amount of paint for each choice. Sand it with typewriter paper (seriously). Finally, slap on as many coats of clear as you have patience for. Anywhere from 16-40 will do. Do a real light (and I do mean real light) sand job and in about a week, take rubbing compound to buff it down. There is a lot of work to this and, barring any mistakes, it will probably take about three weeks. If you make any mistakes, well. . . .



Ron Reichenberger

The second alternative is "House of Kolor", or for that matter, any professional paint house. If you have a good job or a big inheritance, take it to a professional shop. The third alternative is a person you know who does this kind of work. I had my work done by a friend who does painting (custom cars, bikes, lawn mowers). His name is Keith Ferenc and his telephone number is 560-0988. He does a good job and it saves you the hassle.

Another nice-looking addition is having parts chromed or some of your aluminum buffed. There are many plating shops in the city. Just let your fingers do the walking.



Springer extended fork, 2 Type handle bars, high rise seat, Sissy bar and custom paint job top off this 750.

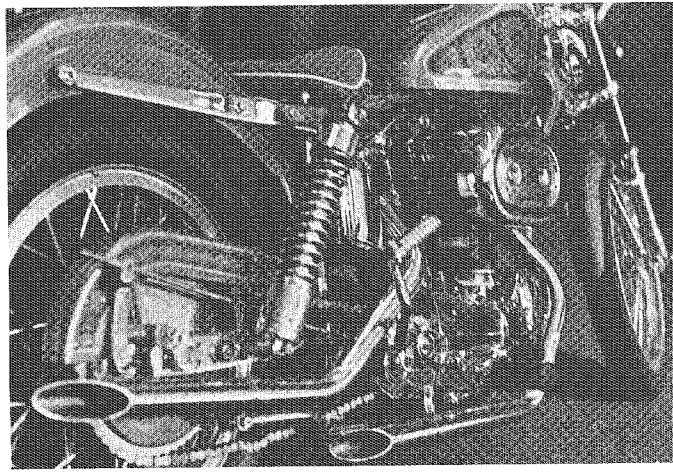
Ron Reichenberger

Other additions are velocity stacks (easy to put on and likely to wreck your engines). Velocity stacks work on the principle of air filling a vacuum. The faster you go, the more air needed to compensate. This air being forced into the stacks continues (still forced) thru the carbs and into the cylinder. If the jets aren't set properly this ram air system tends to burn pistons, cylinder walls, cams, valves, valve seats, and bike owners. Another addition is different pipes, but if you have a scrambling bike, down swept pipes won't fit and you'll need to weld on different front foot pegs and possibly bend a different rear brake. Or just order round pegs and a round brake.



Extenders range from \$30 (four inch) to at least \$245 for springer front ends. Before you do these modifications, check with a mechanic; they are harder than they look and sometimes require welding.

When any engine modifications are made, check with a mechanic. If you do it wrong, you won't have any warranty. Customizing is fun but before you get into it, know what you will have to do. It's bad if you get half way through and realize you're lost.



Ron Reichenberger

## Choosing A Bike

You have to get a bike but don't know which one. Street, street trail, trail, drag; which one? First, to consider which you want, you must make a choice. Do you want to hit back roads, and stay off the highway? Then go straight trail, and probably two cycle. Benilli, Bridgestone, Bultaco, Cimatti, Jawa, Ducati, Garelli, Greeves, Harley-Davidson, Hodaka, Huquavarna, Indian, Kawasaki, Maico, Montessa, Ossa, Penton, Sachs, Suzuki, Yamaha, Zundapp, all of these are two cycle. But for all you who are not racers or bike enthusiasts to the nth degree, then I would suggest Bridgestone, Harley, Kawasaki, Suzuki or Yamaha. Why? These bikes are not racing machines and come stock equipped for the recreational biker. They also are pretty well known and chances are there will be more shops for these bikes. Don't get me wrong, a tuned for speed on the trail Yamaha is a damn good bike but the stock Yamaha will more than suffice for the average biker.

Try to stick to a smaller machine (under 125cc) if you're out just for fun. They are less hassle in the sand and mud, and are much easier to control. If you are more into the road, but still want to hit a few trails, then you should set up percentages. If you want a bike for the road 60 percent of the time and trails 40 percent of the time, then don't go bigger than 350cc (even that is big). On trails you want a light, fast, easy to handle bike and as you go to larger engines, the bike gets too heavy.

I personally like four cycle engines but I know if I say "always go four cycle" I will be jumped on. Both

engines have advantages and both disadvantages, but if you're in for a straight road bike, the four cycle engine is a little better.

If you're going straight road you can choose from BMW, BSA, Dunstall, Harley, Honda, Indian, Kawasaki, Matchless, Moto Guzzi, Norton, Royal Enfield, or Triumph. I would say to choose from these is a pretty rough choice and you would be best to go on cost, dealer availability and looks.

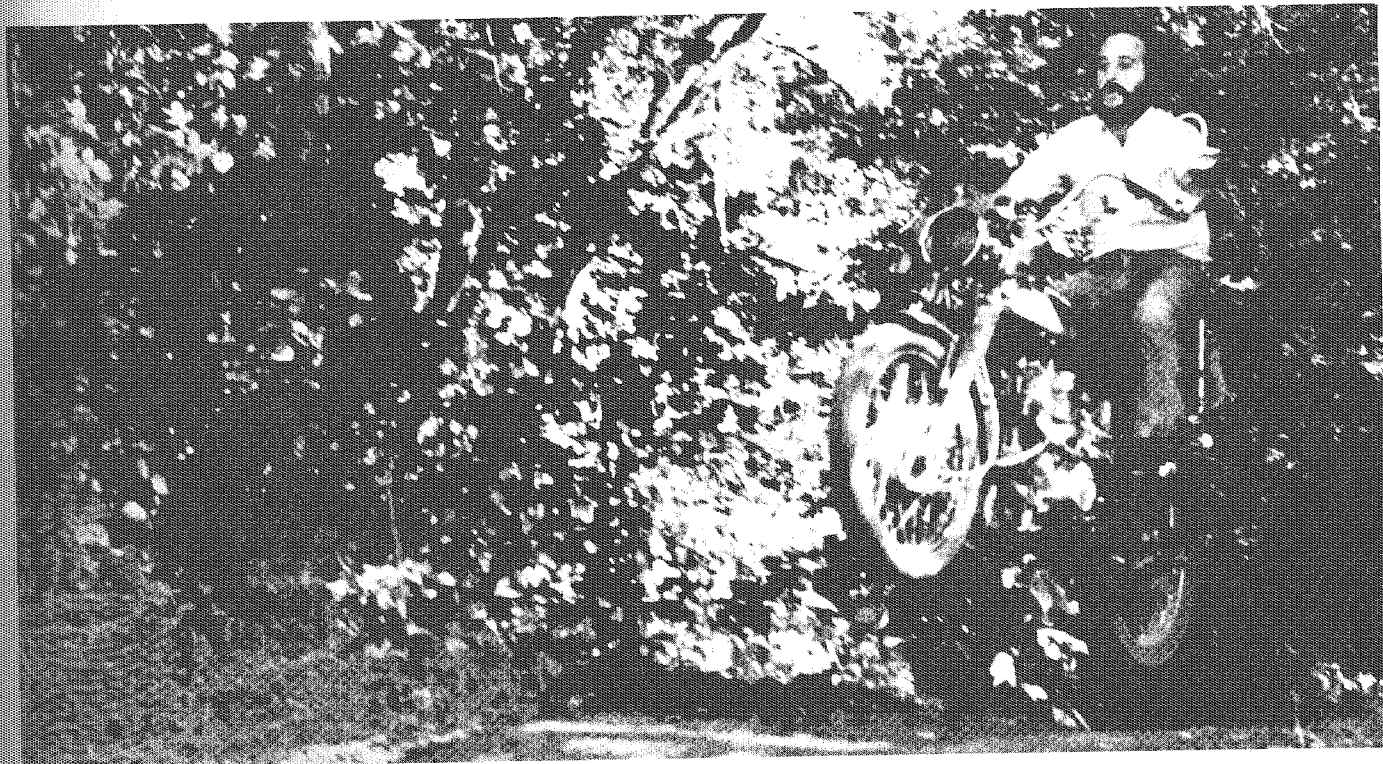


Ron Reichenberger

*Rev your engine, lift your feet, and take off into nature.*

I have a 450 Honda and though it is a good bike, it is not a scrambler. It is a little too heavy for the recreational biker. If you like Honda and also like scrambling the best machine is a 350.

When choosing, consider the type of use the bike will get, cost, dealer availability, performance, looks, and dealing with the bike. Some states won't allow bikes smaller than 250cc on freeways.

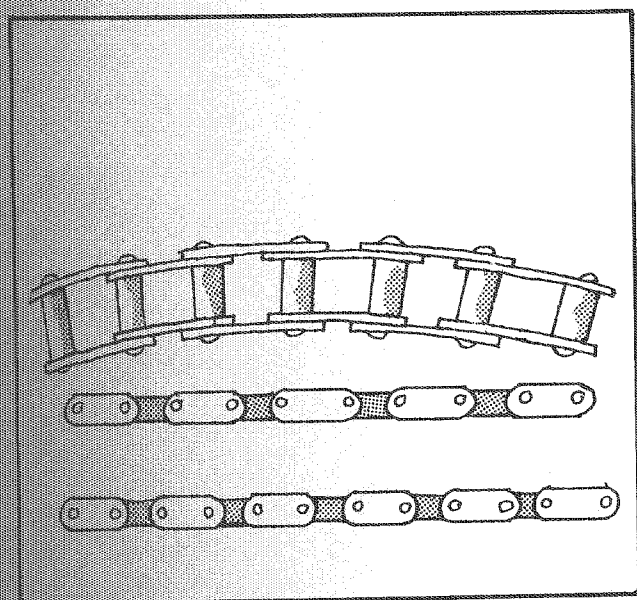


Ron Reichenberger

## Maintenance

There are some things you should know about your new toy to keep it new. Motorcycles will grind for many moons if properly cared for.

Check the battery. A dead battery causes many psychosomatic ailments in these machines. Make sure it is full of battery juice (distilled water), and fully charged. When you charge it, loosen the battery filler caps or you will find one cracked, dead plastic box ready for burial rights.



Now, look to see that the chain isn't worn. To check this, stretch it out on the ground and pull. It should not shrink and grow. Next take two successive links and try to sway them from side to side. If they sway, even a little, it's best to get a new chain. There are approximately 90 links, you find the chain will drift almost an inch. This drift, and growing and shrinking of a chain will not only wear down the sprocket teeth, but also can cause the chain to fly off the sprocket during acceleration, causing much damage to bike and rider.

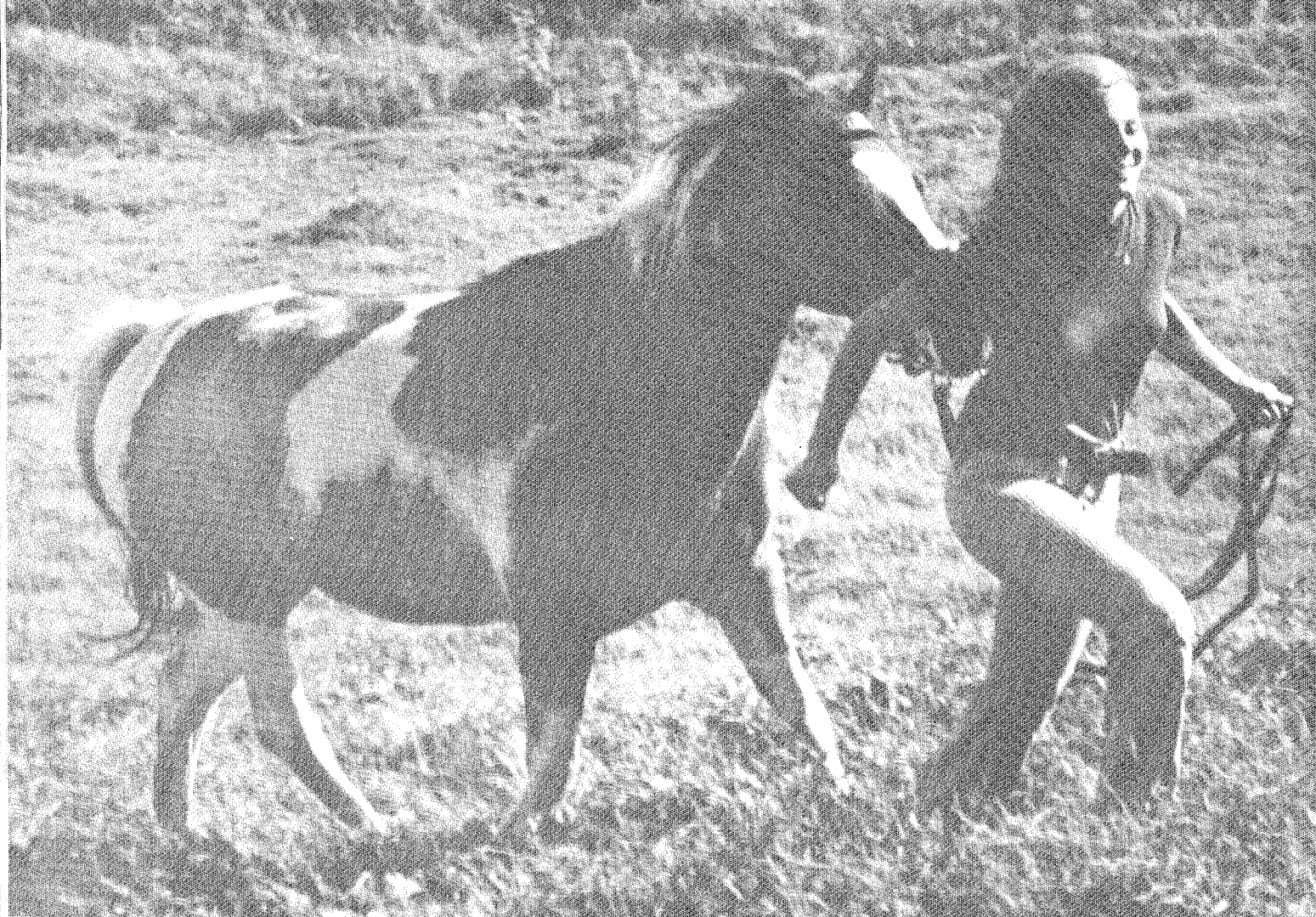
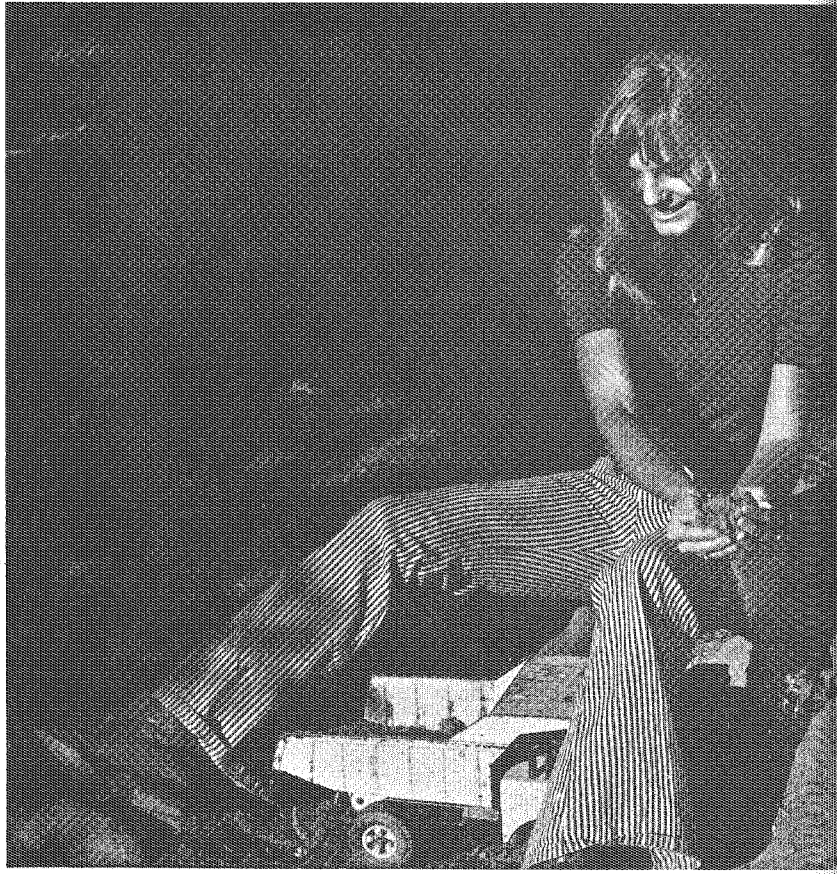
Now check the oil. Before trips I like to change the oil and clean the oil filter. Dirty oil will cause small particles to scratch the parts of the engine, causing rapid wear and loss of efficiency in the engine. Make sure the oil is full, not over or under.

Check the tires. If one blows out at sixty, it could be detrimental to your health and the bike's longevity. Make sure the spokes are all there and the air is at the recommended pressure. Make sure all the lights (especially headlight and brakelight) are in working order.

It is usually wise to keep your machine tuned. This is easy and does not require much time. First clean the points and plugs (or replace them depending on the thickness of your wallet) and regap. Set new points at minimum required settings and set the plugs to double whatever the points gaps are. The ownership manual usually has schedules for cleaning, changing, or greasing the parts of the bike. Follow that schedule, recording the mileage and date that you did the work. This frees your memory for more important things, and makes a good document of service when selling (God forbid) your baby.

Make sure the front brake fluid is at the level recommended. (You can't see it, but if the front fork bottoms out easily, you have too little or too much.) Change it if your instruction manual suggests it.









## TECHMATE

TECHMATE for October is attractive Virginia Eisinger, 1971 E-Day Queen. Ginny is a sophomore in Liberal Arts from Orono. An active member of Alpha Omicron Pi Sorority, she still finds time to sew all of her own clothes. Ginny loves all sports, especially horseback riding.



Photography by Don Neal



# LOG'S LOG

## Introduction

Oh, joy supreme! We're as happy as clams as we celebrate the start of the sixth year of Log's Log. After a year of writing jokes, we've been given our very own column. This is due to our qualifications. Each of us has one year of experience behind us, (we were both late bloomers) can tie our combat boots in the dark, (necessary when hiding from the National Guard in the steam tunnels) and besides, no one else would take the job. With our predecessors doing better and bigger things to the new business staff, we look forward to another year as a non-profit organization.

So, with joy in our heart and warm Tapioca (is that in Kansas?) in our pillowcases, we surge forth into another year of sex, sin, perversion, and all that other good stuff.

## Poetry Corner

Late at night, when it's dark,  
I goose the statues in the park,  
If Sherman's horse can take it,  
Why can't you?

By Rhube & Co.

## The Adventures of Rhube & Co.

Having passed Soc. 1-002, and been convinced that the small town is the backbone of the nation, we decided to strike out on our own and do a bit of sociological research. We chose the typical small town of Lackalot, Minn. The town seemed perfect for our work. It had a small population, no large industry, not too far from the Cities, and Craig's girlfriend just happened to live there.

Craig's car, being laid up in the garage for some work on the "Royalshaft" muffler, and Pete's car having the "Warefast" tires replaced, were of no use to us, so we decided to take a bus down. (We'd been out on a wine binge 'till three in the morning, so we didn't feel like driving anyway.) We got on the bus, with a little help from a friendly nun, at six a.m. and figured we'd get some badly needed sleep on the way to Lackalot. The trip takes about three hours, so we thought we'd be refreshed (awake) by the time we got there. We were about ten miles south of Bloomington when an old lady in the front seat started to tell her own "Peyton Place" to the driver. Her voice had the tonal qualities of fingernails on a chalkboard, the volume of an idling jet fighter, and the speed of a sexually accosted gorilla. We listened, as did the whole bus, as she told of how her grandson had divorced and moved in with a female roller derby ticket tearer. Then the driver told stories of how his daughter was voted "Miss Udder Success" at a 1965 dairy convention. And so it went, until we reached Mankato for a 55 min. stop.

If you ever have the misfortune of being holed up in Mankato, and plan to take any photographs, use black and white film. 'Cuz even if 'ya use color, the shots are going to come out in B & W. The whole town is painted what could be called "glorious grey". There hasn't been any color in town since the last bad car accident. We stopped a local resident and asked her if there was any place we could eat. After explaining to the police that we were looking for a "Cafe", we were released and told never to be seen in town again. Back at the bus terminal, we bought a few paperbacks and some orange juice (that tasted like

3 day old orange peels mixed in iron water) and used the restroom to pass some . . . er . . . time. We got back on the bus and had just started to doze off when the driver announced our stop, threw off our luggage, slowed down a bit and let us off.

Pam, my domestic friend, and Jan Pete's blind date, were supposed to pick us up at the station. After waiting a fortnight or so, we started to walk towards Lackalot, which was another twenty miles. The girls caught us (but not without a long chase) about three miles out of Lackalot, tied us to the fenders, and drove us into town.

Once in town, the fun began, we left. After leaving, we headed for Jan's cozy bungalow in the woods to have some lunch. After stepping out of the car, we found to our great dismay, that Jan had two *very* hungry killer wolves for pets, whose favorite food was leg of city slicker. The girls went inside to fix lunch after coaxing the wolves away from us with rotten chicken eggs, while we went snake hunting in the woods. When we got back, we found that the girls had whipped us up a wonderful batch of chocolate chip hockey pucks and some hamburgers that could go 15 rounds with Joe Lewis and win. Two cases of Alka Seltzer (and white lightning) later, we were sitting (laying?) around belching, thinking of things to do, and passing out.

While in Lackalot, we compiled a list of things to do while stuck in a small town. We present it to you, our readers, in hopes that you never have to use it. (If you come from a small town, you already know what is on the list, so you can stop reading here and get back to the latest "Grange Newsletter".)

Walk downtown and watch the hot car drive down *the street*.

Make faces at the crop duster.

Sit on the corner and listen to the cars rust.

Go to the old tyme dance and listen to Harry Nasel and the Nose pickers to Elmer Shide's arrangements of Patti Page singing Greatest hits of the Jefferson Airplane and his own composition entitled "Dig that Boogie".

Or do as we did, go to the county fair.

(Continued on Page 31)

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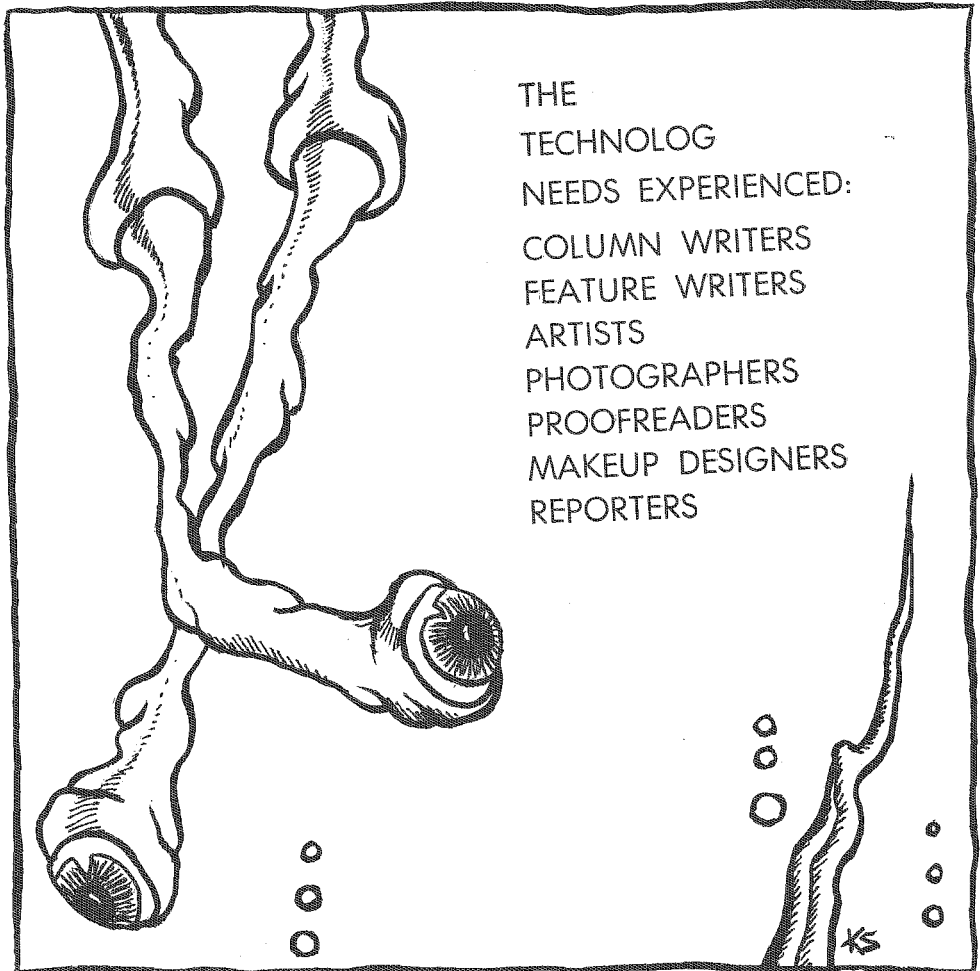
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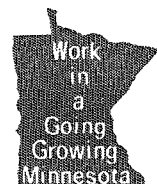
### HELP!

Anyone interested in establishing a student  
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# SPLITTERS

Last summer a forester got a job as a waiter in one of the resort hotels in the catskills. One morning during a medical convention, he was waiting on a table of doctors and scratching his ass while he was doing it.

"Hemorrhoids" asked one doctor.

To this the forester replied, "Sorry, sir . . . no substitutions on the regular breakfast."

\* \* \*

And then of course there was the deaf mute who fell into the well and broke three fingers screaming for help.

\* \* \*

A lunatic was leaning out of the asylum window one morning watching the garden below.

Lunatic: "What are you doing down there?"

Gardener: "I'm putting manure on the strawberries."

Lunatic: "I usually put sugar on them, but then of course, I'm crazy."

\* \* \*

"What a beautiful fit," said the tailor, as he dragged the epileptic out of his shop.

\* \* \*

Typist: "But professor, isn't this the same exam you gave last semester?"

Physics Prof: "Yes, but I've changed the answers."

\* \* \*

Irritated Prof: "If there are any morons in this room, stand up."

After a long period of silence, a lone freshman rose.

Professor: "What, do you consider yourself a moron?"

Frosh: "Well, not exactly, sir, but I hate to see you standing all alone."

\* \* \*

Senior: "If I accept a position with your firm sir, will you pay me what I'm worth?"

Employer: "I'll do even better than that. I'll even pay you a small salary."

\* \* \*

Overhead at a ROTC dance:  
Girl: "What's the difference between dancing and marching?"

ROTC student: "I don't know."

Girl: "I didn't think you did. Let's sit down."

\* \* \*

Johnson was fined \$105.50 for slapping his mother-in-law.

"I can understand the \$100.00," said Johnson, "but why the \$5.50?"

Replied the judge: "Amusement tax."

\* \* \*

Freshman: "Why do janitors wear uniforms?"

Senior: "So we can tell them from the administration."

\* \* \*

As his wife lay on her death bed she pleaded: "James, promise me you will ride in the same car with my mother at the funeral."

James sighed: "Well, OK, but it's going to ruin my whole day."

\* \* \*

If her lips are on fire, she trembles in your arms, and her chest heaves with excitement, give her up Man... she probably has malaria.

\* \* \*

"I believe that you have made a mistake on my bill," said the patron after three superb highballs in a famous New York bar. "You've only charged me thirty cents."

"No mistake," replied the bartender, "I only charge ten cents a drink."

"Terrific," said the patron, "but how, at ten cents a drink, can you afford to operate such a plush club? Are you the owner?"

"No," confided the bartender. "The owner is up stairs with my wife, and what he's doing to her up there, I'm doing to him down here." ■

**Harry E. Adams, Assoc.**

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By Greg Smetana

The Fair

Ah yes, the fair, that wonderous thing that if your lucky only catches you once a year. Well, as I'm sure you know by now, Rhube & Co. are not really bosom buddies with that fickle mistress lady luck, so here is our tale of misfortune and woe.

Now first you must understand that a county fair is no ordinary fair, but one that is set in rural U.S.A., that unforgettable "backbone of the nation" (unfortunately Lackalot seems to have slipped a disk or two), which also happens to be the barnyard of America. (Leaving Lackalot as a pile of . . .) We arrived at the county fair about seven thirty, as they say at Green Giant, "Half past a peapickers arm (?)" P.S. for all you foresters that's when the little hands on the . . . oh well, (that ought to keep you thinking for awhile) on with the fair. Parking was difficult at the best, as always so we had to park about one foot from the gate, (two John Deere tractors had the best spots) and tiptoe gently to the gate,

(the horses use the same path) pay our thirty five cents and then walk in.

First we looked at pigs, cows, horses, and chickens, then we thought we'd go and see some of the farm animals. (Chin up, farm girls, the beautiful people will return! . . . I hope.) Next we went to the home ec. buildings. (Yes folks, they had two buildings) and saw some of the nicest knit hen warmers and crocheted cow blankets we have ever seen. (And ever hope to see.)

Then we proceded to the ride. Now, normally the fair has more than one ride, but due to the fact that no one has ever lived through the first one, there has been no reason to put up the others. This ride (as it is loosely called) is a device designed by the Chinese of the area shortly after Jolly Green Giant took over the valley. Somehow we got talked into (shoved into) this contraption by our girlish friends (alas and alack, to have this done to us by our friends) who were eyeing every other good lookin' guy in the place. After convincing ourselves that it was childs play, (unfortunate-

ly there were no 7 foot, 300 pound solid muscle children around) we stepped in line. The first warning we had was after we had stepped in the cage, a large lock was slipped through the hasp and resoundingly snapped shut. The object (as we were told) was to swing the cage back and forth until we got it up to the top, in which case we would get new Cadillacs, \$5,000,000.00 dollars each, all hospital bills paid in full, a fuzzy bear, and a cigar. After 30 min, during which Craig broke an arm, a leg, 13 ribs, and a collar bone, and I stubbed my big toe, we decided we didn't want to reach the top 'cus Craig doesn't smoke and I already have a Fuzzy bear. When the cage was stopped and unlocked the girls ran over to us, beat us up, robbed us, then took pity on us and drove us home. Once home, the girls stuffed rags in our mouths, so the cries of pain and anguish wouldn't wake the parents, and snuck us in. After a short discussion about the sex life of an amoeba, and a lecture on mountains, our day came to an end with the wonderfulness of being tucked in by a rural American farm girl. ■

Deans (Continued from page 19)

developed considering the current budget cuts.

The UNITE program is a response to a problem, both Dean Cheston and Dean Swalin have encountered. The fact that the bachelor of engineering degree is no longer a truly professional degree. Most industries want a man to have a general knowledge of engineering. From this basis they spend several months training each new engineer for his individual role in their industry. This need for generalization is the undergraduate degree is evolving through the lowering of science and engineering requirements and the reduction of credit hours. This generalization, however, strengthens the opinion that the bachelor degree is not a professional degree. To fill this gap the UNITE program was developed for continuing education, while on the job. Also, I.T. has created the Master of Engineering degree and is planning a Doctorate of Engineering degree. Also, now with the emphasis on multi-discipline projects, both Warren Cheston and Richard Swalin recommend further education after a B.S. in engineering. Further education could be in the areas of Business Administration, Law, Journalism or Political Science. As Dean Swalin stated, "Real problems involve many different disciplines, they aren't restricted to chemistry, physics, or something of this kind . . . but students in I.T. do need a very basic grounding in engineering sciences."

Since Dean Cheston is gone now I.T. is Dean Swalin's baby. Dean Swalin's major theme for I.T. is: "excellence: excellence in teaching, research, and excellence in terms of the student body. The focus should be on the

student. Our principle mission here is to educate at the undergraduate and graduate level, so the focus has to be on the student, without the student we wouldn't be here." Specifically he would like to see more emphasis on the Master of Engineering program, more focus on design with more students going on to a fifth year for a real professional degree. He would like to utilize more visiting professors from industry to present the students with current problems in engineering. He wants developed more courses on technology for non-science or engineering majors, since we live in such a technological age.

"Science in the abstract is neutral, but the application of science is not neutral." Dean Swalin expressed this and the belief that we must control technology, rather than simply operate it, when questioned on the social role of the engineer. An engineer must be concerned with the protection of the environment. The increased flexibility in the undergraduate degree is designed to allow an adequate mix of the arts, humanities and philosophy, along with engineering and sciences courses. This could give students a more realistic outlook towards any project he may encounter on the job. Dean Swalin hoped that the engineering and sciences community could take the responsibility of protecting the environment.

Overall it doesn't look as though I.T. is going to lose anything.

Dean Cheston was a good dean and accomplished some good things for I.T., but he has left. Dean Swalin has the experience and the vitality to keep things progressing. Considering his close association with Dean Cheston, it is sure to be a consistant progression lacking any extreme and disrupting changes. ■



# NEXT MONTH

## Reserve Mining vs. Save Lake Superior

An unbiased view of the conflict between the Reserve Mining Co. and the Save Lake Superior Society over the dumping of iron tailings in Lake Superior.

## Donnybrooke

A pictorial about the Can-Am race held at one of the largest race tracks in the Midwest.

## Unite

Why has the first floor of Mechanical Engineering been re-modeled? Find out in this revealing article about a unique teaching program.

## Synthesized Music

A look at how music is created by electronic methods.

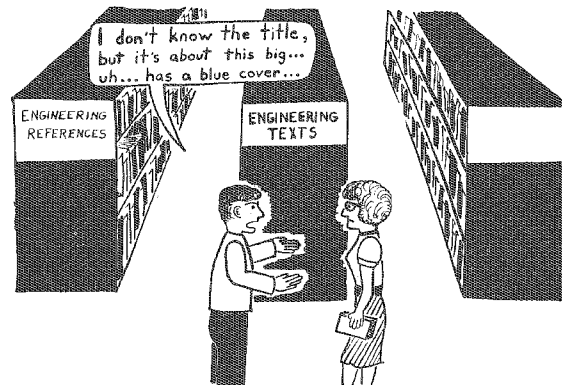
## Welcome Freshmen

An in depth report on the problems freshmen face.

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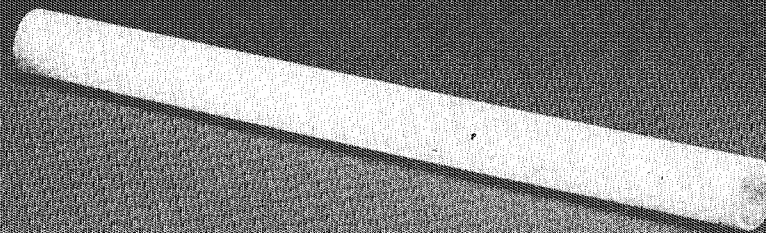
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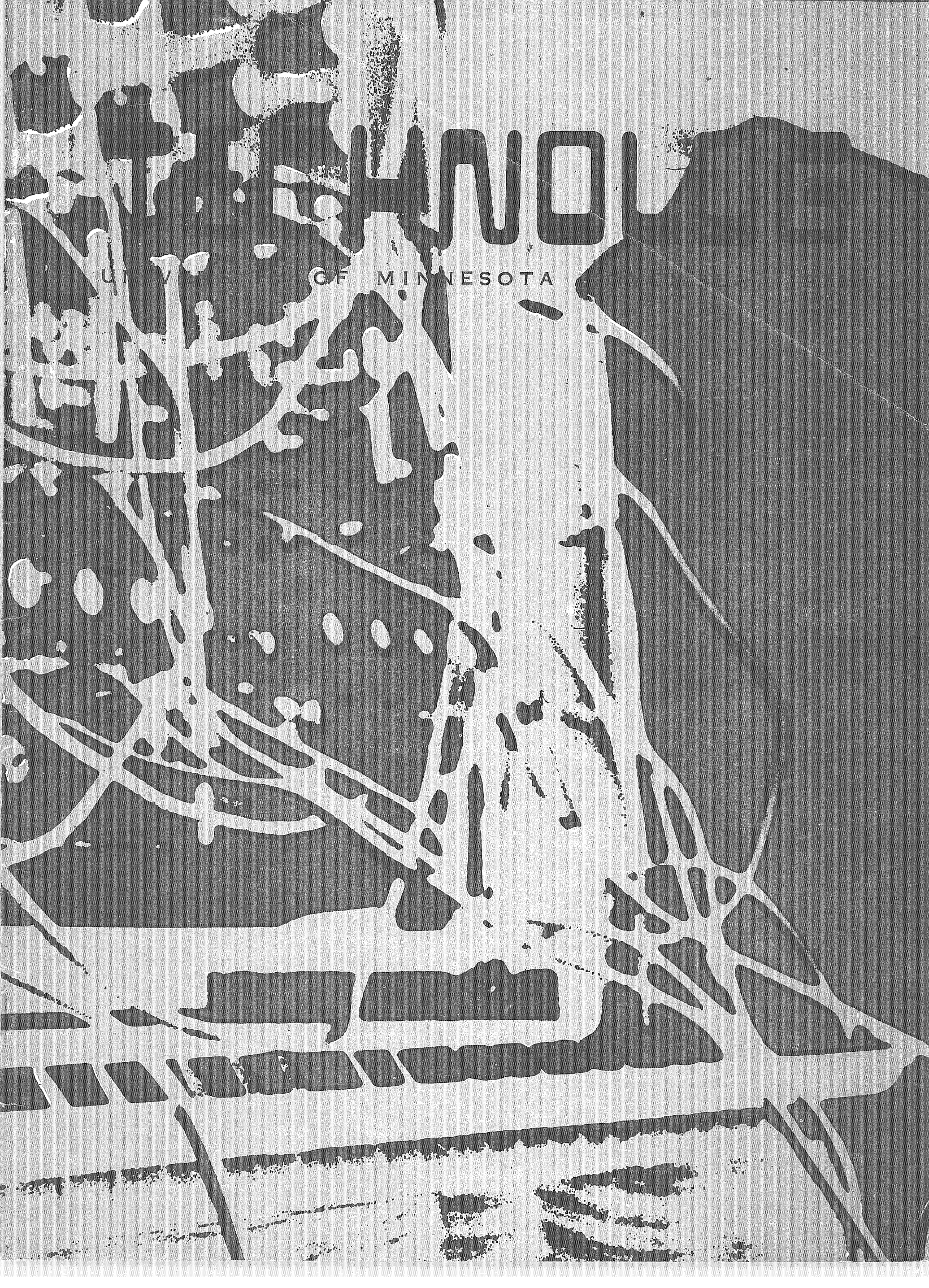
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# WORLD

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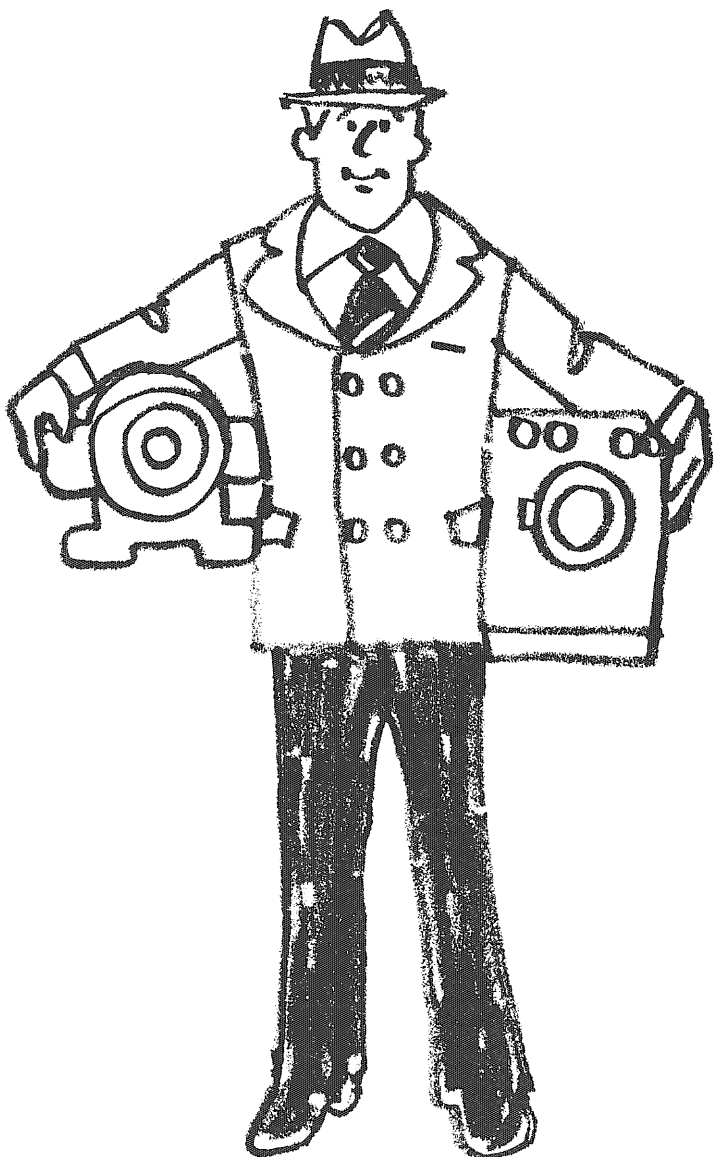




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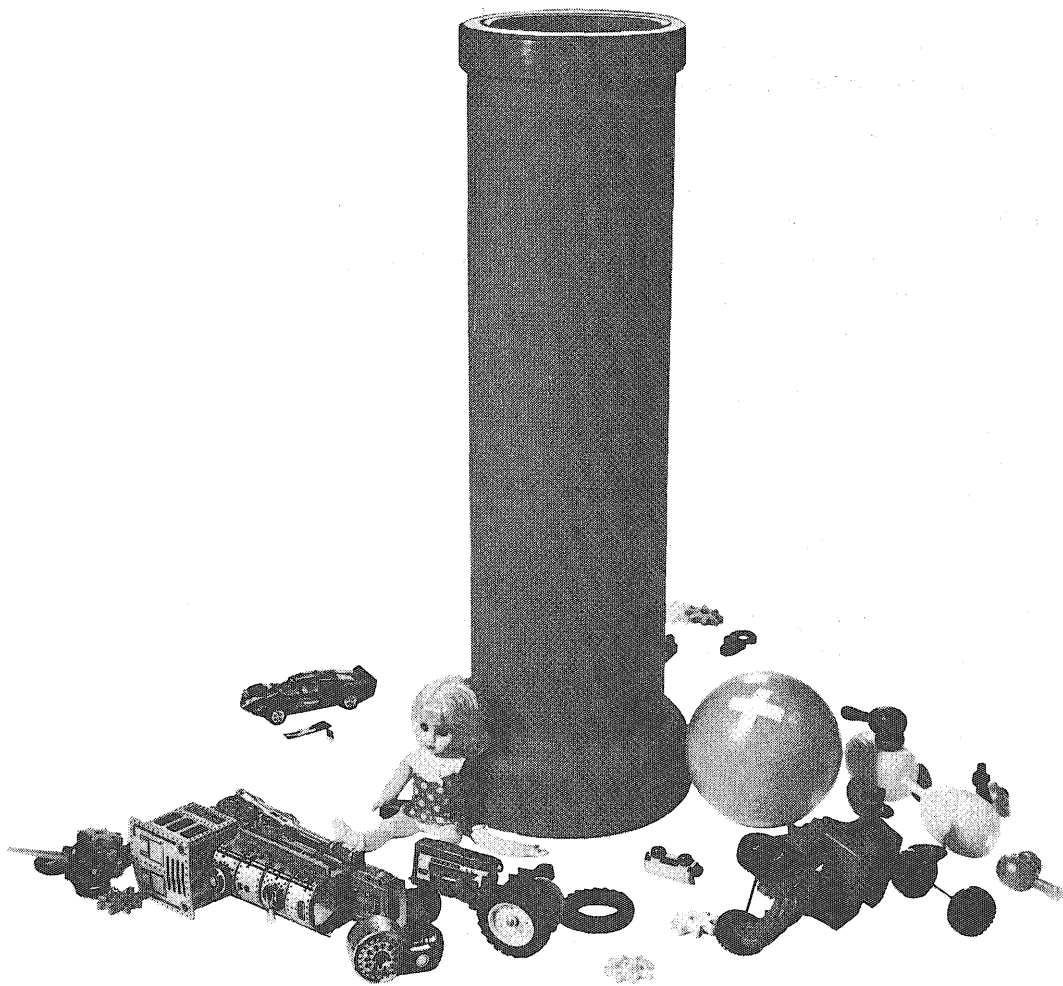
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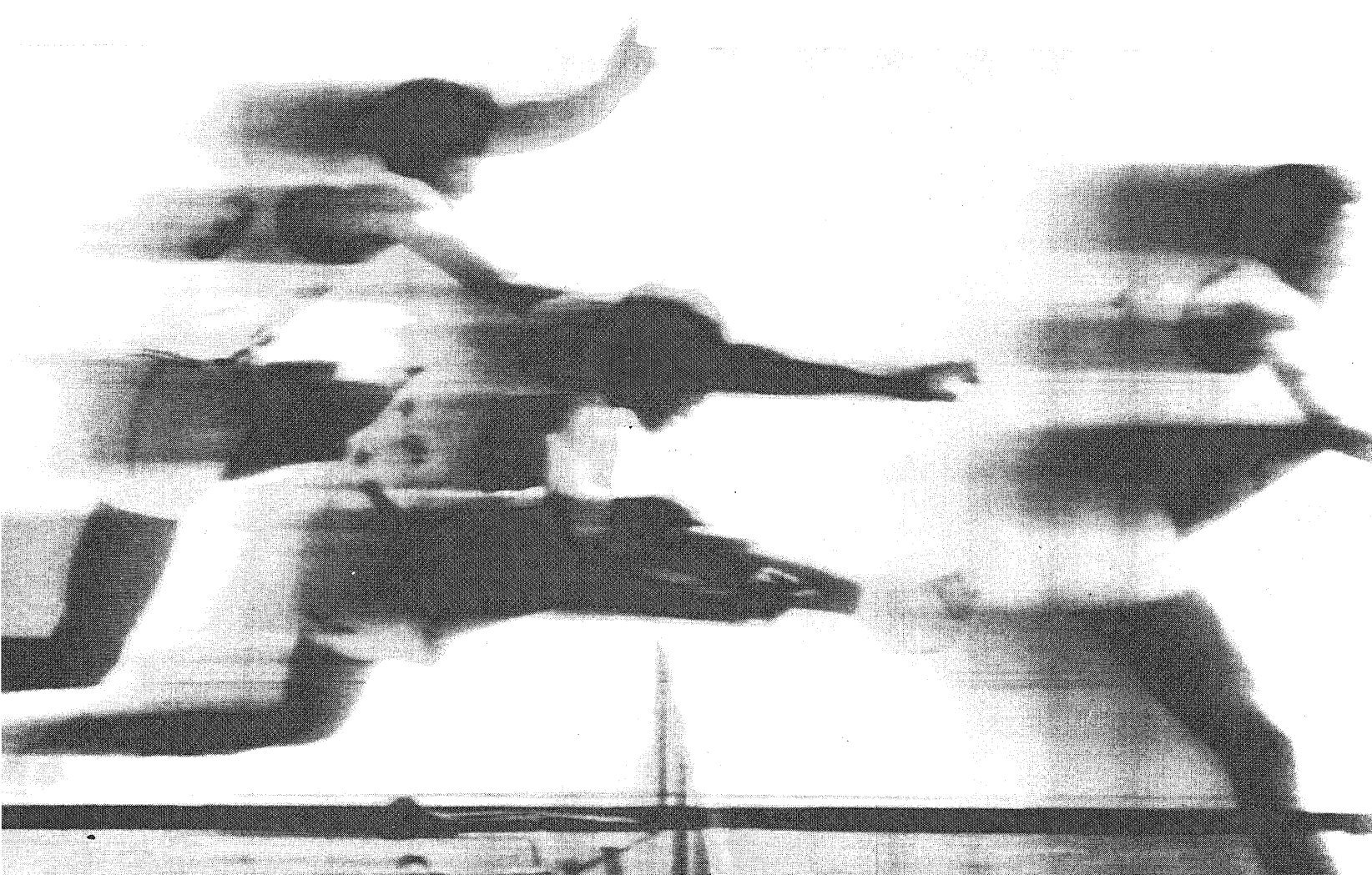
Energy to burn, literally, because ideas—freedom, equality, well-being, conservation of our natural environment—must be turned into realities—food, shelter, warmth, access, economic independence and the physical means to accomplish our goals. Atlantic Richfield is an energy company—in all these ways. One of the nation's thirty leading industrial corporations, and one of the ten companies producing most of our energy needs, with a strong position in diversified chemical products as well as in oil and gas.

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# TECHNOLOG

VOL 52; NO. 2

Official Student Publication of the Institute of Technology, University of Minnesota

NOVEMBER, 1971

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## MEMBER OF ECMA

Published monthly, October through May. Second class, postage paid at Minneapolis, Minnesota. Office: Room 2, Mechanical Engineering Building, University of Minnesota, Minneapolis, Minnesota 55455. Telephone: 373-3298. Printer: Artcraft Press, 425 South Fifth Street, Minneapolis, Minnesota 55415. Publisher's National Representative: Littell-Murray-Barnhill, Inc., 60 East 42nd Street, New York, N. Y. 10017. Publisher's State and Local Representative: University Engineering Magazine Advertising, F. P. McGrath, Manager, Box 14026 University Station, Minneapolis, Minnesota 55455. Telephone: 612-225-0708. Member of the Engineering College Magazines Associated, Chairman: Donald L. Griffen, Iowa State University. Subscription rate: \$4.00 per year, single copies 50¢. Advertising rates upon request. Any opinions expressed herein are not necessarily those of the Institute of Technology or of the University of Minnesota. Copyright © 1971 by the Minnesota Technological Board. All rights reserved. Reproduction in whole or in part without written permission is prohibited.

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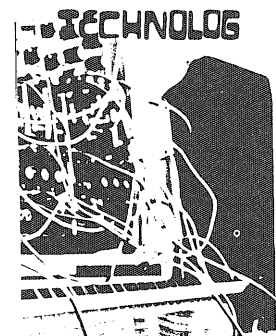
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This month's cover is a high contrast picture of the Moog synthesizer's console. By Kevin Strandberg.



# FORUM

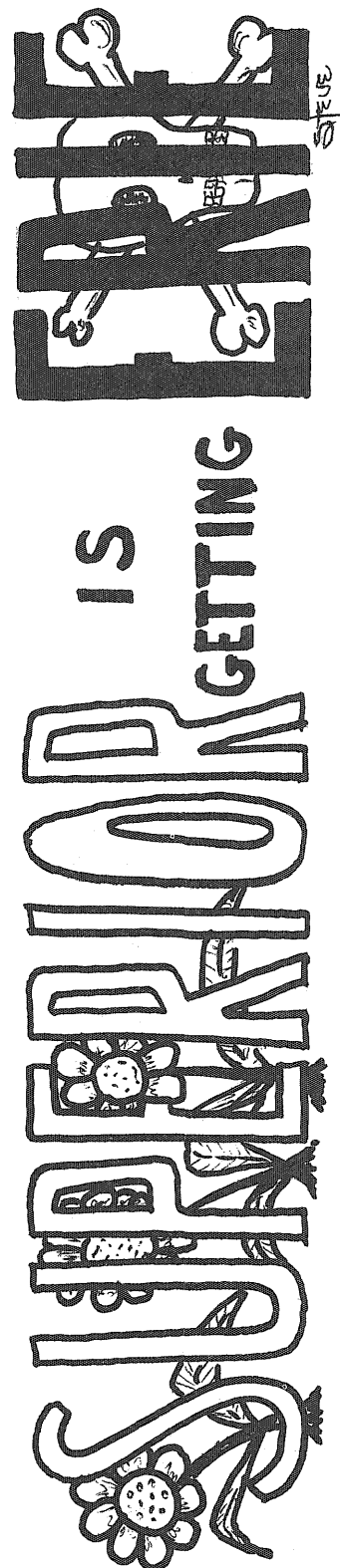
Pollution. Nobody wants it. But in the last century, man has been demonstrating his singular ability, over other creatures of this earth, to destroy the very system of life he came from and depends on. Fortunately, we have become more aware of the problem during the last decade or so, and various government institutions have started to set limits on our pollution. The Government and other concerned citizens have run into trouble, however, in trying to control special interest, industry. Industry is not about to take a loss in profits to "clean up" if they don't have to. But the struggle goes on — with some victories, some failures.

This issue, we will look at one typical controversy — between the Reserve Mining Company and various government and citizen groups over the future of Lake Superior.

Reserve Mining Company has come under a lot of attack, in recent months, over its dumping of Taconite tailings into Lake Superior. Reserve Mining is certainly not the only polluter of Lake Superior. (The industries of Superior, Duluth, Cloquet, and other Minnesota, Wisconsin, Michigan, and Canadian cities share a contribution to the Lake's pollution.) But Reserve's tailings are still just as damaging.

Reserve claims the tailings are harmless. The Federal Pollution Control Agency claims they're dangerous to the health of the Lake. It's difficult to decide who to believe. There is sound evidence, though, that the tailings are ideal for the growth of algae and bacteria. Who really knows what the increase of one form of life will do to the delicate balance of life? It is our duty as merely sharers of the environment to leave it basically as we found it.

Let us hope, then, that the controversy over Reserve Mining's dumping of tailings will be and will set precedent for decisions that we all can truly live with./RR



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# REVERB

## To be a professional

I wish to take this opportunity to comment on the editorial which discussed the "new look" in the *Technolog*. Applause is indeed in order if the *Technolog* succeeds in its new mission of looking at the social aspects rather than the technical aspects of engineering and science. The material presented in the classroom and in technical journals is certainly adequate in the technical area. The engineer and scientist, of course, employs these technical skills within his society. The increasing complexity of social systems practically guarantees that many of the devices and systems which are designed by the engineer will have widespread repercussions throughout society. Many of these repercussions are potentially negative and trade-offs must be made. As a result of this increasing interaction there is international concern with what is called technology assessment. In the process of technology assessment, attempts are made to evaluate the potential gain of a new development or process against possible disadvantages such as environmental, social and/or material costs. This process involves not only mathematical equations and dollars but more intangible ideas as well. As a consequence it is a much more difficult process than dealing with purely technical systems. As Charles Reich points out in "The Greening of America," we have traditional trained individuals to operate technology. We must now begin to train individuals to control technology.

You might ask how this affects you as a student in I.T. If it isn't already clear to you, these changes suggest that it is insufficient to learn only chemistry, physics and mathematics, for example. The engineering or science student must have knowledge of areas of intellectual endeavor such as philosophy, psychology and history. The student must be able as never before to place the social system in which he or she lives and operates in perspective. In order to do this the student must know how his society developed and the philosophy which nourishes it and makes it flourish. He

or she must examine from all perspectives, for example, the cult of growth which suggests that a strong society must grow materially and in order to grow must transform our material resources into pollutants which contaminate the globe as a secondary consequence. Are there alternatives? What are the consequences implicit in these alternatives? What trade-offs are necessary?

The students in I.T. are among the best in the University and society has the right, in view of its investment, to expect that you will use your skills to aid in solving the immense but conquerable problems which confront this society. It is my hope that the *Technolog* can succeed in focussing on some of the many critical and controversial issues and cause its readers to think and in doing so expand their intellectual horizons. I also hope that you will learn not only the technical material offered within I.T. but will also embrace courses in the social sciences and humanities. An individual who combines both technical and non-technical material in a synergistic way is worthy of the term, professional. If a person does less he is purely a technician.



Richard A. Swalin, Dean

## Praise be to the 'Log

I am writing in praise of October's issue of *Technolog*. In my opinion it was a welcome and much needed change. Instead of a resemblance to I.T. textbooks, the articles now relate more to the engineer as a human being. This made it by far the best *Technolog* I've read and I'm looking forward to the next issue. Keep up the good work!

Mel M. Moench  
M.E. Senior

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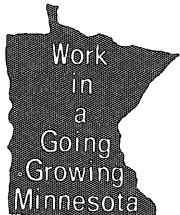
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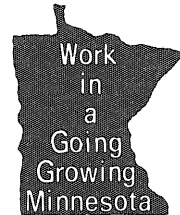


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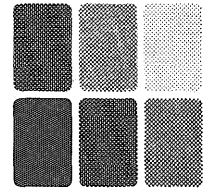
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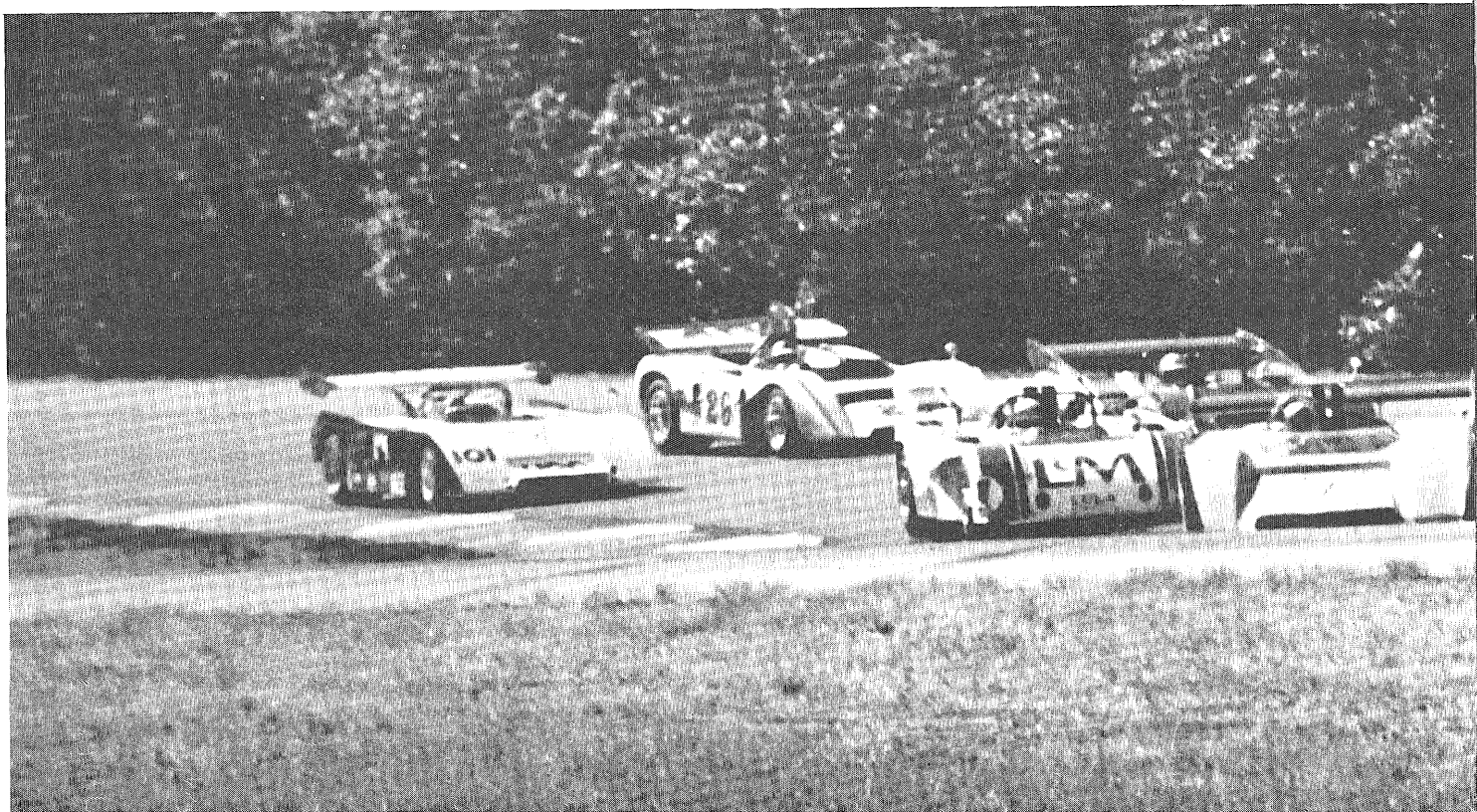
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## **The Technolog Goes To Donnybrooke**

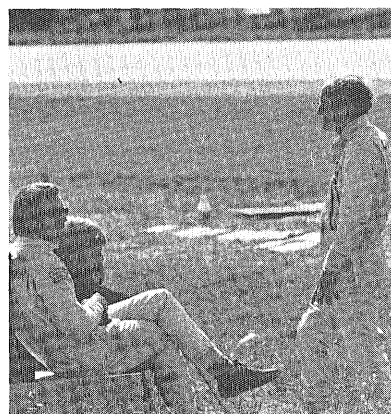
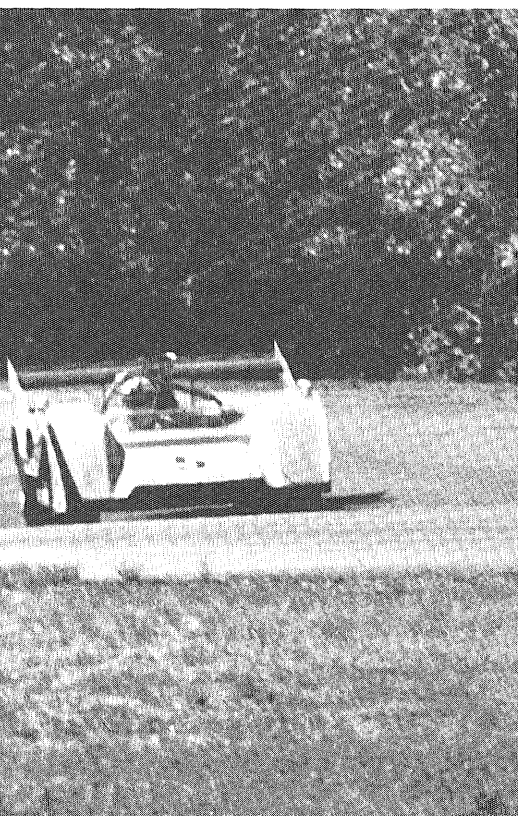
**text & photos by Don Neal**

Team McLaren succeeded in winning another Can Am road race at Donnybrooke this fall. The reliable and competitively designed McLaren Group Seven cars have been producing similar results for the past four years.

The race, however, was not a dull one. European Formula one personalities such as Jackie Stewart, Jackie Oliver and Jo Siffert kept things lively for winner Peter Revson. Stewart, in a new Lola T260 passed the fastest qualifier, Revson, on the first lap. The quicker McLaren soon regained the lead which it retained for the rest of the 210 mile race.

The new cars competing this year included the Lola with blunt aerodynamics and the Shadow which ran on lead free gas and had a radical low profile. There were also several LeMans type Porsches and a Ferrari 512M.

The fastest race in Donnybrooke history featured a 200 m.p.h. sprint on the straightaway by Greg Young. Peter Revson won with an average speed of 119.137 m.p.h. Denis Hulme was second and Greg Young third.



Peter Revson leads the field (upper left). World's Driving Champion Jackie Stewart (upper right). Left, girl watching is as lively as the racing. The McLaren team (above) plans race strategy as one of the McLaren cars (above right) undergoes final race preparation.



# SOFT SISY

## Continuing Adventures of Rhube & Co.

Armed (handicapped?) with last months helpful hints on bike picking and customizing, this years Daring Duo (Pete and Craig) decided that the bike scene needed some class (4-f) and set out to become the "Easy Riders" of Minn. Rhube and Co. reasoned that since they would be on the streets (or all over the streets) 110% of the time and riding trails a whooping -8% of the time, they had better get large drag machines. After purchasing two brand new (never before abused) Honda 50's. We pooled our money (33½¢ and two glassies) to start a customizing fund. First came the paint job. Craig chose blush pink and I chose cherry red. (whew!) We decided to paint the bikes ourselves. So two months later when our tanks were done at "Big Daddy, Ron's" and the rest of our bikes were de-painted, we went on to the next step, the handlebars and sissy bars. (Craig was really excited about those!) After drilling the wholes (what?) in the handlebars and our fingers, hands, arms, etc., Craig started to wire them. I explained to him for half an hour why you can't just solder them all together separately, but how you have to solder them all separately together. (##\$!) After we finished the bars and the sissys (Craig finished the sissys off) we incorporated our friend Scott Atlas to help work on the engines. Actually Scott didn't do anything except strip and twist the head bolts off. (Or was it twist heads off the bolts and then strip?) I decided to add velocity stacks and after finding out that they go on the carburetor, not the exhaust pipes, I got them strapped on. Seeing how nice my bike looked with one, Craig decided to purchase one too. Since the velocity stacks on our bikes were mounted under the seats, we figured that the engine sucked twice as much gas as before. (Another alternative might have been for both of us to ride on one bike.) For exhaust modification we put on straight pipes, but we have a small problem, that is that when you turn the front wheel, it hits the

pipe. (Maybe we should have bent the pipe under the bike.) Now that we have the bikes customized, we must speed tune them. Somewhat limited by the Honda's top speed of 15 M.P.H., but undaunted, we proceeded.

Finally done, we wheeled our two tired (ya know, tire as in warefast?) machines out into the early fall snow, and test rode them. Our preliminary tests did not discourage us, and after tightening all the bolts again and re-tuning (for two days), we finally got them running again. And run they did, as I said, we were hampered by top speed, but they got up to 15 mph in .00003 sec. Craig was at first scared by the power, but when finally he learned enough to take the training wheels off, he was more or less used to it. We have really learned to love our bikes (and wallets) and plan to ride them as long as possible this year, (in fact, we have already started looking for studded snow tires) and next, if we can only find a way to keep them from falling over on us.

## Final Rag

Small town newspapers usually leave space for the use of the local high school. In their space, the high schools report on the happenings at the school; who didn't make the honor role; the lunch menu and without fail, a feature article on the schools athletic teams. These team reports sometimes have a tendency to make the "team" sound better than they really are. Take for example this article from the *Zonk Weekly* on the High Schools basketball team.

Last week our Zonkers, lead by Leroy "Hotlips" Akme, traveled to Mashview. There our guys pitted their undefeated record against the yet winless Mashview team. (*It was the first game of the season for both.*) It was obvious to the many of us in attendance that night, (*there was six counting the coach and Leroy's mother*) that by the way our Zonkers literally broke down the door of the locker room and rambled onto the court that they were both up and keyed for the game. (*First, the Mashview student body had removed the hinges of the door as a joke on the Zonkers; second, the Zonkers didn't ramble,*

by Rhube & Co.

they walked slowly; third, the Zonkers might have been up for the game but most in attendance were higher.)

The opening tap was controlled by the Zonkers who marched down the court and scored. (Several minutes later.) The first quarter was a close, seesaw battle, until the final minute when the Zonkers started to pull away. (It was at this point that the Zonkers scored. Score at the end of one quarter was two to zip.)

The second quarter was highlighted by the Zonker offensive machine. The Zonkers, who average just under six feet per man in height, (five foot six to be exact) were able to out rebound the much smaller Mashview team who averaged only five foot five per man. This height advantage enabled our guys to get many easy close range shots (of which they made three) which made it possible for them to score more points in the second quarter than the Mashview team scored in the whole first half. (Half time score was eight to five Zonkers.)

After intermission the second half opened with our captain Leroy Akme and our star center Harold Sadless hitting one and two each. (What they

actually did was hit players of the opposing team.) The Zonker defense was superb in the third quarter, allowing the Mashies only five points. (Unfortunately, the Mashies defense was also superb and allowed only four points.) The defensive star for the Zonkers was Clyde Barrit who intercepted seven passes throughout the game. (Three Mashview passes, two Zonker passes and two from the crowd.) His quick hands have amazed many people throughout the county. (Both on and off the court.)

The fourth quarter was a run away for our Zonkers as they hit from all angles. (When caught, Zonkers were seen throwing punches when lying flat on their back.) When the final buzzer finally sounded, (moving both teams and fans outside to finish what they had started) our coach Harry Nasel was asked his opinion of the game. He said "it was just a peachy keen game — those Mashies really gave us a run for it. (What he actually said was "it was a F.x.r.r.r.x good game", then joined his team outside.)

High scorer for the game was Zonker captain Leroy Akme, who again hit for double figures, (both of his

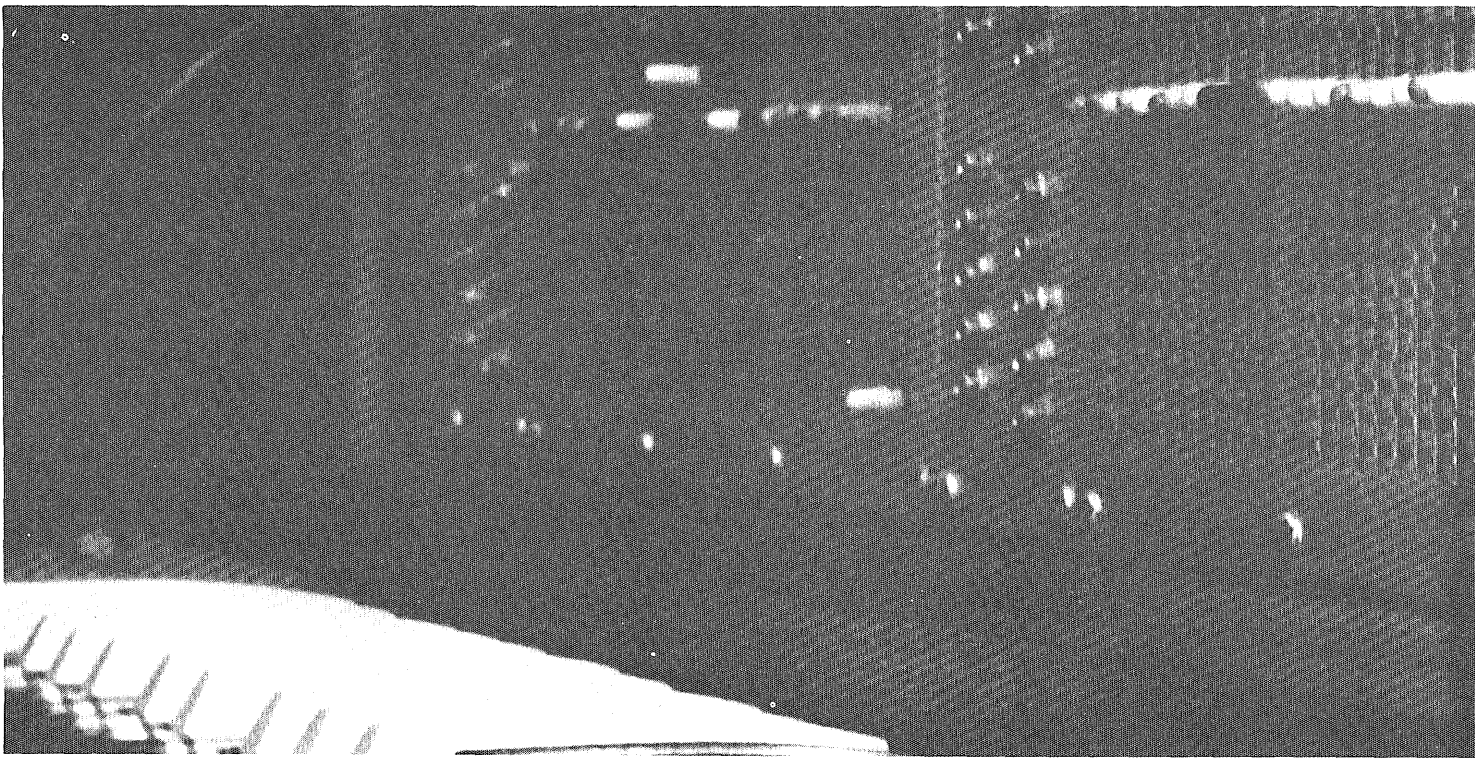
girl friends were there) getting half the teams points. (Eight.) High scorer for the Mashview team was Fred Carp who hit for only five. (Actually, it was Leroy Akme of the Zonkers, who got seven of the Mashview points. Leroy isn't too bright.)

### S.S.S.S.S.

During the first year of operation, Super Steve's Speedy Stud Service showed a net loss of 43¢. Due to Tricky Dick's price-wage freeze, he can't get a raise. Therefore Steve is making certain cutbacks. Half of his able-bodied staff has been laid off. But this isn't why I'm writing. One of our satisfied customers has been kind enough to keep in touch with us. She has sent us cards and letters expressing her joy and contentment with our services. To thank this lady, we would like to give her a gift certificate good any time of the day or night at Speedy Steve's S.S.S. All she need do is send or deliver her name, I.D. and paid fee statement to Steve's office to claim her gift.







# SYNTHESIZED MUSIC

by Bill Loye

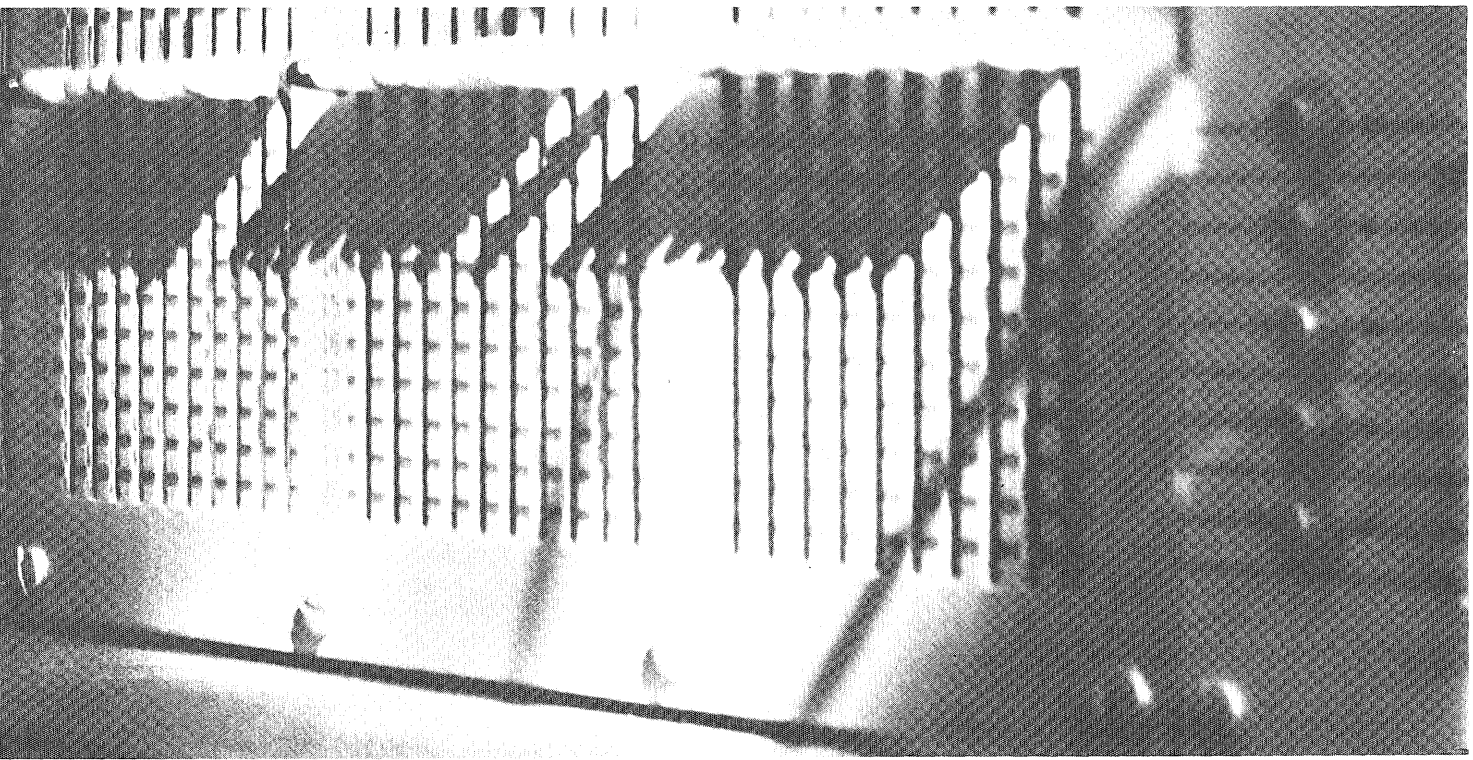
If you heard it once, you won't forget it, at least not for awhile. An eerie moan, a high wail, any number of sounds all properties of the electronic music synthesizer. The synthesizer is the most versatile instrument ever made, if you can call it an instrument. The synthesizer is the brain child of Robert Moog, and you will usually hear it referred to as the Moog Synthesizer. The Moog is used in science-fiction films and television. It has been recorded doing its own version of Bach (switched-on Bach) and the compositions of Emerson, Lake and Palmer.

Though Moog music is versatile and creative, it also has its drawbacks. Synthesized music sounds hollow or cheap. This non-quality quality is caused by the lack of harmonics in electronic music. If you talk on the telephone, you are using a crude microphone, amplifier, speaker set-up and, I stress, crude; yet you can talk into this and still recognize a person's voice. This is because of the many harmonics of the voice.

Next in harmonic quality is a good instrument: Steinway piano, Stradivarius violin, Stella guitar (oops) — these instruments use perfect wood for resonance, creating a greater number of harmonics than could be created from using an inferior wood, such as pine. But the Moog (or any electronic music maker) has very poor harmonics. This accounts for its emptiness. Usually the Moog is either a back-up or has back instruments to fill in for this lack of tone. Emerson, Lake and Palmer use guitars and drums to cover.

The principle behind the Moog is not based on music, but on physics and electronics. We start with frequency — being the number of times a function completes the cycle per unit of time. For example, your house current completes 60 cycles per second (60 Hz.). Each frequency has its own tone. Our average audible frequency range is 18 to 20,000 cycles per second. Though these numbers vary for each individual, this gives you an idea of the range of frequencies we hear.

We will deal with three forms of waves which can be



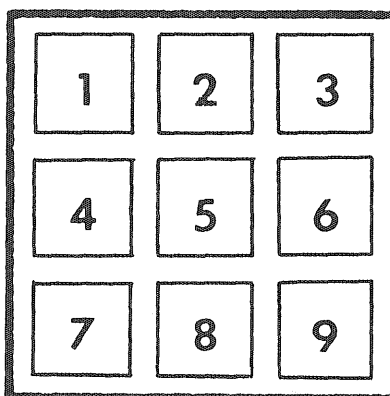
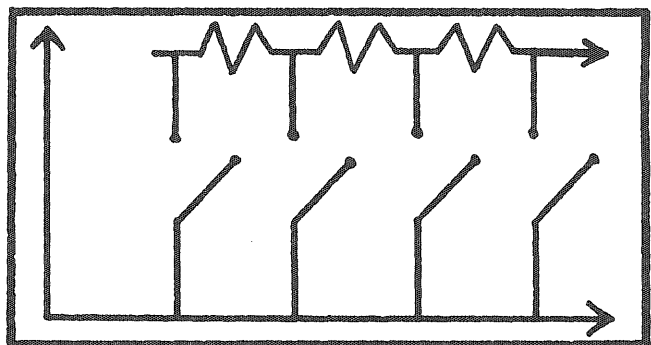
produced by the Moog: the sine wave, the triangular sine, and the square sine. The sine wave is the simplest wave. House current is in the shape of the sine wave. The triangular sine wave has even harmonics while the square wave contains even and odd harmonics. The square wave is a little harder to create but because of harmonics, is more interesting to listen to. Once you have chosen the wave form, you can make the pitch high or low by using a variable resistor to vary the frequency.

Now you begin to treat it. You can put the tone in to a circuit that will cause it to vibrate or you can shape the wave. Shaping a wave is simply amplifying it and cutting off the top and bottom, or, if you'd like, by adding other waves to create new waves. You can create a bell-like effect or you can add echo-reverberators. You can create fuzz tones or clear tones. There are schematics available in almost any electronic's book for all of these functions I've mentioned except for the echo-reverb. You can get that from electronic stores.

The principle behind the keyboard of the Moog is simple. Each key acts as a switch or a set variable resistor. The resistance between each key should be about 1,000 ohms. If you designate a certain key to be C then you put a 1,000 ohm resistor between that and the next key to get D.

If you are more interested in the principle of Moog then I suggest you take physics, electrical engineering and math. But if you are interested in the workings and music theory of the Moog, then we have just the thing for you: two basic Moogs (\$5,000); one complex Moog, and one Arp Synthesizer. These instruments are being used by Eric Stokes, a music teacher who is offering classes in the Moog this winter. Contact Erick Stokes, Music Education Building, for further information.

If you plan on building your own Moog, I have a few hints. When working on circuits, disconnect power. If you feel frustrated because at first you don't succeed then try. . . , er, try . . . , er, try drums, they're easier!



Layout of basic Moog components

Above, top: The keyboard arrangement for the arp synthesizer. Each switch is separated by 1,000 ohm resistors.

Above: 1 — Wave generator. Chooses frequency (pitch) and type of wave. 2 — Noise generator. Produces cymbal sound (also used for ocean waves). 3 — Vibrato. Causes increase and decrease in frequency of tone. 4 — Gating. Controls attack and decay of tone. 5 — Gating, Bell. Causes bell-like tone in notes. 6 — Fuzz tone. Creates a "fuzzy" or distorted tone. 7 — Percussion. Uses tone impulse to make a drumlike (rapid attack and decay) tone. 8 — Tone shaper. Shapes tone by cutting top and bottom of sine waves, or by adding harmonics. 9 — Amplifier. Must be used in conjunction with shaper. Wave must be preamplified, cut, and reamplified.



# Lake Superior

Edited by Br

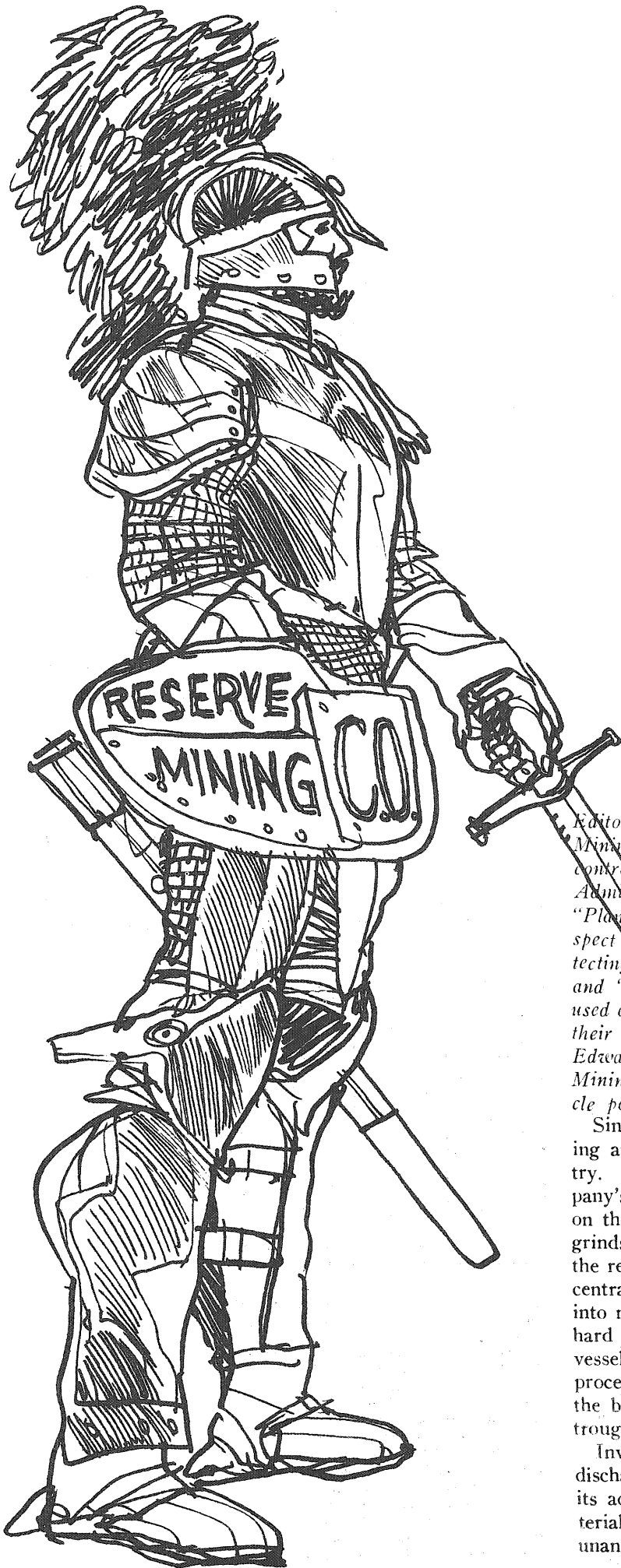
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*Editor's Note: This article is designed to give Reserve Mining Company's views and findings on their current controversy with the Federal Water Pollution Control Administrator. Direct quotations from the pamphlets: "Plan to Modify Tailings Discharge System"; "A Respect for Nature . . . A Response to Need"; "Protecting the Quality of Lake Superior, Nine Witnesses"; and "Reserve Responds"; published by Reserve were used as often as possible, in order to allow Reserve to tell their story in their own words. We would like to thank Edward Schmid, Assistant to the President of Reserve Mining Company, for his cooperation in making this article possible.*

Since 1956, Reserve Mining Company has been mining and processing taconite for the nation's steel industry. Mining is done at Babbitt, Minnesota. The company's processing plant is at Silver Bay, 47 miles away on the shore of Lake Superior. Reserve crushes and grinds taconite, then separates the iron ore particles from the rest of the pulverized rock by magnetism. The "concentrate" that results — jet black iron ore — is rolled into marble sized pellets. These are fired to make them hard enough for shipment down the Great Lakes by ore vessels to the steel mills. The sand left over from this process (called "tailings") is deposited harmlessly on the bottom of Lake Superior in a 600 to 900 foot deep trough near the Minnesota shore at the Reserve plant.

Investigations and scientific studies indicated that the discharge of the inert sand would not harm the lake or its aquatic life. In short, disposal of the inorganic material in the lake posed no conservation dangers and unanimous decision placed the processing plant at Sil-

Continued on page 24



# or: Polluted?

an Johnson

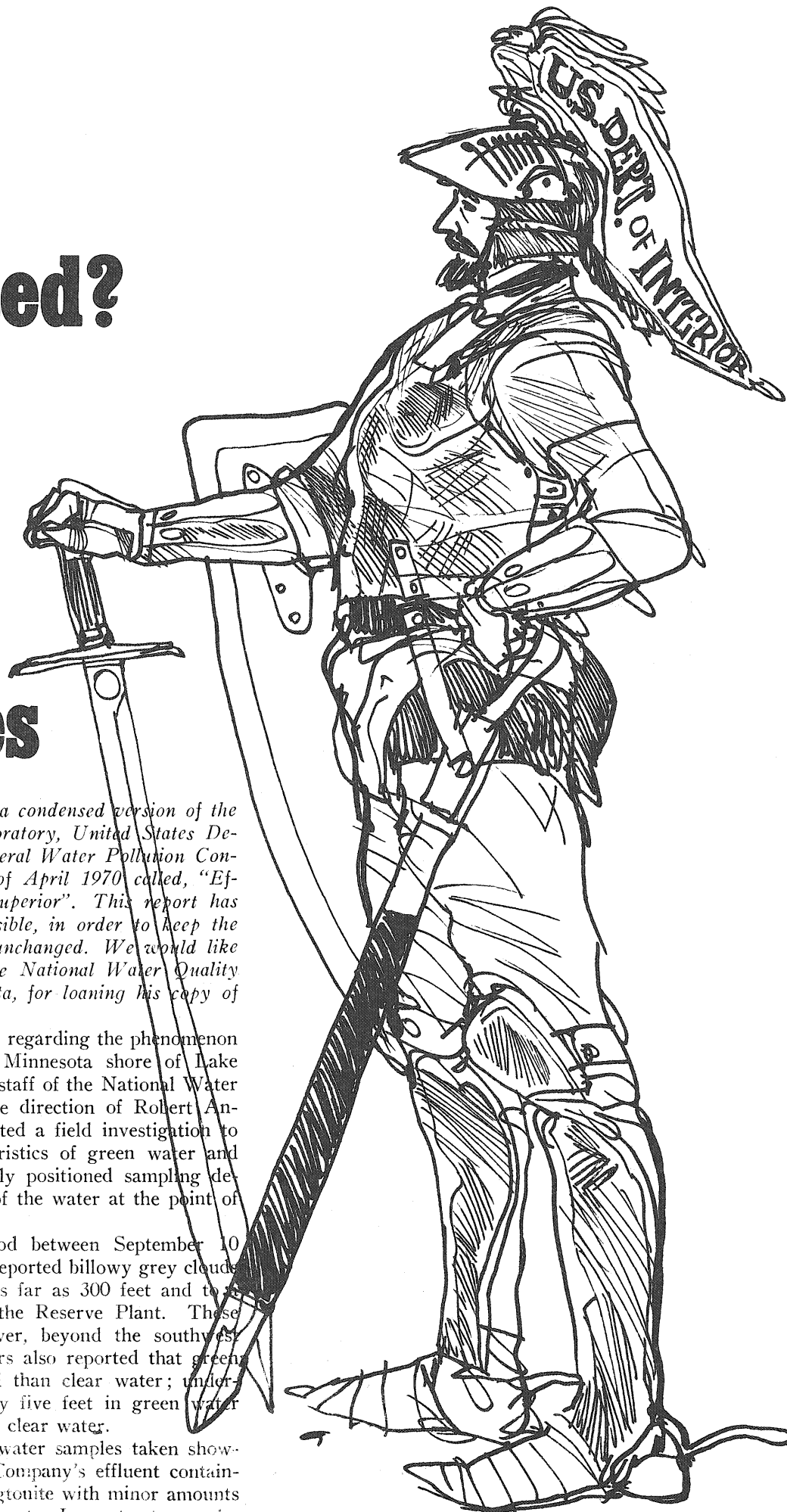
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*Editor's note: This article is a condensed version of the National Water Quality Laboratory, United States Department of the Interior, Federal Water Pollution Control Administration's report of April 1970 called, "Effects of Taconite on Lake Superior". This report has been quoted as much as possible, in order to keep the findings of the investigators unchanged. We would like to thank John Teasley of the National Water Quality Laboratory, Duluth, Minnesota, for loaning his copy of the report to us.*

As a result of public concern regarding the phenomenon of "green water" along the Minnesota shore of Lake Superior, scuba divers on the staff of the National Water Quality Laboratory, under the direction of Robert Andrew and Gary Glass, conducted a field investigation to observe the physical characteristics of green water and to obtain samples of accurately positioned sampling devices so that the appearance of the water at the point of sampling would be known.

During this sampling period between September 10 and October 11, 1968, divers reported billowy grey clouds of waste extending offshore as far as 300 feet and to a depth of 35 feet in front of the Reserve Plant. These clouds were not seen, however, beyond the southwest breakwall of the plant. Divers also reported that green water was much more turbid than clear water; underwater visibility was commonly five feet in green water and thirty five to forty feet in clear water.

Laboratory analysis of the water samples taken showed that the Reserve Mining Company's effluent contained mostly quartz and cummingtonite with minor amounts of chlorite and mica also present. In contrast, samples



DODGE 71

Continued on page 25



## 10 Years After

A small high-energy lithium battery has been developed for industrial applications, particularly those that require long-term storage.

Design of the battery and use of lithium anodes enable it to offer long-term storage for special applications, with double the voltage of flashlight batteries.

In its present design, the battery is about half the size of a standard flashlight cell, one inch in diameter and 1.4 inches long, with a weight of 26.2 grams. Nominal voltage is 3.2 compared with all-mercury batteries of similar size, which produces 1.2 or 1.23 volts.

Storage potential of more than 10 years is made possible by isolating the electrolyte in a glass ampule to keep it from the lithium anodes. An external cap, provided with the cell, uses a pin to shatter the ampule and activate the battery. Then, depending on storage temperature, it can maintain most of its charge for many weeks.

Tests at temperatures from minus-40 to plus-75 degrees Fahrenheit show the battery will last 500 hours at one milliampere continuous current drain; 20 hours at 20 milliamperes drain, and 12 hours at 50 milliamperes drain. At over 165 degrees Fahrenheit, with a current drain of one milliampere, the battery will last 400 hours.

The battery is the first primary-reserve lithium power source to be manufactured in volume quantities.

## Life On Mars?

The ruddy planet Mars, object of centuries of theoretical speculation, will be put to a stern day-by-day scientific scrutiny in November when the Mariner 9 spacecraft begins at least three months of orbital study.

With two 1969 Mariner flybys having indicated Mars is really more pink than red and having revealed uncratered areas which might involve recently active processes, space scientists hope the 1971 mission will produce a scientific bonanza without parallel in planetary exploration.

If all goes well, a veritable infor-

mation explosion about the Mars terrain, climate and atmosphere, even its two tiny moons is anticipated. Scientists even hope to establish daily and seasonal weather patterns.

It is predicted that this year's planetary mission could send back 15 times as much data for scientific investigators to study as the twin 1969 flybys yielded.

Scheduled to arrive at Mars November 13, Mariner 9 is set to radio back from 25 to 30 billion bits of information gathered in six scientific experiments.

Photographs and scientific measurements will be taken from as close as 750 miles — compared to previous flyby distances of 2,000 to 6,500 miles. In its twice-a-day elliptical orbit, Mariner 9 will swing out to 10,700 miles from the planet. The orbit will give good planet coverage at a 65-degree inclination from the Martian equator, with highest resolution from South to North at low orbit.

Teams of scientists hope to map more than 70 per cent of Mars, and determine temperature, terrain and atmospheric conditions.

The instruments will view an early summer atmosphere and surface in the South and early winter in the North. The Mars surface is to be examined by photography and in the infrared wave-lengths.

An instrument complex will study certain phenomena which have aroused curiosity through observations from Earth and previous Mariner missions. These phenomena include clouds, hazes, bright spots and dust storms.

A specific objective is the study of the apparent "wave of darkening" which seasonally sweeps across Mars. The spacecraft will arrive at the peak of this seasonal darkening period in the southern hemisphere.

Detection of any life forms on Mars is beyond the resolution capabilities of the camera. However, correlation of the photographs with data from the other instruments may yield information on the suitability of Mars as a habitat for some type of life.

Another mission goal is to fix the true orbit of Mars and details of the Martian gravity field also will be revealed by the spacecraft's repeated orbits about the planet.

Mariner's rounds will also carry it between Mars' two tiny moons, Phobos, orbiting at 4,000 miles and Deimos, at 12,000 miles. ■

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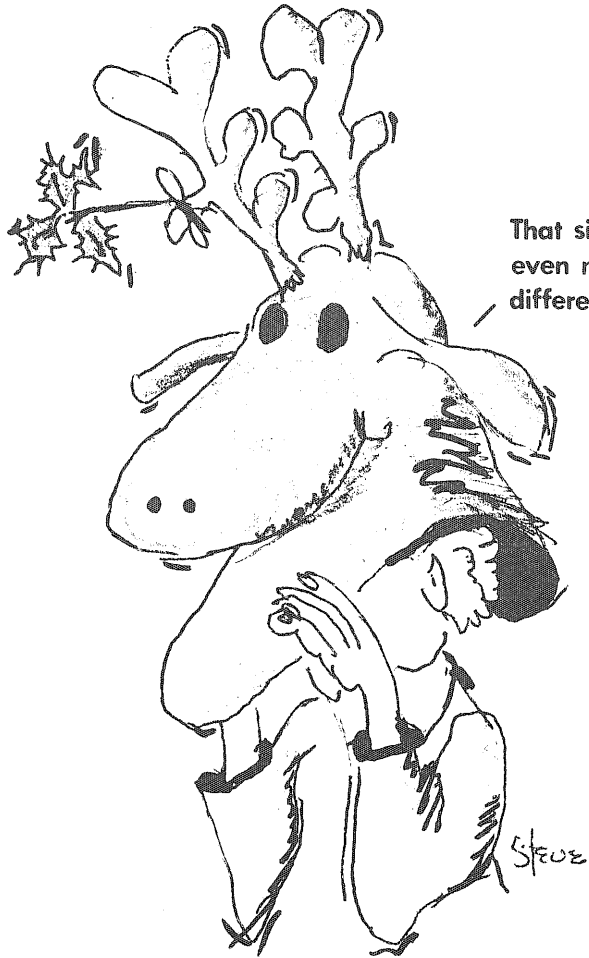
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photography by Don Neal



## TECHMATE

November's Techmate is attractive Sherrie Pugh, a junior in interior design from Mound. An active member of Pi Beta Phi Sorority, she still finds time for creating original handicrafts. She also does the choreography for her sorority's Carni dance line.



# SQUINTERS

Coming home one night a drunk fell on his pocket flask and smashed it. He happened to be carrying it in his rear pocket and so consequently he cut up his rear end. Arriving at home, he found his wife asleep, so not wanting to wake her, he collected some band-aids and a mirror and proceeded to apply first-aid. Come morning his wife shook him and shouted, "Were you drunk last night?" "Why no!" he replied. "Then what the hell are all the band-aids doing on the mirror?"

\* \* \* \* \*

A young married couple recently rented a home. After moving in and finding the place crawling with mice, the husband purchased two mouse-traps and placed them in the basement. By one trap he placed some cheese and by the other he placed some nuts. Late that evening a snap was heard downstairs and the husband rushed to investigate. His wife followed him to the top of the stairs. "I got him!" cried the jubilant husband. "Did you catch him by the cheese, dear?" asked his wife. "Guess again" he answered.

\* \* \* \* \*

A sailor, taking his first ride on a San Francisco bus, lit up a ciggy butt, as he sat reading the advertisements overhead. Soon, the bus driver came over and asked him if he could read the sign that said "No Smoking". "Yeah", came the reply, "but the one next to it says "Wear Playex Bras" so I ain't payin' attention to either of 'em.

\* \* \* \* \*

A drunk was sitting at a bar next to a man and his charming wife. Suddenly the drunk let out a loud belch. "How dare you belch before my wife," demanded the husband. The drunk proceeded to dismount the bar stool somewhat unsteadily and, with a sweeping bow, said, "A thousand pardons, my dear fellow. I wasn't aware that it was her turn."

\* \* \* \* \*

His first day in the army, the recruit was issued a comb, and then the company barber shaved his head. The second day he was issued a toothbrush, and then the dentist pulled all his teeth out. The third day he was issued a jock and hasn't been seen since.

\* \* \* \* \*

A drunk forester was trying to walk down the street with one foot on the curb and the other in the gutter. "Come along with me buddy, you're drunk," growled a cop. "What a relief" replied the forester, "I thought I was crippled."

\* \* \* \* \*

Two duck hunters were sitting in their blind, one was drinking from a thermos full of hot coffee, and the other from a quart of whiskey. After some hours of sipping a lone duck came winging through the sky. Taking aim, the coffee drinker rose, let fire, and missed. His companion staggered to his feet, fired, and brought down the duck. The coffee drinker, quite astonished, congratulated him on his fine shot. He replied: "Aw, that's nothin', I usually get four or five out of a flock that size".

\* \* \* \* \*

Victims of an accident in Scotland were still lying in the street, when along came a native and said to one of the victims lying on his back: "Has the insurance man been around yet?" "No," came the answer. "Ah, well," replied the Scot, "I'll just lie down aside ye."

\* \* \* \* \*

A motorist, after being bogged down on a muddy road, paid a passing farmer fifteen dollars to pull him out with his tractor. After he was on the road again, he remarked to the farmer, "I should think that at this price you'd be pulling people out of this stuff day and night. "Can't," drawled the farmer, "at night's when I tote the water for these here holes."

\* \* \* \* \*

## Harry E. Adams, Assoc.

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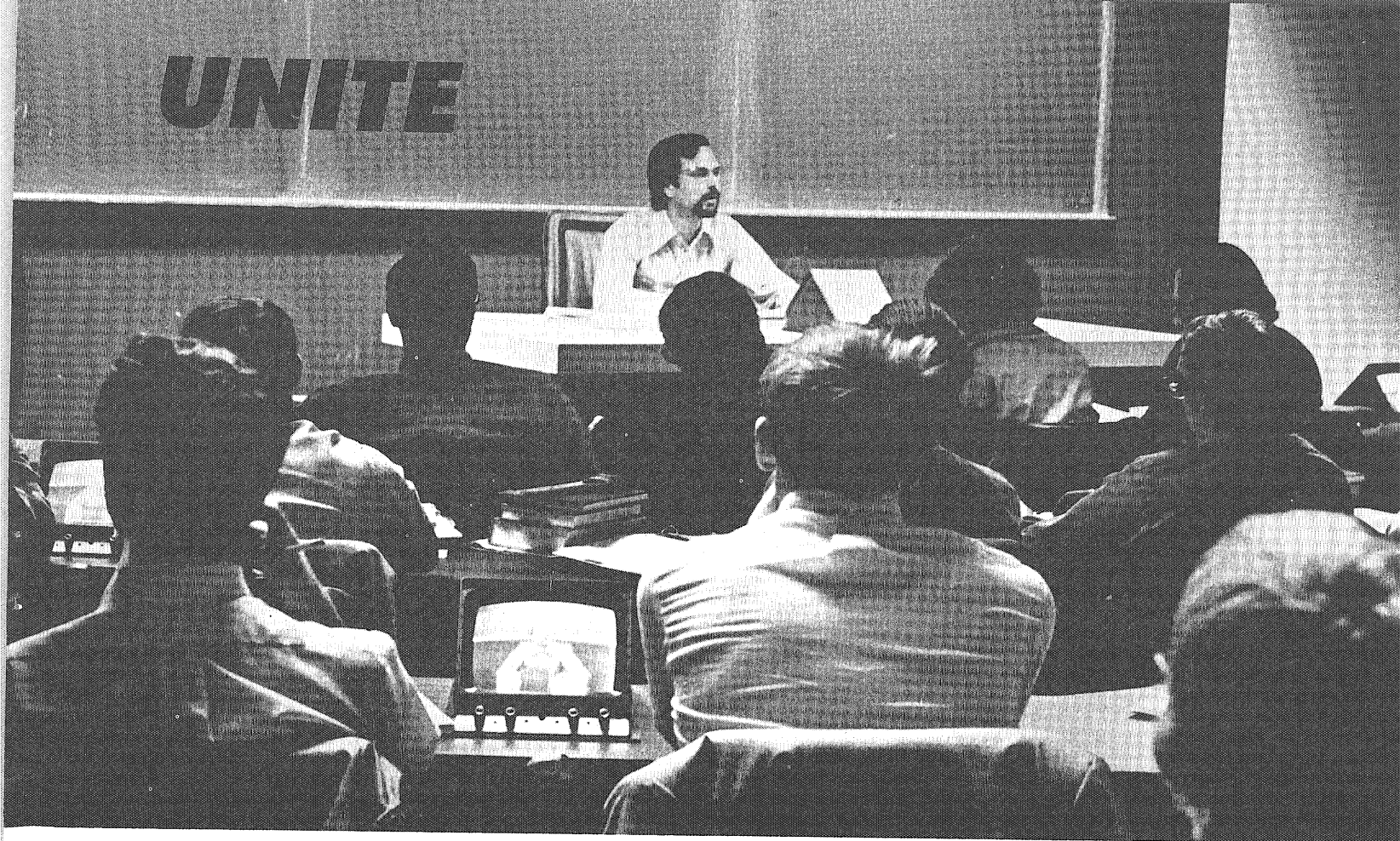
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by Greg Smetana & Kris Kampf

# UNITE



**by Becky Phillipps**  
photos by John Johnson

Beginning fall quarter the University of Minnesota starts a point-to-point instructional television system. This system has been code-named UNITE (UNiversity Industry Television for Education). It was initiated to fill the gap that exists in the education of any professional after he has been on the job for several years. As it is impractical for a business to continuously give employees leaves of absence to expand their education; but, since such expanded training is beneficial to the business, the UNITE program was established to allow advanced training to take place on the premises of the participating business. The pilot phase of the UNITE program is being developed by the Institute of Technology with the cooperation of the General Extension Division. While the initial courses are technically oriented, the program will eventually be expanded to other areas.

The impetus behind developing the point-to-point television system lay in the realization that many of the courses desired by the industries were available in the regular IT day schedule. Participation by industry in these classes faced many difficulties considering travel time and work disruption. Any attempt to schedule all the desired classes into a night school program would create severe financial problems. It would require an

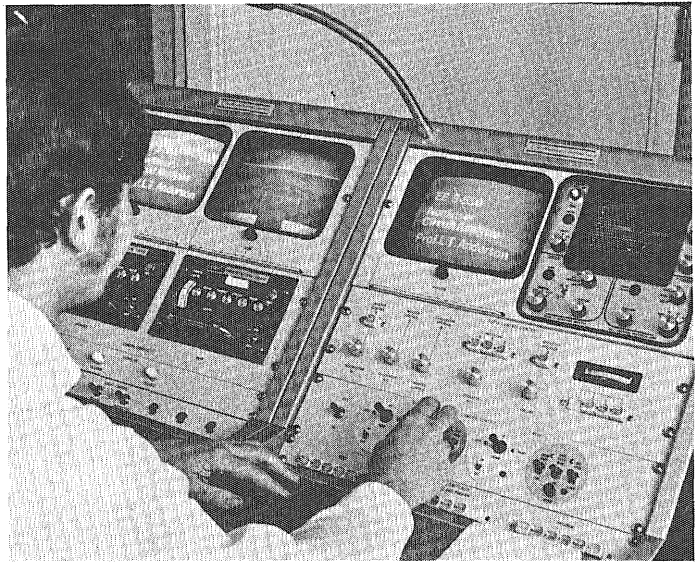
incredible amount of rescheduling of the night school program.

The industries and the University decided that the costs of such a program could have been covered by student fees, plus assessments paid by the companies. The IBM plant in Rochester posed a special problem, because the distance required of its participants in attending the University would be inconveniently long. The use of a point-to-point television system was the only possible solution. It would allow the industrial participants to remain in their plant, while able to watch, and through FM talk-back facilities, participate in a live University class. This system, although initially costly, was readily accepted by the other industries. The installment costs are high, but the long-term costs, considering the easy availability of the system once installed, should be considerable lower than the alternatives. The recent economic decline has made the unit cost per student higher, but the technological advancements in the areas of point-to-point television systems has made this electronic extension of the classroom feasible. In a way the new system will be less expensive, because it is more cost-effective. It keeps the student in his own environment, thus eliminating travel time; it is offered during the day, therefore causing less fatigue than night school; and it has access to all the University facilities. With these advantages over night school or off-campus lectures, the system offers more learning potential per investment dollar.

The classes will be conducted as any regular course, only in a rather irregular setting. Two studio classrooms were constructed this summer on the main floor of Mech-



anical Engineering. Two studios were necessary, as operation begins this fall on two separate channels. Both studios will be used almost constantly from eight o'clock a.m. to five o'clock p.m. Each classroom is fitted with two television cameras, which are controlled by an operator in a control room at the rear. One camera offers a complete view of the room and can be used for close-ups on the blackboard or the professor. The other camera is mounted directly above the instructors' desk. This enables the instructor to use paper and felt pen, instead of the blackboard. The instructors' desks contain a translucent screen for transparencies; also, slides may be projected on this screen from beneath the desk. Students on-campus are seated at long desks fitted with a television monitor for every two students. There is a microphone with each monitor, which allows the student to talk to the professor. The off-campus classrooms are generally small, similar to a conference room with a TV monitor and microphone. Some companies have larger rooms with several monitors and microphones. The UNITE systems' two channels operate in the range of 2500 to 2690 megahertz. This is the ITFS or Instructional Television Fixed Service band. The license was granted by the FCC. This license allows up to four TV



Above: From the control panel, the operator controls the angle and magnification of both cameras and the volume of both the professor and the students' responses.

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*" . . . disadvantage in not being able to see the audience, but there are ways to get around this disadvantage. The clear-cut advantage is to the students in the plant."*

Prof. L. T. Anderson

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channels. In addition there is one FM radio channel reserved for each TV channel. These are to be used for the talk-back facilities.

The University ITFS transmitting antennas are located on the Foshay Tower. They operate at low power, omnidirectional signals for area coverage within a 25-mile radius. Each receiving sight has two parabolic reflecting antennas or "dishes" for receiving the transmissions and relaying any responses. Upon reception the ITFS band is converted to the regular VHF band for easy distribution with the building. In consideration of the extra distance to Rochester, dish antennas receive the signals at a relay point between Minneapolis and Rochester. These signals are then retransmitted to Rochester. Video signals are beamed via microwave to the Foshay from a dish antenna atop the Electrical Engineering building. Voice response signals are relayed from the Foshay back to the classroom via special telephone circuits.

The offering of courses is quite diverse. The daytime schedule includes graduate and upper-division courses in electrical engineering, mechanical engineering, computer science, engineering mechanics, physics, operations research, and geological engineering. Twenty daytime courses are scheduled in a category listed as UNITE A. In addition the General Extension Division offers some evening classes listed under UNITE B. The selection

will be determined by student demand. Also, technical seminars and departmental colloquia will be offered, during otherwise unscheduled hours, whenever the subject matter is of interest to participating firms. In addition some experimental courses will be organized for the benefit of the employees of participating companies. These special offerings are included under UNITE C.

Interest in the program seems to be very positive. As of August 1971 IBM, 2 plants for Univac, 3 plants from Honeywell, Northern States Power and the U.S. Bureau of Mines Research Center are actively participating. Other firms and agencies are showing a healthy interest. According to Dean Swalin the general response of the faculty has been positive.

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*" . . . a real breakthrough in continuing education. The average family man has only 30% of his time free, this program offers him an opportunity to attend a college level class at his job. Through the use of videotapes, he has the option to make up classes without any inconvenience."*

Dave Muyaert  
HONEYWELL

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Whether the system will work or not is not really an issue. A great deal of research was done before the construction began. It is technically feasible. The only question is whether the industrial students will respond favorably. ■

# For Freshmen Only

WARNING! Anyone offended by complete frankness should not read this.

With the arrival of fall quarter comes the yearly phenomenon everyone at this University has had to undergo at one time — being a first-quarter Freshman. Members of the class of '75 will no doubt live up to the standards of past freshmen: scurrying about aimlessly like lemmings on their death-march into the sea, awed by the immensity of the campus, dumbfounded, and perhaps, just plain dumb. Well, listen up, you peons, for old Ace will try to set you straight on some very important matters. All other students are welcome to read on, too. You might learn something for a change!

First of all, freshmen, learn the layout of the campus along with the abbreviations of the buildings. You can't find your little niche on this campus if you keep getting lost. If necessary, keep a copy of the Fall Quarter Class Schedule with you on your trek from misery to misery. (There's a map of the campus in the back.) Those of you who get lost in your own neighborhood had better buy a compass, walkie-talkie, flare-gun, and nametags. (Most of these items are undoubtedly available in the bookstore!)

Secondly, learn where and where not to park your car or cycle, if you have one in the first place. Those dastardly parkettes (alias flunkies) have a reputation (what a bunch of ugly . . .) of writing tickets for a multitude of sins. Many a student has had to restrain himself from tipping over those three-wheeled broomsticks!

Thirdly, learn to guess where you can find your adviser. Yes, you read right, *guess* where your adviser hides. If any of you freshmen can do this, consider it a major accomplishment. In fact, go out and celebrate because you have done something few upperclassmen can boast about. Advisers seem to rank in the category of fairies and fuzz — they're never around when you need them. Finding your adviser's office guarantees nothing. Try to catch your adviser in his office — ah, now that's the challenge.

You can't go by the listed office hours — most don't change theirs every century as they should. Also, disregard any and all "Do Not Disturb" signs. It's a well-known fact that most advisers are disturbed in the first place.

Fourth, after you are able to navigate around campus without getting lost, start looking for a spot you can claim as your own. University life can get pretty boring and meaningless if you don't find "your place". "Your place" can range from athletics, whether intramural or varsity, to any of the numerous campus organizations. Speaking of organizations, we can always use extra help here at the *Technolog* office (Room 2, Mechanical Engineering), whether you think yourself creative or just a common laborer. Get involved and then note the satisfaction you feel. It's well worth it.

Fifth, and lastly, in an effort to get freshmen involved in campus affairs, I have drawn up a rather brief scavenger hunt. The first person to collect all of the items in the list will receive a \$5.00 gift-certificate from yours truly, Ace. In the event of a tie, the earliest submitted entry will be declared the winner. Entries may be submitted between the hours of 9:00 a.m. — 3:00 p.m. Monday-Friday in Room 2, Mechanical Engineering. Here, then, is the list of items to scavenge for. Good luck,

1. Slide rule grease and fittings.
2. September issue of the *Technolog*.
3. Engineering library pass. (from IT window in Morrill Hall)
4. Picture or sketch of the emblem on the main door of the Atomical Engineering Bldg.
5. The name on the door of ME 515.
6. A signature on this page of yours truly, Ace, or your adviser. ■

by Mike Chase



*“No agency, industry or individual — public or private — is more interested in preserving the high quality of Lake Superior than is Reserve Mining Company. . . In all our operations we have followed good conservation practices. We pledge to continue.”*

*Edward H. Furness  
President  
Reserve Mining Company*

“No” from page 14

ver Bay, with its adequate water supply and close access to the deep trough. The basis for Reserve's discharge system is the natural phenomenon called a “heavy density current”. A density current forms when sufficient solid material is suspended in water to give it a greater density than that of surrounding water. At Silver Bay, the discharge water, heavily laden with sand, flows by gravity from the plant toward the lake. The coarse sand, about half of the total, is heavy enough to settle out promptly, forming a stable, solid beach or delta in front of the taconite plant. The fine particles of sand are carried over the beach to the lake where the density current forms. The current flows down the sloping lake bottom into the depths of the great trough. There, the density current comes to rest and the particles of sand settle on the lake bottom.

Occasionally, Lake Superior may have a “thermocline” — a layer of warm water above the cold water of the lake — caused by unusual extended heat periods, surface currents carrying warm water from shallows, or heavy summer rains draining from shore areas. Because of the different temperatures, these layers of water have different densities.

As a result, some fine particles of tailings — as well as fine particles of beach sands and steam sediments — when they encounter a thermocline, may detach from the density current and go into temporary suspension. The light reflection from water containing such particles, or merely having different temperatures and densities, may give a “green water” appearance. This is a very temporary phenomenon lasting only a few days. It is not a true color. Viewed in a glass, or subjected to color tests, the “green water” is as colorless as is so-called “blue water”.

This interesting “green water” phenomenon is seen in many lakes. It existed in Lake Superior before Reserve began operations. Federal scientists and others have sampled and analyzed “green water” in Lake Superior which had no relationship whatever to Reserve's operations and contained no tailings. Despite the obvious economic benefits taconite processing has brought to the North country, and despite the elaborate efforts Reserve Mining has made to guard the water quality and aquatic life of Lake Superior, the company finds itself the target of criticism. “Why not dump the waste sand someplace inland where it can't possibly pollute the water?” critics ask. A site on high ground above Silver Bay, a few miles inland from Reserve's plant, has received considerable attention as a potential disposal area. Briefly, the answer is this: First, no change is necessary as there is no evidence of damage or potential harm; no state or federal permits are being violated.

Second, the use of an inland disposal site in the area high above Lake Superior beyond the rocky ridge in back of Silver Bay presents difficult conservation, engineering and economic problems.

According to Stig Forssmark, President, Trygve Hoff & Associates, Engineering Consultants, Cleveland, Ohio, the alternate plan (on land disposal) would destroy private and state property in the entire drainage area. The proposed site is 800 feet above the present tailings delta. The suggested plan would create staggering engineering problems including a series of dikes, or dams, two of which would probably be among the largest rock dams

Continued

**"Yes" from page 15**

from north shore streams contained the normal group of soil minerals, which included kaolinite, mica, vermiculite, chlorite, the feldspars, and quartz.

The distinguishing characteristics of the tailings are: 1) large quantities of cummingtonite, especially in the 2-45 n.m. fraction and, 2) absence of feldspars and kaolinite.

In conclusion these investigators found that:

1. A major cause of "green water" along the north shore is tailings suspended in the water.
2. Not all green water masses occurring in Lake Superior are due to tailings.
3. Water clarity in green water, caused by tailings, is 4 to 10 times less than in clear water.

In July of 1969, with the primary intent to determine the real extent and depth of deposition of cummingtonite in the bottom sediments of Lake Superior as an indication of the deposition of taconite tailings, the staff of the National Water Quality Laboratory again set out on the investigating trail. Samples were collected on the lake bottom and at the mouths of the major tributary streams entering the western basin of the lake. As well as taking bottom sediment samples, the researchers took core samples at each of the stations (fig. 1). The results of these core samples are given in figure 2 and 3, while the results of the sediment samples are given in figures 4 and 5. From these maps and graphs, along with the direct measurements, the investigators deduced the following conclusions:

1. Taconite tailings from the Reserve Mining Company at Silver Bay, Minnesota are deposited discontinuously on the surface of the lake bottom over an area of at least 1,000 square miles in the western tip of Lake Superior.
2. The tailings are mixed in the top 5-10 cm. of sediment.
3. The percentage of cummingtonite in tributary stream sediments accurately indicates the cummingtonite content found in the subsurface bottom sediments.
4. Tailings deposits are found in both Minnesota and Wisconsin waters. Although the sediments in Wisconsin waters contain very low percentages of taconite tailings, the tailings deposits are distinguishable quantitatively from stream sediments.

Dr. Herman and the staff of the National Water Qualities Laboratory, during the summer of 1969, collected samples from Lake Superior in order to determine the effects of taconite tailings on bacterial growth. As test bacterium, they used two types of *E. coli*, which are widely used as indicators of pollution, and *Klebsiella pneumonia*, which was isolated from tributary water to be used as a representative pathogenic species.

These three bacteria were grown in the laboratory on varying concentrations of taconite tailings in lake water at 20°C. according to standard microbiological methods. Here are the results of these experiments in the words of Dr. Herman: "Bacterial counts in Lake Superior are strikingly low, a feature of the lake that makes it one of the best water supplies in the nation. The discharge of taconite tailings by Reserve Mining Company has a potential effect upon the high quality water of Lake Superior which relates directly to the bacterial pollution already entering the lake." The data clearly shows that concentrations of tailings of 1.6 mg./l. (1%) or less promote growth and significantly reduce die away of bac-

**Continued**

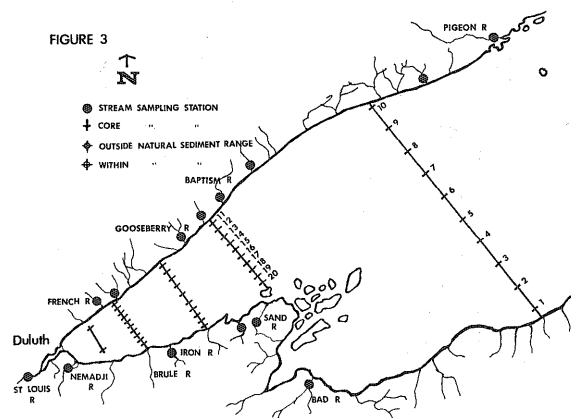
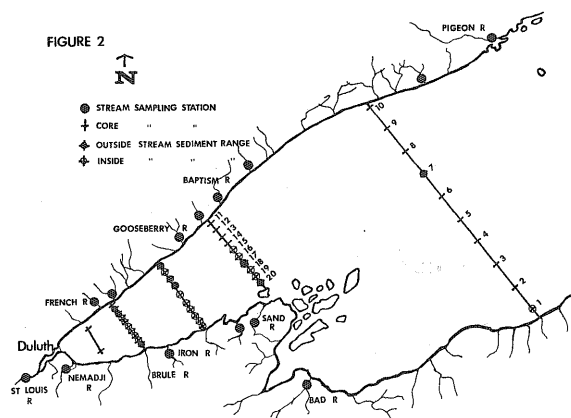
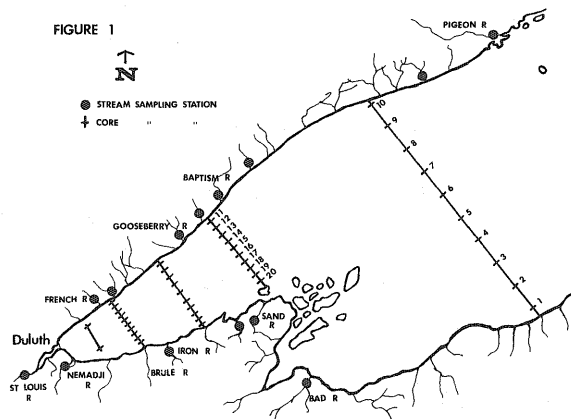


Fig. 1 — Location of sampling stations in the western basin of Lake Superior. Fig. 2 — Location of sampling stations where the cummingtonite content of the deepest sample in the core is outside of the statistical range (95% level) for the natural stream sediments. Fig. 3 — Location of sampling stations where cummingtonite content of any upper sediment layers is greater than the statistical range (99% level) for the natural bottom sediments.

in the world. One would be about 250 feet high and more than a mile long; another would be 200 feet high and more than two miles long. The new facilities would include ten pipelines, ten pumping stations, the dike system, three huge concrete thickeners on the present delta, and facilities to grind the coarse tailings to permit pumping in a slurry. The flow of the east branch of the Beaver River would be drastically reduced. During periods of heavy rain, excess water carrying the finest tailings would have to be drawn out of the basin into the river which flows into Lake Superior. The proposal is neither feasible nor practical and would create — not solve — conservation problems.

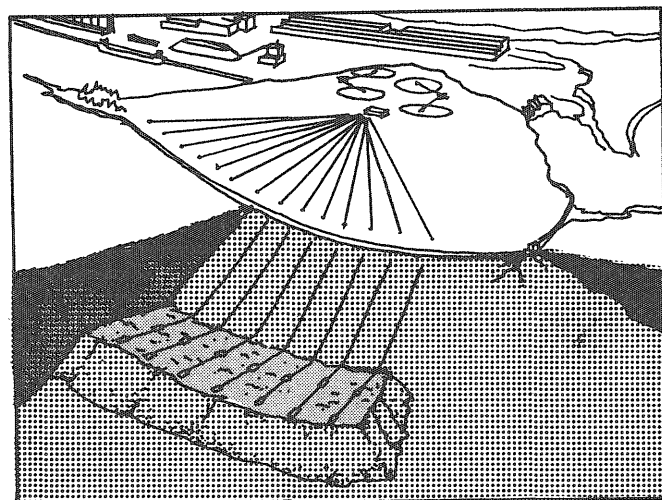
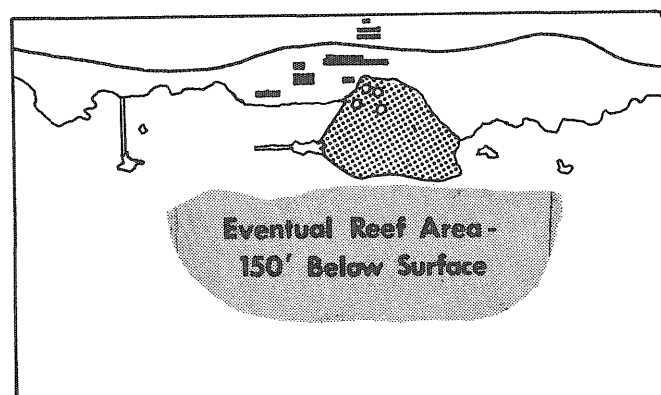
Another proposed system of on land disposal is to haul the tailings back to the Mesabi Range and deposited in open pits. It's obviously impossible to use any active mine for such deposition because most exhausted natural iron ore mines represent a "bowl" of taconite which, hopefully will someday be processed by others. The means of transporting the tailings back up to Babbitt is another problem. The problem being that Babbitt is situated 700 feet higher in elevation and 47 miles from Silver Bay. Because the tailing slurry is mostly water, piping of such a volume of liquid so high would be out of the question, not to mention "freeze up" problems. Shipping the tailings by rail would mean the addition of about three times the horsepower to move the extra weight up the hill, and because of the freeze-up problem, special electrically heated and insulated railroad cars would have to be developed (taking at least three winters).

How then can Reserve modify its system in accordance with Judge C. Luther Eckman's court order (from the district court trial conducted between June 22, and August 5, 1970, which investigated Reserve's discharge systems) which states, "the present method of discharge of tailings from plant at Silver Bay, Minnesota shall be altered and modified by appellant Reserve Mining Company to the extent that desposition of fine tailings into Lake Superior and distribution thereof into areas outside of the so called "great trough" is discontinued. Reserve Mining Company shall submit to the Minnesota Pollution Control Agency on or before May 15, 1971, for approval, such plans for modification as necessary to accomplish the result set forth above.

After such approval by Minnesota Pollution Control Agency, Reserve shall have two years in which to build, install, and put into operation such approved modified methods of tailing discharge. Their, Reserve's, only solution seems to be a modification of their water deposition or to cease production. Since discontinuing production of taconite is out of the question, Reserve has formulated a plan for alteration of their present discharge system.

Under this plan, Reserve's waste sand (tailings) will be pumped far below the surface of Lake Superior where it will form an underwater sand reef 150 feet below the surface of the lake. The accompanying sketch shows the area of the lake bottom which will be raised to this depth during the balance of Reserve's planned mine life. It represents 1.2 square miles of the nine-square-mile zone of discharge specified in Reserve's permits.

Mammoth thickeners and hydroseparators and a settling agent will be used to create a thick slurry - as contrasted with the present discharge which is 98.6% water. Then the discharge will be pumped through 14 eight inch pipes submerged far below any surface-affecting thermoclines, surface currents or wave action and form the underwater reef. The clarified water will be returned to Reserve's harbor at a point near the plant's existing process water intake.■



Above, top: Dark shading is present delta. Light shading shows area which will be built up to reef, 1.2 square miles in area. Reef will take 40 years to complete.  
Above: Cut-away drawing of underwater reef, showing pipes which carry tailings to depths below influence of surface-affecting currents and thermoclines.



“Bacterial counts in Lake Superior are strikingly low, a feature of the lake that makes it one of the best water supplies in the nation. The discharge of taconite tailings has a potential effect upon the high quality water of Lake Superior.”

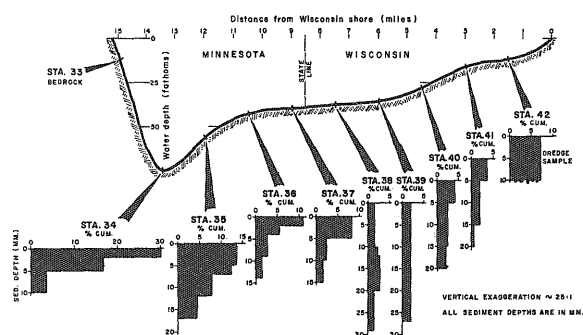


FIGURE 4

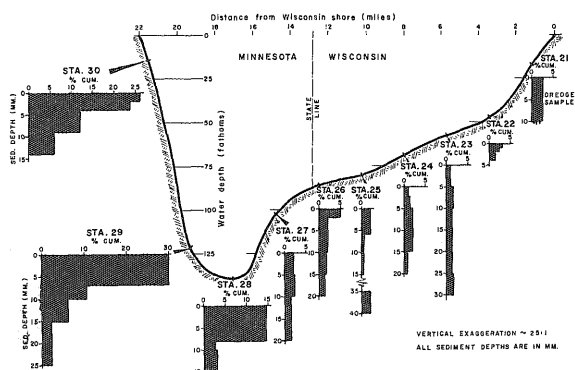


FIGURE 5

Figure 4 — Stoney Point, Minn. to Brule River, Wis. transect showing the relationship of % cumingtonite to sediment depth in core samples. Figure 5 — Encampment Island to Herbster Wis. transect showing the relationship of % cumingtonite to sediment depth in core samples.

teria of sanitary significance. Since green water has been shown to contain 1 to 2 mg./l. of suspended solids, and in preliminary counts contained higher bacterial counts than clear water, the field and laboratory data compliment each other and definitely demonstrate biological activity and discredit the statement that tailings are inert.

In order to test the toxicity of taconite tailings to lake organisms, Armond Lemke and the staff of N.W.Q.L. in Duluth, subjected *Limmocalanus*, a lake opossum shrimp; and *Daphnia magna*; to various concentrations of taconite tailings in raw Lake Superior water. Initially concentrations of 200, 20, 2, and .2 mg/l. solids were used and later test concentrations of 200, 100, 50, and 25 mg/l. were used in order to more precisely determine the toxic concentration level. Their conclusion is that direct toxic effects of tailings on the lake organisms were found at concentrations that would be expected to occur only in local areas of the lake.

The question of the effects of taconite tailings on algae growth was undertaken by Robert Andrew and Gary Glass.

The lake's ecosphere was simulated by using raw, filtered Lake Superior water and accelerated summer conditions (10 C. water temperature and 22 hours per day of simulated sunlight) in the laboratory. Concentrations of 10%, 1%, and .1%, of tailing suspensions were made to get an idea of the possible stimulation of algae growth. In their report of their findings the researchers stated, "algae cell counting and chlorophyll analysis of selected flasks showed that little or no growth occurred prior to the fifth day of the experiment. From the fifth day thru the termination on the eighteenth day, all flasks except the sterilized and filtered lake water controls showed an increase in growth rate."

The results of these experiments show that the growth rate of algae in 10% tailings (16 mg./l. particles less than 2%), is roughly 40-80%. Concurrent studies by the National Water Quality Laboratory staff on the solubility of tailings indicate that several elements (notably silicon, magnesium, sodium, potassium, and manganese) are soluble at concentrations considerably higher than the levels found in the water of the western basin of the lake. All of the above elements are known nutrients required for the growth of algae, and contribute to eutrophic effects if increased in concentrations in the lake as a result of tailings disposal practices. ■

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April 1970

pgs. 5, 6, 16, 17, 30, 31, 33, 39, 40, 47, 48, 49,  
50, 51, 53, 55, 56, 67, 68, 71, 74, 76, 77, 78, 80.

# NEXT MONTH

## Plight of the Cities

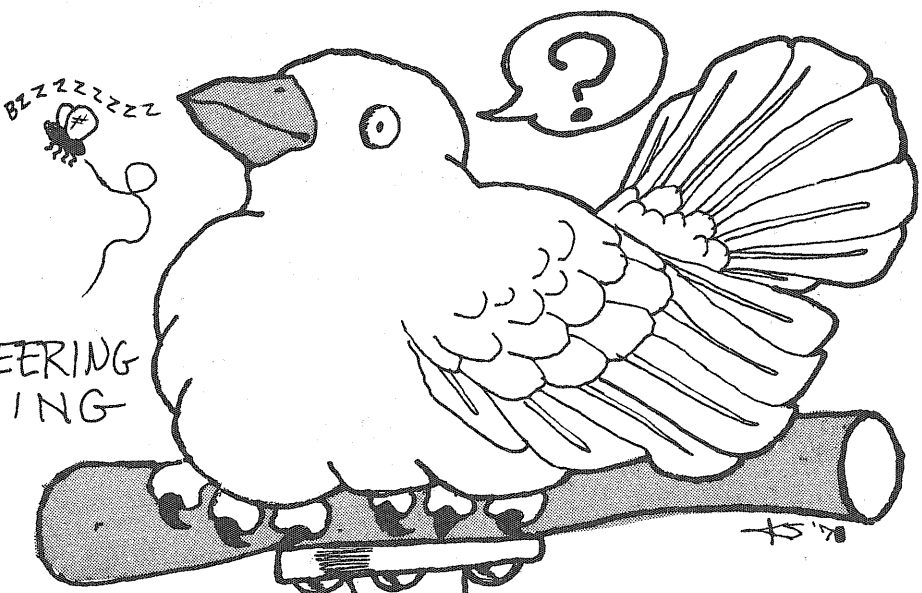
An introduction of a three part series dealing with some of the problems cities' face and how modern technology might solve them.

## Mass Transit

Part one of this series discusses alternate public transit systems with particular emphasis on personalized transit (PRT).

## Recycling Plants

A new method of preparing coated and treated waste papers for recycling, which leaves no waste itself!



MAIN  
ENGINEERING  
BUILDING

OPEN  
8:00 A.M.  
to  
4:30 P.M.

CONTRARY TO POPULAR BELIEF, 8000 CANARIES ARE NOT SOLD AT THE:

# ENGINEERING BOOKSTORE

The ad shown below has told the public about a Kodak product intended to save people from a life of mental retardation.

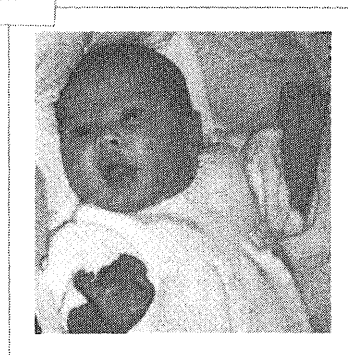
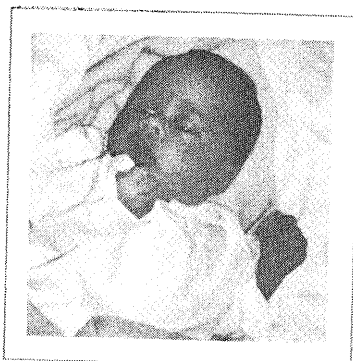
A young Kodak technical guy convinced us we ought to market that product.

Convincing us was not easy.

*Nobody* who wants to do a little good in the world *ever* has an easy time of it, *any place*.

EASTMAN KODAK COMPANY

**Kodak**



The upper row of crescents in each case is for comparison.  
The lower row is from the baby.

### Baby pictures

Seen here as strips beneath the familiar kind of baby snapshots is a new kind, made from urine samples donated by these healthy new citizens. (A test of blood plasma is also desirable.) The strips tell about body chemistry. One out of many thousands of such patterns may turn up with a prominent crescent in the lower row at this particular point



Such is the hint that the infant's body is mishandling phenylalanine, a required substance that results from digestion of any natural protein food, like milk. If this continues, the child will probably suffer mental retardation.

Most states already require a test for this condition. If after the first weeks at home babies had an additional blood test

with one of these snapshots, chances would increase of detecting other such metabolic defects. Unrecognized and untreated, many of these also lead to retardation and other severe impairments.

Treatment consists of precise regulation of diet.

Kodak, long known for simple snapshots, also makes the material on which these simple non-photographic ones are taken. (Thin-layer chromatograms, they're called.) No camera, only a few plastic accessories.

The physician's time and insight are required only for the infant whose test falls outside the common range of variation—to decide on more detailed confirmation of abnormality and, if confirmed, on remedial measures.

Cute baby pictures are both priceless and remarkably inexpensive. So is this less cute, biochemical kind. Who ought to pay for it is an interesting question in ethics, politics, and economics. Here is one place where industry's ambitions for efficient production may encounter little opposition.



# HOW CAN A SHEET OF SILICONE RUBBER HELP TURN A TEN-YEAR-OLD INVALID INTO A TEN-YEAR-OLD ATHLETE?

A few years ago, General Electric engineers developed a silicone copolymer rubber with some remarkable properties.

It's a membrane that permits the rapid exchange of oxygen and carbon-dioxide molecules.

So it's made a revolutionary new artificial lung possible. The GE Peirce lung™ oxygenates blood in much the same way the human lung does.

That's a major engineering accomplishment. But that's not the reason it's important.

The GE Peirce lung works with a minimum of disturbance to blood cells. So it can be used safely much longer than conventional lung machines. Days instead of hours.

That extra time may be what a doctor needs to repair the defective heart of a child. To open

the clogged arteries of an adult. Or to save the life of an accident victim whose lungs give out.

That extra time may be all it takes to help put thousands of those invalids back on their feet.

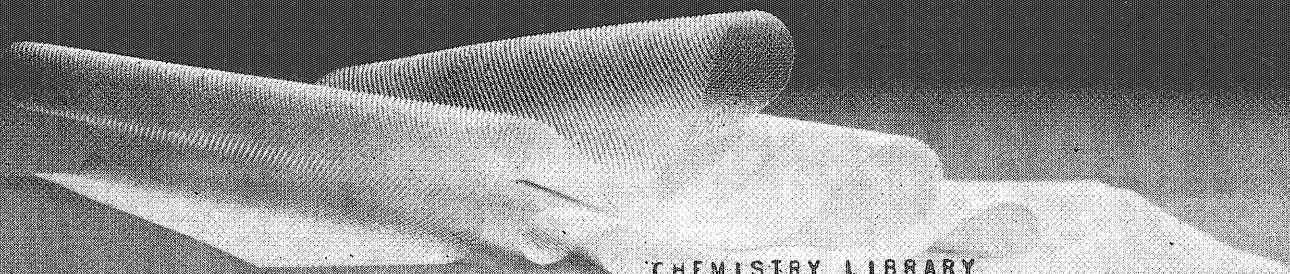
It's a pretty clear example of how a technological innovation can help solve a social problem. A lot of times, the effect of technology on society is rather direct.

That's why at General Electric, we judge innovations more by the impact they'll have on people's lives than by their sheer technical wizardry.

Maybe that's a standard you should apply to the work you'll be doing. Whether or not you ever work at General Electric.

Because, as our engineers will tell you, it's not so much what you do that counts. It's what it means.

GENERAL  ELECTRIC

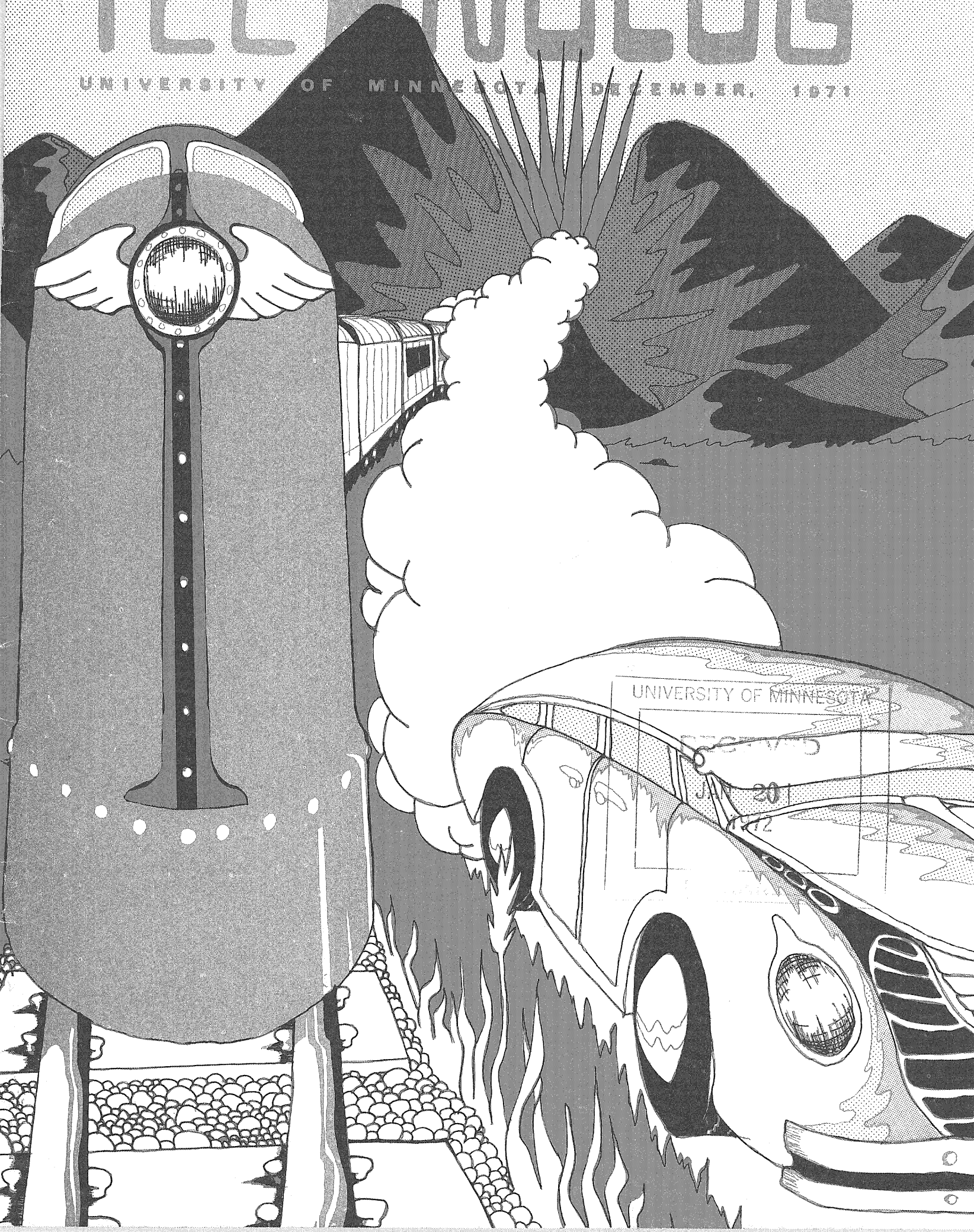


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CAMPUS



# TECHNOLOG

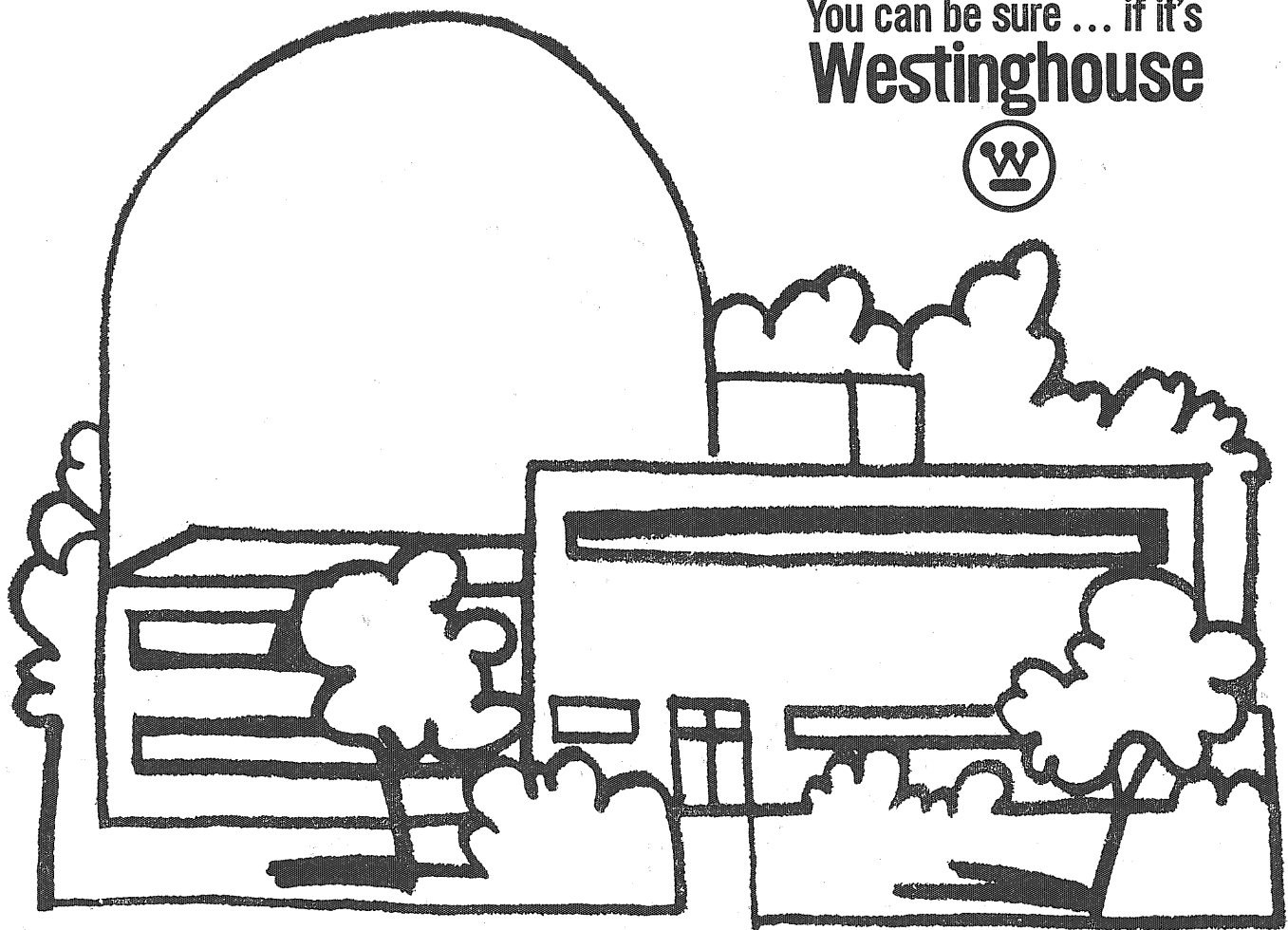
UNIVERSITY OF MINNESOTA DECEMBER, 1971



# Who's the No. 2 maker of nuclear powerplants? It isn't Westinghouse. You bet we're hiring.

If you can't wait for the recruiter,  
write today to George Garvey,  
Westinghouse Education Center,  
Pittsburgh, Pa. 15221. An equal  
opportunity employer.

You can be sure ... if it's  
**Westinghouse**





# Cast it or weld it?

The beauty of *cast-steel* construction is that you can combine the casting process with another production technique, and cash in on the economies of both.

Suppose you had to create a heavy-walled fluid-handling component with complex internal configuration . . . a component that is basically a "twin" design. Can it be made as a single casting? Easy—but how much more economical to split the design into two "chunky" castings (thus minimizing core costs) and then weld the two halves together.

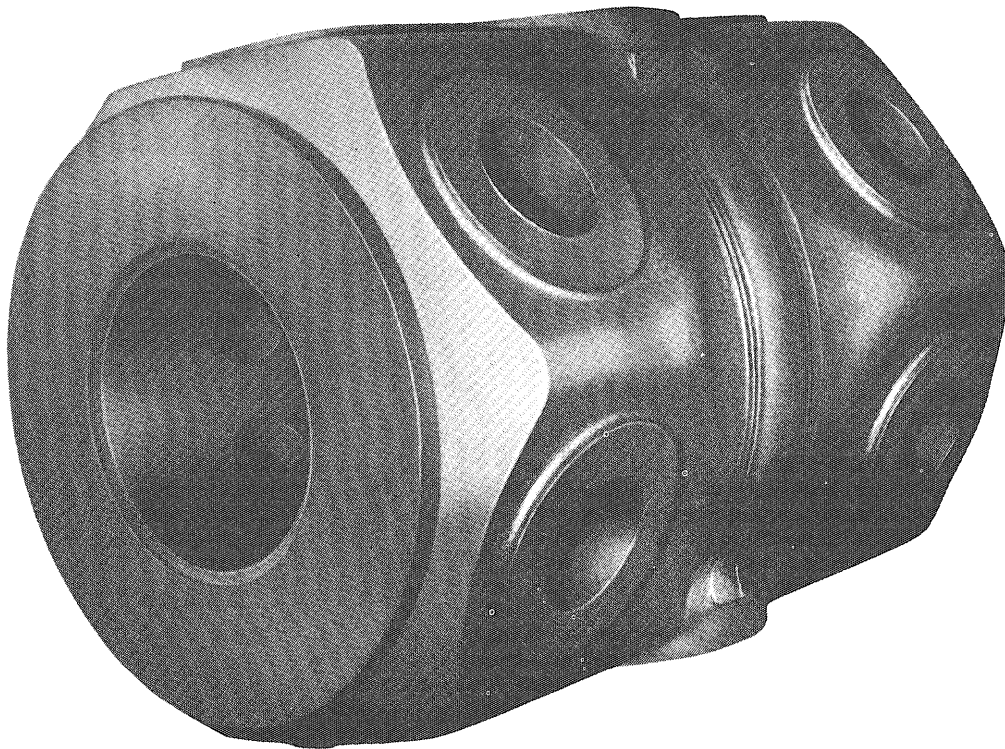
Theoretical? Not at all. We're talking about the 12,000-pound, 7-foot-long compressor cylinder shown . . . Designed for continuous operation at 1150 psi, it must withstand testing at 1800 psi, plus rigorous radiographic and magnetic particle inspec-

tions. How else would you make this component? Forge it? Impossible. Hog it out of a solid chunk of metal? Prohibitively expensive . . . By using *cast-steel* the designer got maximum economy, *plus* the extreme dependability and safety which were "must" requirements in this high capacity compressor unit—since he could specify the precise composition needed to meet calculated stress requirements.

Want to know more about *cast-steel*? We're offering individual students free subscriptions to our quarterly publication "CASTEEL" . . . Clubs and other groups can obtain our sound film "Engineering Flexibility." Write Steel Founders' Society of America, Westview Towers, 21010 Center Ridge Road, Rocky River, Ohio 44116.



## STEEL FOUNDERS' SOCIETY OF AMERICA



***Cast-Steel  
for Engineering Flexibility***

# How to call a stereo buff's bluff.

A buff will probably tell you you've got to drop a bundle to get a really great stereo system. Nonsense.

Stereo is all in the ear. It's how it sounds, not how it costs, that makes a stereo system great.

So next time some buff hands you that old line call his bluff. See if he can figure out how much you paid for your Sylvania matched component stereo system. Just by listening.

Pick your favorite record. Put it on the BSR micro-mini turntable. (If tape's your thing, slip one into the 8-track cartridge playback.)

Then balance the bass and treble on the FM stereo FM/AM tuner and amplifier. And let him have it.

Make sure he digs those round low notes from the two six-inch woofers. And those high sweet ones from the two three-inch tweeters. They're all air-suspension speakers, so they sound as good as standard speakers two sizes larger.

Your buff won't have a chance. He'll stand there, surrounded by sound, completely bluffed. Trying like crazy to figure out how much you laid out for a stereo that sounds that great.

But don't tell him.

After all, you just want to call his bluff. Not destroy his ego.

**GTE SYLVANIA**



# TECHNOLOG

VOL 52; NO. 3

Official Student Publication of the Institute of Technology, University of Minnesota

DECEMBER, 1971

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DEPARTMENTS

## MEMBER OF ECMA

Published monthly, October through May. Second class postage paid at Minneapolis, Minnesota. Office: Room 2, Mechanical Engineering Building, University of Minnesota, Minneapolis, Minnesota 55455. Telephone: 373-3298. Printer: Aircraft Press, 425 South Fifth Street, Minneapolis, Minnesota 55415. Publisher's National Representative: Littell-Murray-Barnhill, Inc., 60 East 42nd Street, New York, N. Y. 10017. Publisher's State and Local Representative: University Engineering Magazine Advertising, F. P. McGrath, Manager, Box 14026 University Station, Minneapolis, Minnesota 55455. Telephone: 612-225-0708. Member of the Engineering College Magazines Associated, Chairman: Donald L. Griffen, Iowa State University. Subscription rate: \$4.00 per year, single copies 50¢. Advertising rates upon request. Any opinions expressed herein are not necessarily those of the Institute of Technology or of the University of Minnesota. Copyright © 1971 by the Minnesota Technology Board. All rights reserved. Reproduction in whole or in part without written permission is prohibited.

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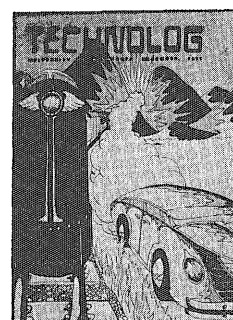
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This month's cover is a pen and ink drawing by Kevin Strandberg.



# FORUM

## What can we say about pollution, that hasn't already been said?

We have all heard phrases like: "Nature is being destroyed", "population explosion", "dying rivers". These are words that don't say anything but merely stir emotion. The same is true for those people who say them. These people are uninformed, or worse, partially informed. They cry "pollution" and try, honestly, to stop it. But their methods sometimes create more pollution than they prevent. The most recent and local example is the case over Reserve Mining's disposal of tailings. Governor Anderson, backed by Senators Humphrey and Mondale, is crying "pollution". He's saying Reserve's present methods of disposing its 67,000 tons of tailings daily, into Lake Superior, is destroying its ecological balance. Anderson has asked for Federal courts to force Reserve to convert to an on-land disposal system. However, Reserve is, to our knowledge, the only company that did extensive research on on-land disposal. They found that this system would not only pollute the land, air, and surrounding rivers, but would also ultimately pollute the lake to a greater degree than the present dumpings. Also, development would take about three years. Is Gov. Anderson's proposal in the best interest of the environment and the people? We think not. He is asking for an alternative but does not realize its consequences completely. Anderson's request is based on incomplete information.

A situation such as this happens all the time.

Because phosphate-containing soaps were labeled as pollutants, public pressure forced the manufacturers to produce soaps that clean just as well but contain no phosphates. The fact is, these new no phosphate soaps may be more detrimental to the environment than the phosphate soaps.

Leaded gasoline, having come under attack by the ecology bounds, forced the development of unleaded gasoline. Unleaded gasoline, be-

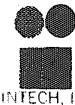
cause of the increase in hydrocarbons to replace the tetraethyl lead, is more dangerous than the leaded gasoline.

When cans and paper were found to upset the ecological balance, the public started to demand returnable bottles to replace them. The fact of the matter is the heat used in cleaning these bottles causes a thermal imbalance; possibly more dangerous than the cans and papers.

These "right ideas, but misguided measures", must be prevented, but how and by whom?

The how is "easy". Make sure that the general public is *completely* informed so that they can apply the pressure in the right directions.

Who has the responsibility to inform the public? The people who can best understand the facts and convert them to common, everyday language without using sensationalism. These people are engineers and scientists. These are also the only people who can present any viable and complete answers to the pollution problems./BJ,RR



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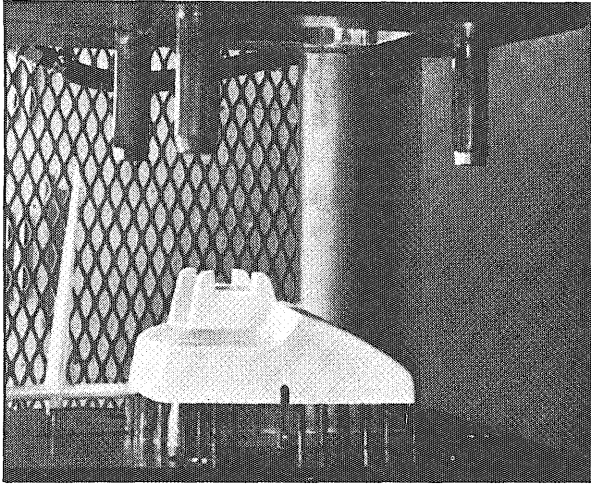
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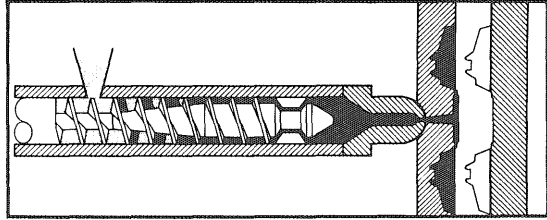
# WESTERN ELECTRIC REPORTS



**Molding by the millions.** Western Electric people produce some 8 million phones a year. Molded plastic is used for housings and many other parts. So there is a constant investigation into the most effective way to use these materials.

$$A^*(z,t) = A_e^*(z) - [(A_f^* - A_i^*) / (1 - e^{-\beta N t r_f})] e^{-\beta N t}$$

**In developing the model** at Western Electric's Engineering Research Center, it was found that melting behavior can be described by this formula which includes terms for shear heating and conduction heating effects. Other models were developed for temperature and pressure profiles.



**End of molding cycle.** At this point, the screw is stationary and heat is conducted into the plastic on the screw. After the plastic solidifies, the mold is opened as shown. The parts can then be ejected.

## Solving the mysteries of molding with mathematics.

Even though plastics have been around for many years, there's still a lot to be learned about these versatile materials and their processing. So they are the subject for continuing studies by our engineers.

Some of their recent investigations have brought forth new and highly useful information about a relatively unexplored area: the melting behavior of plastics in the injection molding process.

One result of these studies is the mathematical formula, or model, above.

The model helps us predict melting behavior along the length of the injection screw molding machine used to mold telephone housings and other parts. Melting behavior is extremely important, because plastic pellets should be completely melted but not thermally decomposed before injection into the mold.

This information on melting is then used to investigate screw designs, operating conditions, machine sizes and plastic properties. All of which is aimed at obtaining optimum processing techniques.

Predictions obtained from the mathematical model have checked out closely

with experimental observations. So the resulting screw designs are now undergoing evaluation by engineers at our plants in Indianapolis and Shreveport.

**Conclusion:** For new designs and materials, the model can help reduce the development cost for new molded parts and materials. For manufacturing current products, operating costs can be reduced.

Perhaps most significant is that we're getting information about molding temperatures not available experimentally. And many other types of information can be obtained without the use of costly, time-consuming experimental work.

The end result will be more efficient plastic molding and therefore a better product for the lowest possible cost.



## Western Electric

We make things that bring people closer.

# REVERB

## Hurt by Textbook Shortage?

As one of the two students appointed to the Textbook Task Force, I hope the procedure we recommended will be used for Winter Quarter. According to our memorandum, if a student cannot find a required text for one of his courses, all he has to do is to fill out a mimeographed form and drop it into one of the complaint boxes, located near the check out counters in the Engineering Bookstore. A member of the administration will review the complaints daily during the week before school and the first week of classes with the Bookstore manager and, if necessary, will call on the instructor. I would like to hear about any hassles the student encounters as he (or she) attempts to use this system. Please drop a note by the Tech Commission Office: Rm. 230 TNCE.

Ted Greacen, Senior, M.E.

## Freshman English??!!

My complaint is not particularly with the study of poetry and literature in class, which can be very interesting at times, but rather with the horrible themes that must be written for class. When writing a theme I don't mind the form that is necessary in writing, but the subject matter leaves much to be desired. Writing a technical paper is easily done, but when it comes to analyzing a poem I could scream! My English Professor sends a continual stream of comments scrawled on my themes that demand that I "argue with depth", be more probing, and that I come up with some fresher ideas. So I try again, with what I thought was very good idea, only to find it cut to ribbons when the theme was returned.

Now, I ask, why must we freshmen IT students, who will never have to analyze another poem as long as we live (provided, of course, that we manage to pass Freshman English) be forced to do so? I would gladly learn how to write if the subject material was something more concrete than a piece of poetry. And I would be happy to study literature if I didn't have to worry about writing a paper on a little understood piece of prose or poetry. It's too bad we can't seem to convince the English department that

it's not English we can't stand, but the analyzing of some crazy poet!

IT Freshman

*This letter was printed exactly as received with no editing or proof-reading to prove a point: IT freshmen do have a need for Freshman English. We suggest that you reconsider your feelings and realize how important training in non-scientific analysis and communication skills are. The Editors*

A truly representative magazine for I. T. needs feedback from its readers.

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## Do you keep an eye on the time line?

To gain the competitive edge, the experts in downhill slalom have this advice: "Watch the time line—the fastest course line."

"In the race against time, if a skier slips off and goes too low in the traverses, he'll lose precious seconds."

As you look to your future course, watch for the company whose progress is on a time line with your own.

Ask companies about their expansion and modernization programs (ours is an optimistic \$221 million). Find out if you're interested in the markets they're interested in.

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A milk or ice cream carton, a waxed paper cup, or a poly-coated food package from the super market freezer is hygienic and totally fit for human use.

Those very same containers and the waste from their manufacture have always been, for recycling purposes, contaminated and totally unfit for anything but incineration and/or bulldozing into a landfill site.

This has been one of the knottiest problems in the evolution of paper recycling. A container of this type is made with the best wood fiber available on the wood pulp market.

Then, because the food or beverage within must be protected, the paper from which these containers are made is coated and/or impregnated with protective films and waxes which are designed to guard against anything which would lower the quality of the food product (heat, cold, humidity, dryness).

These protective materials lock the fine wood fibers in, and until recently there was no way to retrieve them.

Wax was the first material used to coat cartons and cups. But a thin layer of wax becomes brittle when it is cold and has a tendency to crack if it is bumped around. Years ago, it wasn't uncommon to bring a "leaker" home from the grocery store, a milk carton that didn't announce its deficiency. The discovery was made later upon opening the refrigerator door and finding fruits and vegetables awash and the offending carton almost empty.

Technology developed during World War II brought out a whole new world of paper coatings and impregnations. Polyethylene, then the wet strength resins (urea formaldehyde, melamine formaldehyde, kymene resin), helps to keep paper intact even when soaked, steamed, or scalded.

As more uses were found for coated or impregnated paper board, more protection had to be invented for it. Now it is possible to protect food against contamination by salt water, grease, lye, vinegar, odors that might affect its taste, and the elements.

There are also sophisticated cold and hot-melt adhesives which are used for gluing flaps and ends. There are special inks to be used when printing coated or impregnated paper board.

All these developments lock the original basic wood fibers in more tightly. As the millions of tons of paper, food, board, and literally billions of paper milk cartons that are produced annually are used and then discarded into the solid waste stream, the care-free "disposable" has become a way of life. A way of life, incidentally, that may bury earth's inhabitants right up to their eyebrows in solid waste before many decades have passed.

Many pulp and paper mills have been recycling waste paper since before the turn of the century. Their technology, while keeping pace with their own individual mill's demands, has not kept pace with environmental demands.

During the early 1950's, Riverside Paper Corp. of Appleton, Wisc., began to use the secondary fiber that was generated in the manufacture of juice and milk cartons. This fiber was white bleached board contaminated with polyvinylacetate (PVA). Percentages of PVA and adhesives ranged up to two per cent by weight, and wax up to 12 per cent.

The fiber in these cartons and the scrap from their manufacture was repulped, screened, and used to make conventional writing paper. But the PVA would show up as yellow shiners in the paper, and the wax would cause excessive slip. In addition, contaminant build-up on paper machine dryers caused excessive (and expensive) downtime, a term used when machinery is inoperable because of the need for clean-up or repair.

So Riverside's laboratory technicians embarked on a research program and ultimately developed a solvent extraction process. An operational plant was constructed in 1958, and its operation was successful for several years. But polyethylene slowly became a contaminant in this type of secondary fiber. A second research effort was conducted, resulting in a modification of the process and rebuilding of the existing plant.

When Riverside technicians first began to tackle the problem at hand, they used caustic soda, wetting agents, soaps, de-inking formulas, and solvents. These cooking formulations were followed by washings, screenings, floatations, and centrifugal cleanings. All were designed to get rid of PVA and adhesives. Some of the trials were encouraging in the laboratory, but when they were applied to large scale production, the same problems came up — yellow shiners, excessive slip, and coating of dryer surfaces.

In 1955, when Riverside technicians decided to try continuous hydrocarbon solvent extraction, they initially used carbon tetrachloride. The pilot plant simply had not been built to handle this type of operation and the results were both discouraging and encouraging at the same time.

Solvent losses were high, resulting in high toxicity and poor economy. Yet the extractions were highly successful, so Riverside engaged the Battelle Memorial Institute of Columbus, Ohio, to investigate further.

One of the theories Riverside had operated on was that a continuous solvent extraction process was more efficient and more economical. Battelle reached the conclusion that the Riverside process was technically as well as economically feasible but that it lent itself better to batch, rather than continuous, operation.

Battelle discovered that the waste contained, in some instances, much more adhesive (such as PVA) than had been realized. In addition, Battelle developed an extremely effective method of solvent recovery.

Continued on Page 12

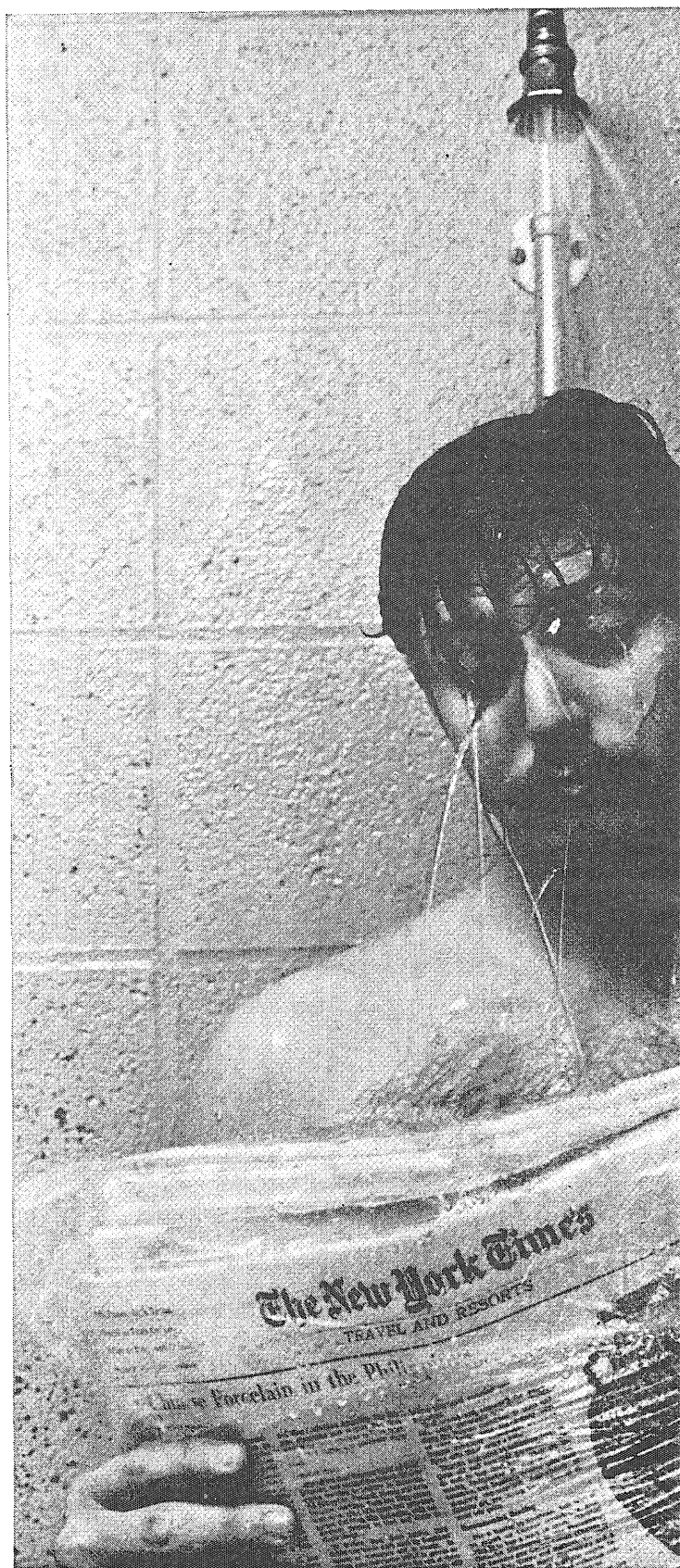
by Gloria Anthony  
with Jennifer Kerr

# Old Milk Cartons, Do Not Die





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the news  
fit to read.**





Each Saturday night *The New York Times* wraps up the news.

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at all the things we do.**

## Cartons From Page 9

So it was decided that Riverside would build a new pilot plant in Appleton, Wisconsin. It would use the process and the new recovery phase. No major problems developed in this plant and challenges were met as they were encountered.

Ink and wax necessitated some minor adjustments. Tons of accumulated wax stacked up, so a buyer had to be found for it.

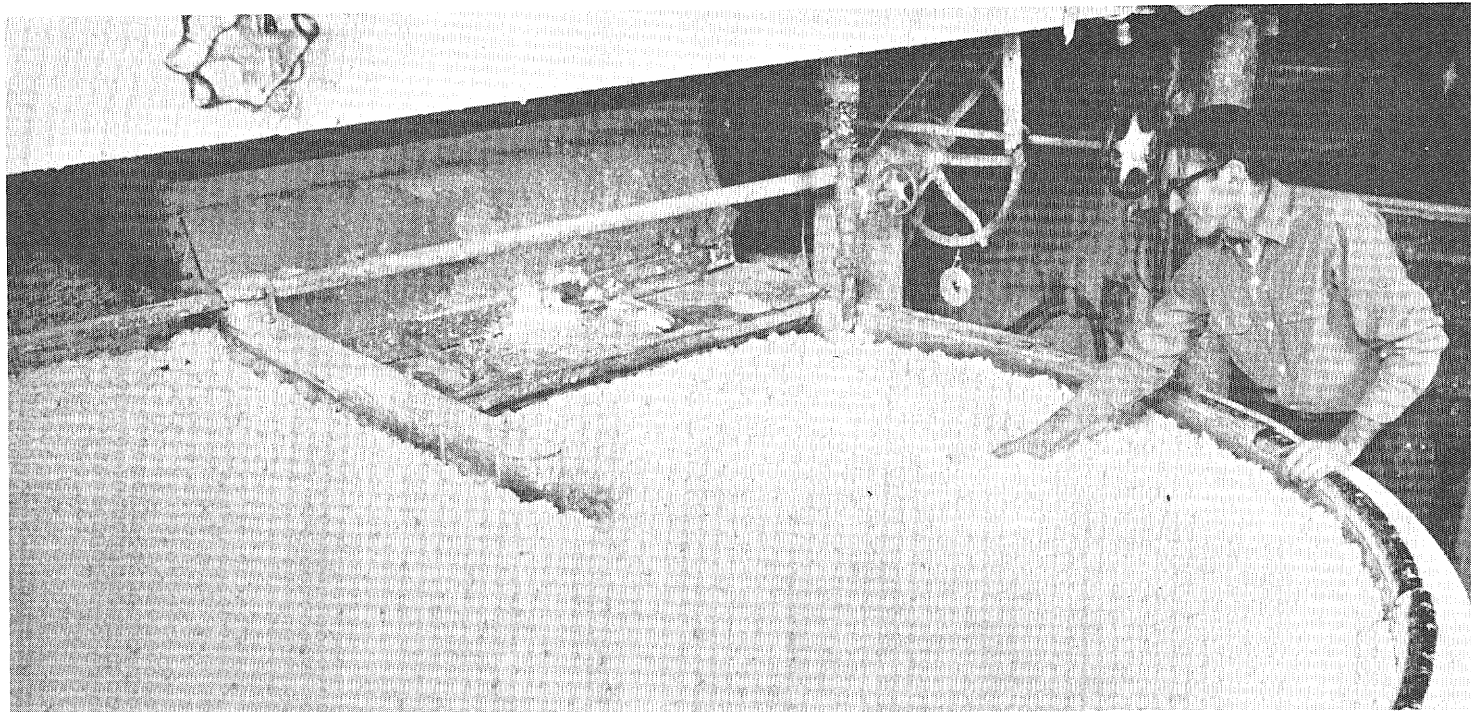
Polyethylene became common as a carton coating, so another pilot plant was constructed. Right away, the dissolved polyethylene plugged the evaporator in the distillation process. So temporarily, all wax waste was saved and blended with the poly-coated waste in the extraction phase. This way the waste did not plug the evapora-

tor during the distillation (solvent recycling) process and a lower temperature could be used for the recovery.

clean, sanitized, reclaimed fiber. It goes from there into Riverside's conventional papermaking equipment. The wood fibers are dispersed in water, laid down on a screen and dried to allow bonding of the fiber.

All that waxed and poly-impregnated waste has been recycled into high grade, watermarked bond paper, the kind you write, print, or draw on. Holding the paper up to the light reveals the watermark — "Ecology 100% Reclaimed Waste".

Riverside's Ecology paper has about the same dimensional stability as a paper made from virgin fiber. It contains no groundwood (the weak, short fibers such as are used in newsprint) and, its colors are softly-muted, non-pollutant dyes.



*Waste paper emerges from solvent baths as clean fibers ready for processing in the conventional way.*

tor during the distillation (solvent recycling) process and a lower temperature could be used for the recovery.

Early in 1971 a patent was issued for the Polysolv Process. Midway through the year, a new plant was put into operation. In this plant, waste is fed into a rotary reactor, washed, and put through what is literally a triple dry-cleaning process in baths of super-heated trichloroethylene. The solvent (trichlor) is used within a reverse, or counter current, recycling system.

Bath one involves solvent which has already been used twice (in the third and second cycles). Bath two is made in solvent which has been used once. The third and final bath is in clean solvent, which was used three times before going through a still and a condenser to remove contaminants (a complete recycling).

The waste originally fed into the reactor emerges as

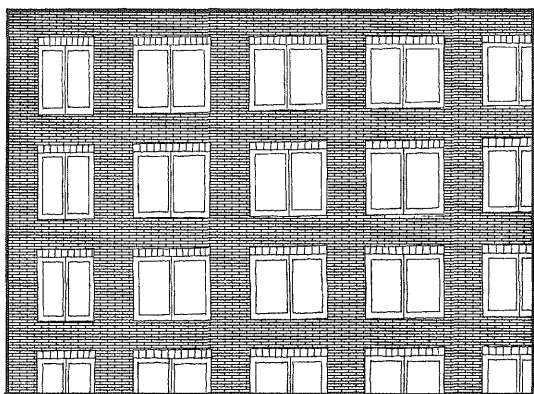
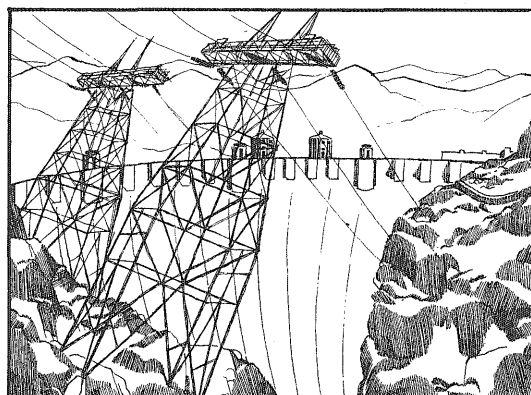
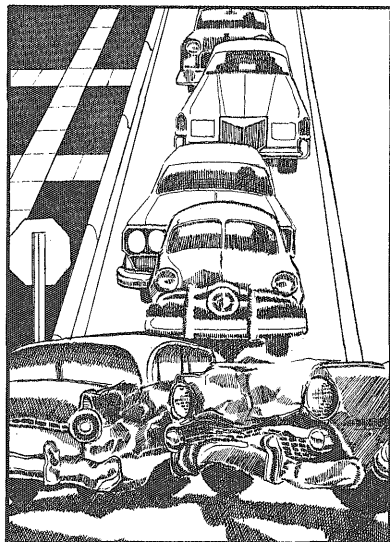
To further assure a pollution-free operation, Riverside's Polysolv Process is a continuous, closed system. In addition to completely recycling the solvent, the system's water (used for cooling) is recycled over and over again. Out of that original waste, 90 percent of which was reclaimed into fiber, 10 per cent remains as a jelly-like accumulation of wax, ink, adhesive, and poly film.

The use of wax on cartons is not as prevalent as it once was, so Riverside no longer sells this wax. Instead, Riverside technicians have found a way to reuse the 10 per cent of waste remaining after the recycling process. A number of dispersing agents were tried before it was discovered that ordinary fuel oil does the job. The jelly-

Continued on Page 21



# Urban Odyssey



by Bruce Wright

Minneapolis and St. Paul are attracting more and more kibitzers, savants, experts, dreamers and even computer specialists. But it's too easy to be Pollyanna and argue that everything is well, or to be a prophet of doom, saying that we are going down the drain.

Critics continue to predict that the cities are steadily and rapidly becoming repositories for the under-educated, the poor, the elderly and the underemployed.

This issue begins a three part series on some of the problems urban dwellers face today and will face in the future. The first article covers the important subject of mass transit and its competition with the ever popular automobile. With the production of cars increasing every year, our cities become more and more undrivable and it is not too unbelievable that someday cars might be banned altogether.

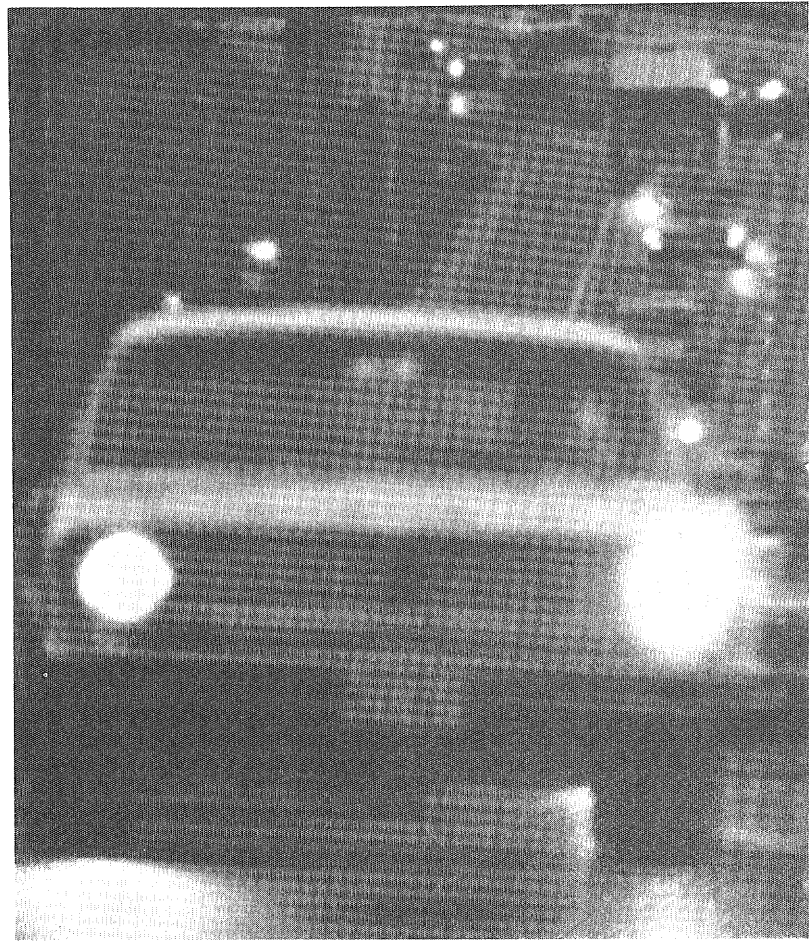
Second in the series is a revealing article on energy consumption by grad student Wes Fisher, head of the Twin City Area Urban Corps for

the Energy Education Project. As our consumption of energy expands, the Urban Corps says it will become "a serious threat to the well being of American society".

To round off the set, an article on the very critical state of housing in this country is planned for the February issue. Included will be some of the ways this crisis might be solved using modern technology.

Even with all of the technical accomplishments that Americans possess today, there is still a major block preventing any of the dreams from coming true. It all depends upon the willingness of the people to change and to meet the challenge of changing times. Indeed, history will demand that humans meet the challenge, or the life of the world and all living things on it will be at stake. It's all part of evolution.

But we push these thoughts from our minds as we concentrate on the "Laugh-In" re-run. After all, our lives haven't changed *that* much and you've gotta pay *something* for progress. . . . but HOW MUCH?



# **THERE'S MORE TO MASS TRANSIT THAN MASS**

**AN ANSWER TO THE  
7:45 SQUEEZE ON I-94**

**BY ROGER PETERSON**

Roller skates might someday compete with automobile travel on several urban freeways as Twin Citians experiment desperately with new ways to get where they are going. Considering this possibility, with our mobility momentarily lost and our roller skates heavy on our feet, may inspire some thoughts on the condition of urban transportation. Mobility is a basic human requirement and is essential to urban living. For this reason, I believe transportation will be a crucial issue in the future of our cities. Today, the masses in our cities suffer not only a deteriorating environment, but an impoverished mobility as well. Transportation is only one of the many environmental problems, but it is a large one, and one which has affected the ecology of the cities.

Given that we recognize a problem with transportation, what are the ramifications? Congestion restricts the vital movements of the city; wasting time, money, fuel and human energies. In addition, the social implications of our existing transportation systems are far reaching, much further than generally noted. One quarter of city dwellers are not well-served by present transportation systems. Those who do not own an auto or do not drive are a large part of this group. Without an auto, the next available



transportation (excluding an expensive cab) is a giant step down. Consider the young people who require an auto to reach their jobs, yet their earnings are nearly consumed by the costs of that auto. Consider the old who are isolated from friends and cultural amenities by the transportation barrier.

Briefly explore the environmental effects of present movement systems. One system is predominant, almost a monopoly: the auto, with paved surface routes, provides over ninety per cent of the person-miles of travel. Some of the aspects of urban living acted upon by this predominance are an increasing level of air and noise pollution, spreading patterns of concrete-asphalt landscape, and even psychological duress. Recent literature is replete with depressing descriptions of these problems. It can be seen that, essentially, we have taken a very sub-optimal approach to urban transportation.

The sub-optimal description is meant to imply several things. First of all, urban systems are still not fully conceptualized. Our models now are limited ones. The tremendous strengths of rigorous systems analysis have successfully landed man on the moon, but have not been applied extensively to problems closer to home. It is true, of course, that a moon landing is a much

less difficult task than solving some of these problems. Secondly, the range of alternatives in transport is only now being recognized and developed. The technology of the aerospace industries has opened a broad range of radical new possibilities in urban transportation. Yet a sort of tunnel vision has prevailed in some circles; leading many people to regard conventional alternatives as the only viable ones. Thirdly, the decisions leave a great deal of room for improvement. Even to the extent of our understanding of urban systems and recognition of alternatives, the decisions have not maximized the quality of urban living (defined as a mean quality). Perhaps our measures of effectiveness in decision-making have been inadequate. It is more likely that sub-optimal choices are largely the result of extrinsic pressures. Choice here refers to much larger decisions than where to locate a highway or how to subsidize a bus system. It refers to the now culminating trend toward individual, random-routed conveyance in the cities. The decisions on this trend have neglected the potential of organized systems of public transport. Those who stood to benefit, financially and otherwise, from increasing auto use have predictably attempted to perpetuate this trend as far as possible.

The "quality of life" measure is not to be confused with the "standard of living", a very quantitative measure. America has an abundance of transportation; amounting to nearly one-fifth of the Gross National Product as an activity. Yet the two measures of quality and quantity seem to move in opposite directions; perhaps a demonstration of the old adage: "Everything has its price". Our transportation decisions must engage environmental criteria to a greater degree, and public participation in planning must be enlarged.

What are the alternatives in urban transportation? Most commonly, a chronic expansion of auto facilities has been used in the attempt to curb congestion. New freeways, roads, parking lots, etc. proliferate in response to increasing demand. (A per capita increase, it should be noted.) Yet the new facilities are often filled to capacity soon after the concrete hardens. The automobile has been so successful that it is a failure as a means of mass urban transportation. *Quad erat demonstrandum.*

A second alternative would be the conventional types of transit that have been available in essentially the same form for many years. But when rail and bus transit have lost in competition with the eminently "successful" automobile, how can such classical solutions be successful? Currently there are attempts to revive conventional public transit in hopes of alleviating the difficulties of auto-monopolized urban transportation. I would submit that such attempts will accomplish very

Continued on Page 18





# THE GREAT AMERICAN

**Soon 90-mph commuter trains will put a little more rush back in everybody's rush hour. And nickel's helping make it happen.**

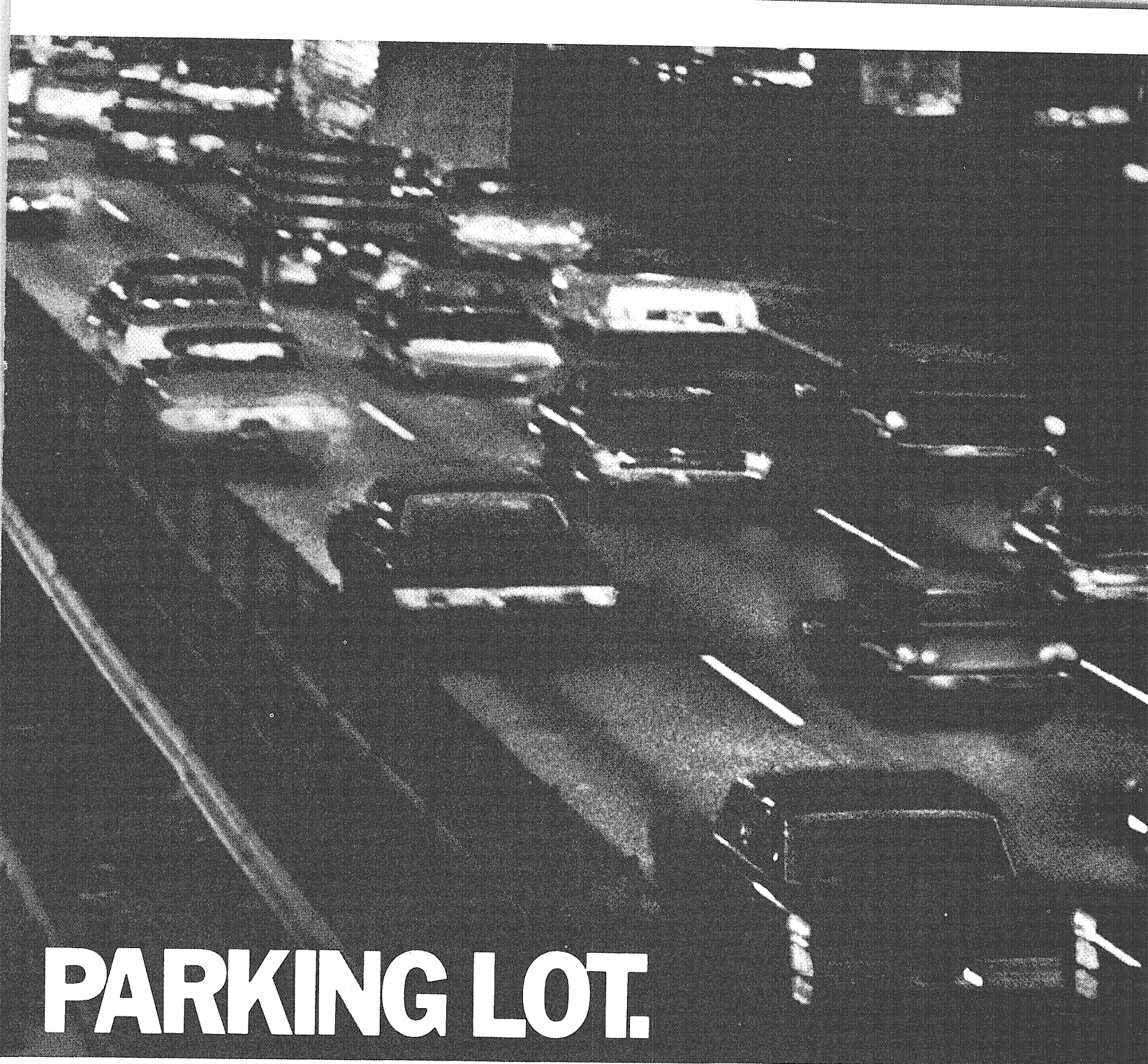
At last, true high-speed rail service is on the way. In mass transportation systems from New York to San Francisco.

And, by taking some of the pressure off our clogged highways, it promises to make life easier for motorists as well as rail passengers.

The progress of the Long Island Railroad is typical. Every week now, it replaces six or eight of its old cars with gleaming "Metropolitan" cars. About the middle of next year, after its entire new fleet of 620 cars has been put in service, it will start cutting commuting times throughout its system.

Both the frame and skin of the new Metropolitans are nickel stainless steel. The nickel's in there for several reasons. It makes the steel easier to weld and form, and adds toughness to insure car safety. It also helps arm the car against grime and corrosion. Maintenance can take place at the wash siding, instead of the paint shop.





# PARKING LOT.

And, because of the remarkable strength-to-weight ratio of nickel stainless, each new car is about 3,000 pounds *lighter* than if it had been built with ordinary steel. Which means quicker acceleration and braking, plus savings in power costs estimated at \$2,700,000 for the fleet over a 35-year lifespan.

Just as our metal is a helper, one that improves the performance of other metals, so International Nickel is a helper.

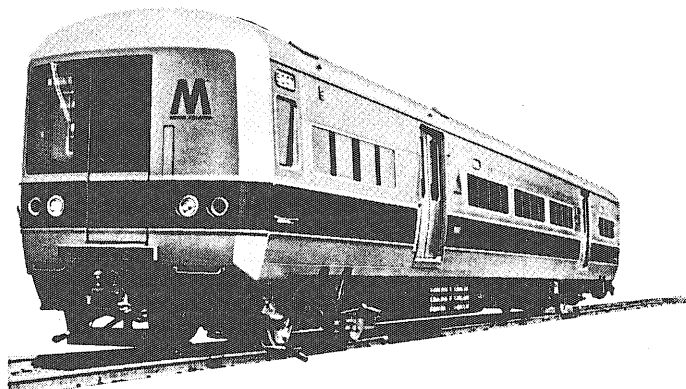
We assist dozens of different industries all over the world in the use of metals. We offer technical information. And the benefit of our experience. Often, Inco metallurgists are actually able to anticipate alloys that will be needed in the future, and to set about creating them.

This kind of helpfulness, we figure, will encourage our customers to keep coming back to us.

And that helps all around.

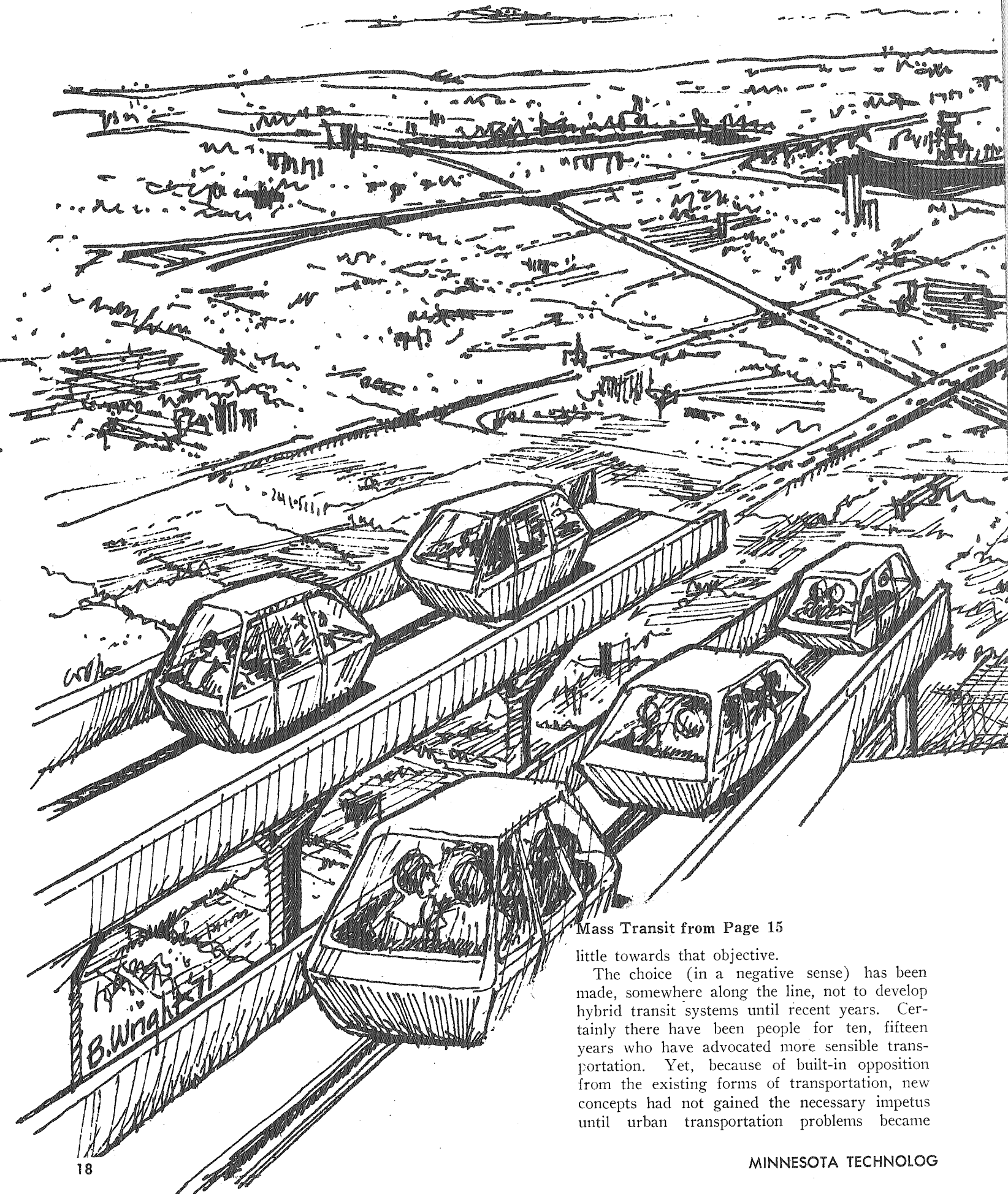
The International Nickel Company, Inc., New York,

N.Y. The International Nickel Company of Canada, Limited, Toronto. International Nickel Limited, London, England.



New "Metropolitan" car of nickel stainless steel.

## INTERNATIONAL NICKEL HELPS

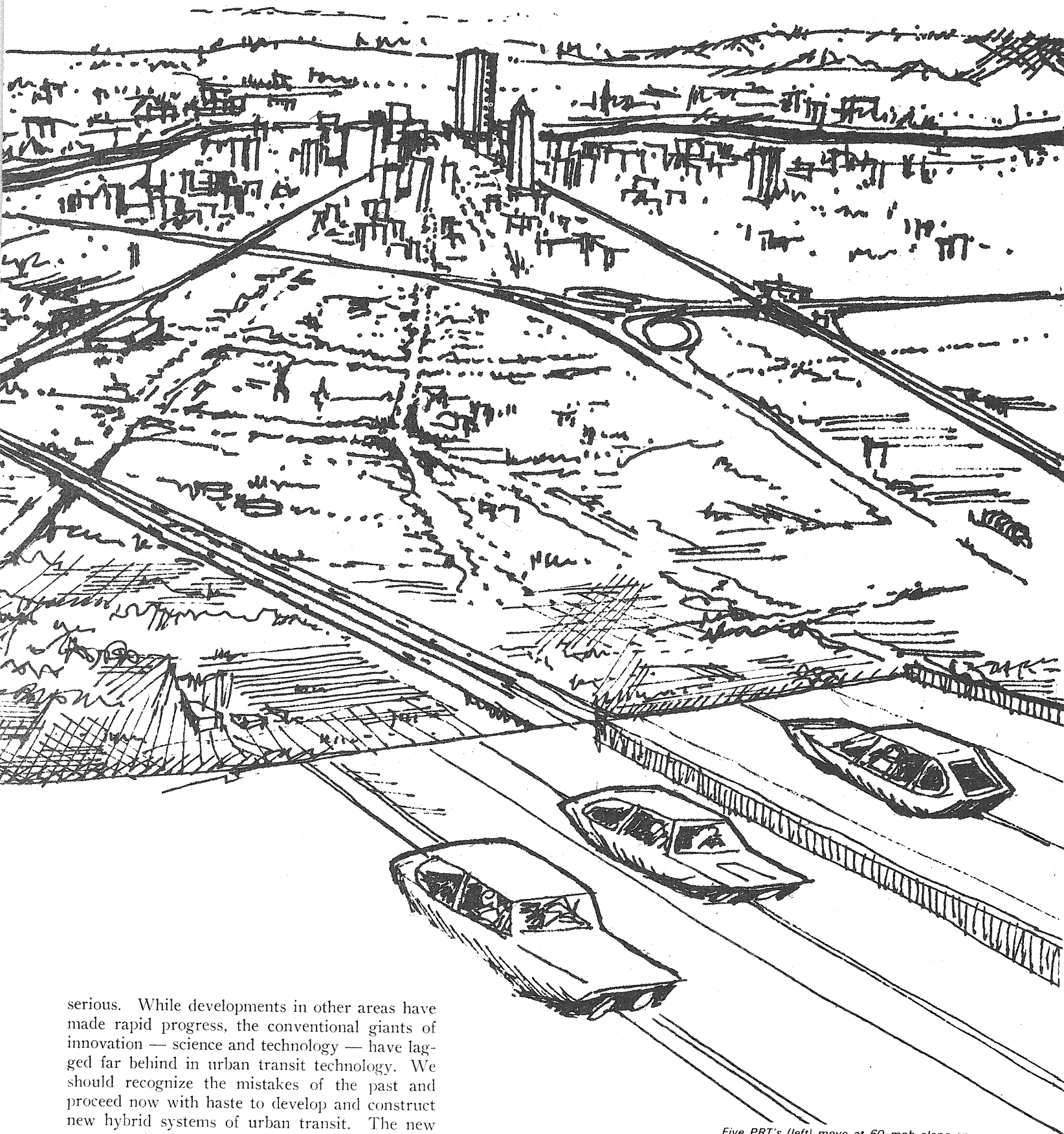


Mass Transit from Page 15

little towards that objective.

The choice (in a negative sense) has been made, somewhere along the line, not to develop hybrid transit systems until recent years. Certainly there have been people for ten, fifteen years who have advocated more sensible transportation. Yet, because of built-in opposition from the existing forms of transportation, new concepts had not gained the necessary impetus until urban transportation problems became





serious. While developments in other areas have made rapid progress, the conventional giants of innovation — science and technology — have lagged far behind in urban transit technology. We should recognize the mistakes of the past and proceed now with haste to develop and construct new hybrid systems of urban transit. The new systems offer an improved mobility (including for those who are now the transportation-poor) at a lower environmental and social cost.

Continued on Page 28

Five PRT's (left) move at 60 mph along an elevated track. Passengers under the glass tops enjoy the scenery and a "hands-off" ride. Above, cruisers streak along freeways at 100 mph. Able to link with fixed rail systems, these vehicles can detach and use conventional roads.

# WHAT'S NEW

## STOLed Traffic

Plans for a very large commuter airplane — big enough to hold nearly as many passengers as most Boeing 747's, yet able to land on runways in downtown Manhattan — are being considered.

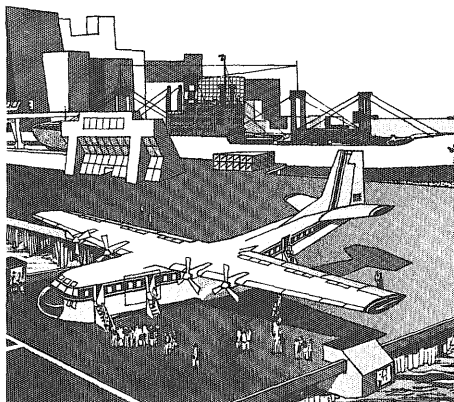
One such airplane could ferry almost 1000 suburban workers to their city jobs in a single rush-hour period.

A STOL (short take-off and landing) craft, it would be powered by four 6,100-horsepower Rolls Royce turbo-prop engines with propellers almost 18 feet in diameter. A flying model is now under construction.

The plane would take off in 500 feet — only a little more than three times its length. Runways to accommodate it could be built over waterfront piers adjacent to Manhattan's financial district or along the Hudson between 23rd and 42nd Streets.

Suburban runways might be located above railroad terminals or atop parking facilities.

The plane would be wider, but shorter and smaller, than the jumbo jet. And its interior walls would be



more nearly straight, since the shape of its cross-section would be rectangular rather than round. This shape can offer more seats — or carry more cargo — by filling in the corners of the plane. There's no need for a cylindrical fuselage, because the plane won't fly high enough to need pressurization. The rectangular fuselage also allows the floor of the cabin to be very close to the ground — only four and a half feet high.

The key to the new design's STOL capacity is its huge wing — 201 feet

# “The Upper Midwest grows on us”



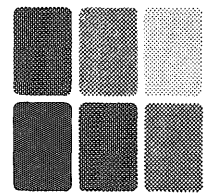
During the last ten years the population of this great land NSP serves grew by close to 21%.

The Dakotas, Minnesota and Wisconsin also rank high nationally in terms of economic growth.

It's a great place to live and work.

And we at NSP are dedicated to keeping it that way . . . and at the same time fulfilling our responsibility to supply your power needs.

## NSP



*a brighter life for you*

like gunk which is left is mixed with fuel oil and soon turns into a poly-wax fuel which is used to fire the mill's steam boilers.

Riverside's new Polysolv plant is indeed an innovation in recycling. It has upgraded the original use intended for the fibers it uses; it does not simply take high-grade waste paper and recycle it. It is a closed system and causes no air or water pollution.

Riverside and the many other paper mills, turning out recycled paper which contains from a small percentage to 100 per cent reclaimed fiber, all began recycling as an economic imperative. Recycling has since become an ecological imperative.

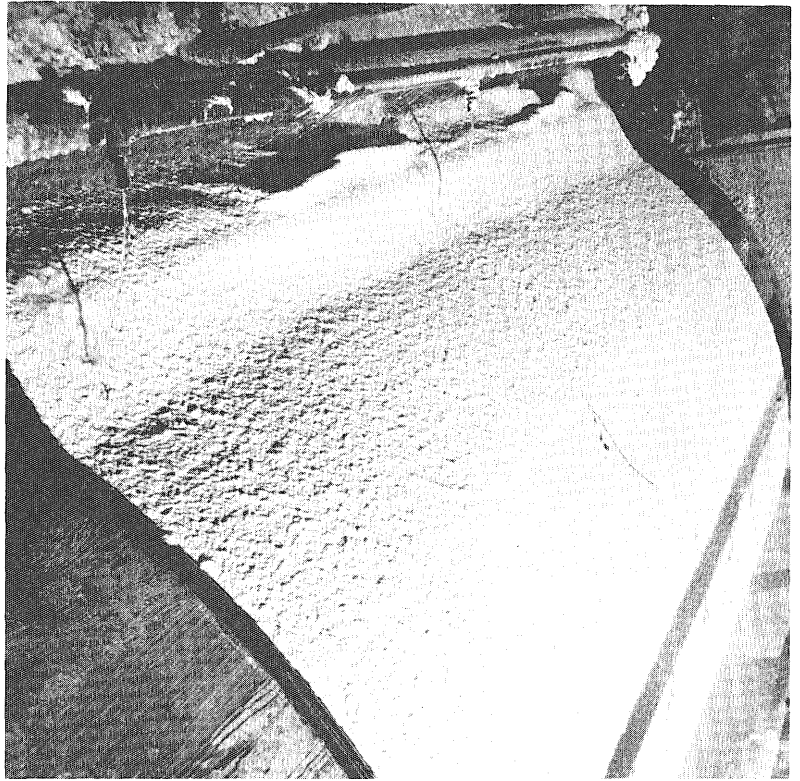
This is not meant to slight the small mills which own no timberlands, particularly those whose end product is a 100 per cent recycled product.

It's important to know that a ton of waste paper has a wood fiber content equivalent to that of 17 pulpwood trees. It's important to know that recycling can put these original trees to work again and again.

But when the tree people negate this truth, they have a valid point. They are the people representing the giants of the paper industry, the big integrated pulp and paper mills owned by corporations that also own huge tracts of forest land.

They claim that their operations do not deplete natural resources because their forests are skillfully managed.

That may be so, but they do not appear to be swayed by the ever-growing matter of pollution. It does not appear that they even take notice of the smothering amount



*Clean fibers are washed to remove any remaining solvent and spread on a screen for drying.*

*Photo's courtesy of Riverside Paper Co.*

**S O S**

An opening for  
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**ME COMMITTEES**

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WANTED:

M.S. Candidates PhD Candidates  
Upper Division  
Lower Division and  
Undergraduates

**Institute of  
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Grievance Comm.**

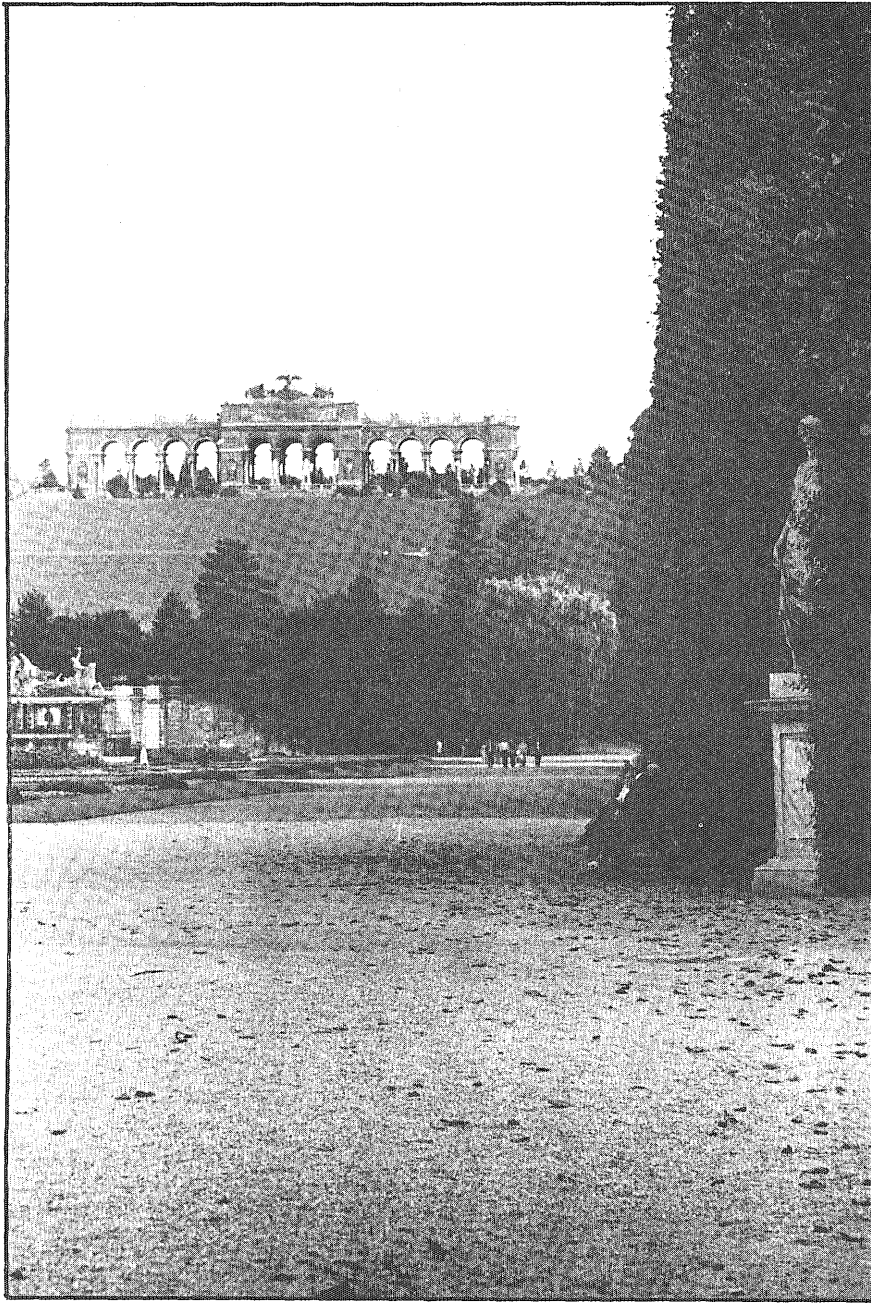
Students needed for  
ad hoc committees  
throughout the year.

**Tech Commission**

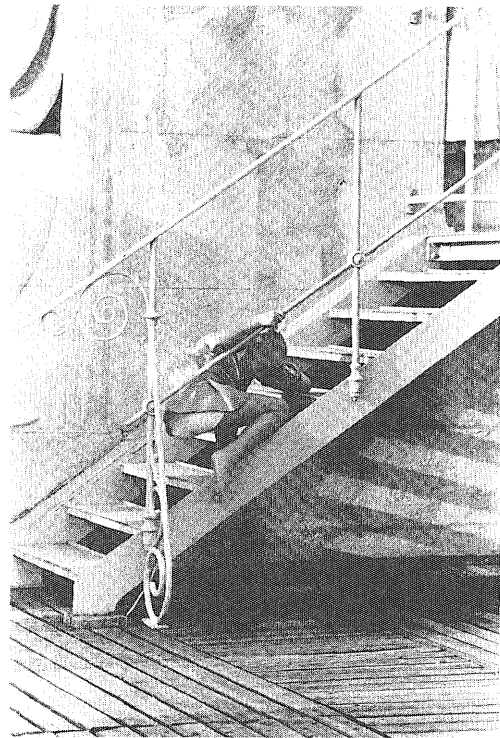
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Committees for  
Grads and Possibly  
Undergrads  
**CHEMISTRY DEPT.  
GRAD STUDENTS FOR  
DEPARTMENTAL  
COMMITTEES**



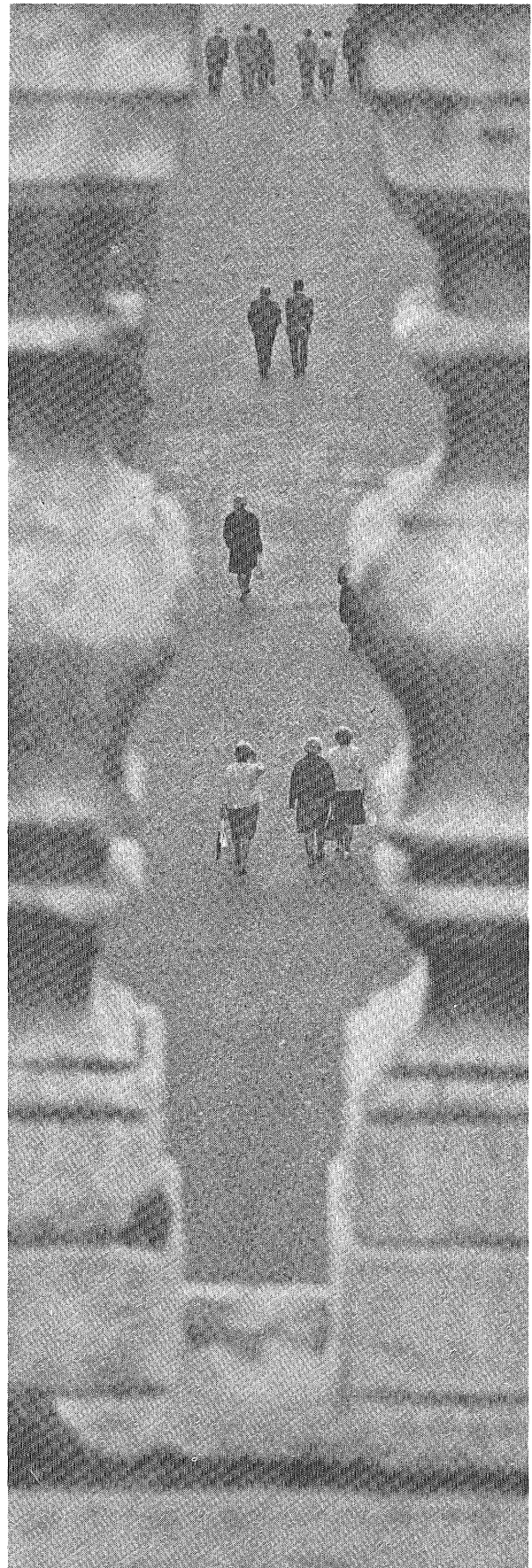
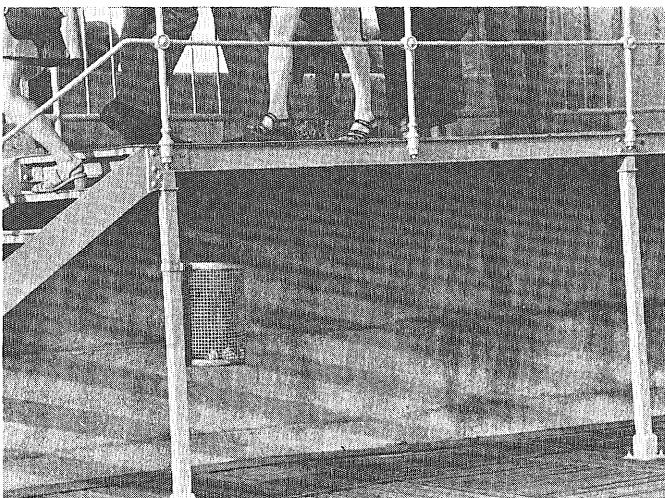
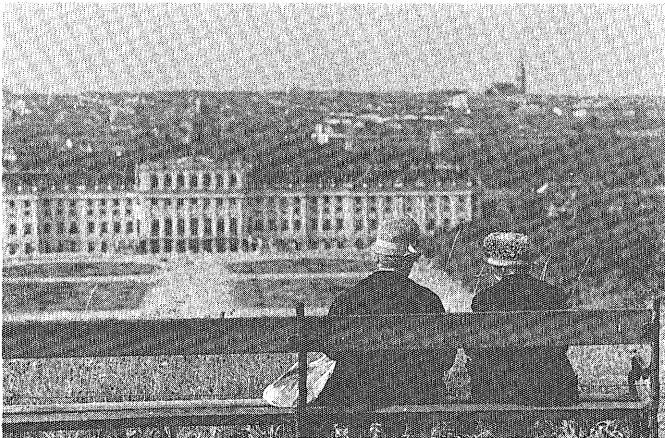


# Sunday at



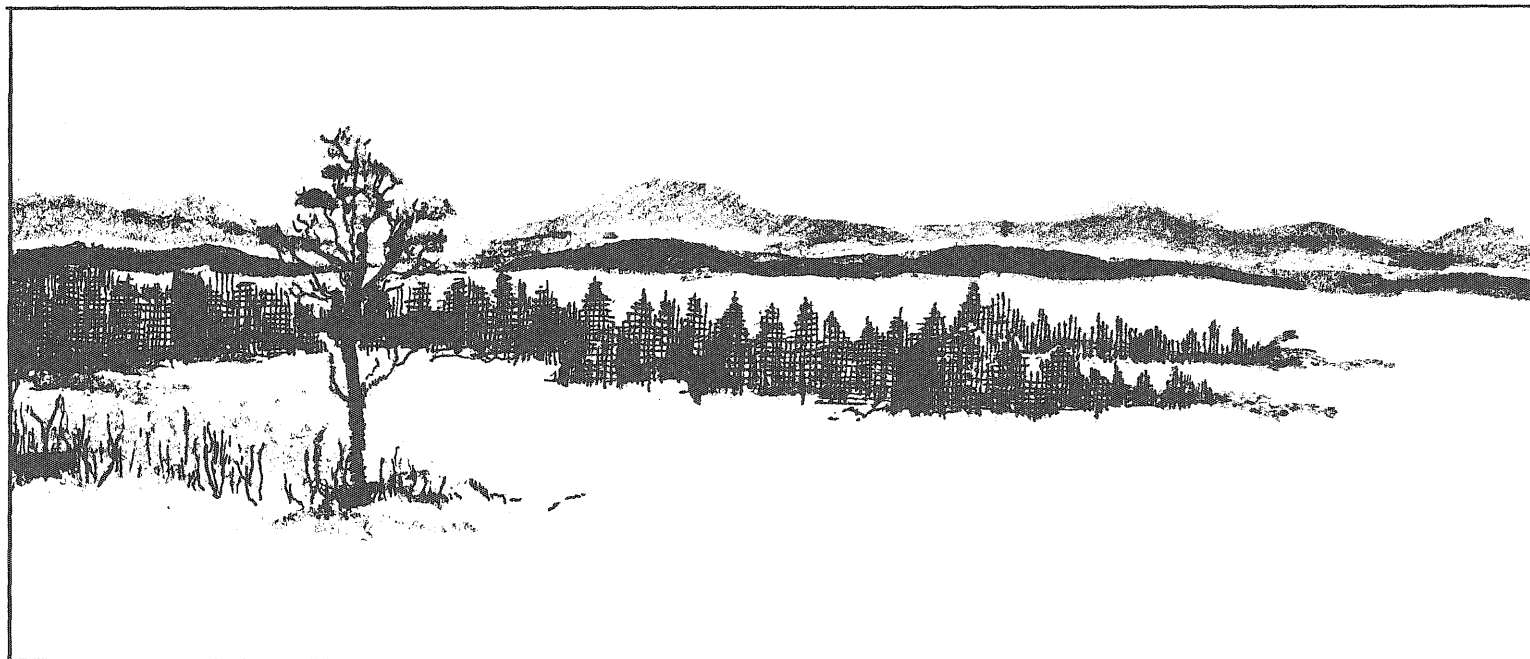
Next time you're in Vienna, hustling and bustling through museums, shopping, cathedrals, beer and wine gardens, take an afternoon off to visit the Schönbrunn Palace and b-r-e-a-t-h-e.

# Schönbrunn



# Ski Touring

## An Escape to the Open Air



by Bill Loye

Some people call it cross-country skiing. Some people call it touring. Some people use it as a means of getting and staying in shape. Some people use it as transportation to and from school. Some people use it as a backwoods means of escape. No matter what you call it, or how you use it, cross-country touring has become the nation's biggest winter fad, even bigger than regular skiing.

Perhaps it has grown faster because of its advantages. You can cross-country ski anywhere there is snow. You don't need a lift. You can go alone or with friends. You can use it as transportation or a muscle builder. Cross-country skiing is not a difficult art to master. It's a lot like walking only faster.

Perhaps it's popular because of the price. The best skis can be had for around \$45. Good skis cost around \$30. If you're a shopper, you can get cross-country skis at an army surplus for between \$10 and \$20. Bindings

will run about \$8. The best boots may cost \$30, but if you look you can pick them up for a lot cheaper, perhaps for as low as \$5. Poles will cost you around \$5. All in all, for as low as \$30 (or as much as \$100) you can be a cross-country skier. You can make your own trails, get into nature. You won't even need to buy a lift ticket. Just pack a lunch and spend the day exploring.

The technique is easy . . . sort of. Think of yourself as you would be ice skating, gliding. Try to keep your skis parallel and your knees well bent. Now slide one leg forward and keep your weight on that foot. After gliding a little ways, begin to straighten your body and at the same time slide the foot that was in the back, forward. When your back foot passes the foot that was in the front, shift your weight to it. You want to keep your weight on the forward ski.

In cross-country skiing you want to develop a graceful gliding motion. This way your momentum is not wasted and you get the most out of each step. You want to keep your poles relatively near your body; do not stretch out. This will not only tire your arms but it will also



absorb your momentum and you will require more steps to go the same distance you would otherwise go with proper pole plants. You want to use the poles for both balance and for push.

Though cross-country touring may seem to be more demanding on muscles it really isn't. You will most likely experience most of your problems with your breathing. You will experience the old pain in the side and shortness of breath: symptoms you would experience with long distance running. These problems usually occur from improper breathing. It is easier to breath in, than to breath out, consequently you will end up with a little CO<sub>2</sub> (carbon dioxide) after each breath. This CO<sub>2</sub> builds up and will take up space that is needed for pure oxygen. There are two methods of breathing that can cure this problem.

birch separated by the air. It's light, but don't breath on it or it will break.

If you are new to the sport, and don't plan to go from Minneapolis to Utah and back, I would suggest a solid hickory ski. These cost the least and are the toughest of all of the cross-country skis available.

The bindings are simple. They hold the front of your boot to the ski. Not the back, just the front. This is so you can "run" with your heel free to move up and down (as in normal running). The boots you will use are thin, but warm. They may remind you of your first pair of tennis shoes. Very rubbery yet warm. They must be light and flexible so that the bending of your foot is not hindered. Almost all sizes of skis (supplied with bindings, usually) and boots are available at army surplus stores. If you are not real rich, but would still like



One method is the rapid grunt. Though it may sound obscene, it really isn't. With the rapid grunt method you push out the air in your lungs, causing a grunting sound. Though this method is effective, it is not much fun, for it tires you out quickly. The other method is more controlled breathing. You should try to take two or three steps while inhaling, and exhale slowly over the span of five or six steps. This way you will clear out all the CO<sub>2</sub> and eventually this method will become second nature to you. Establish a rhythmic breathing pattern with a rhythmic skiing pattern and you will find you can go on almost indefinitely.

Cross-country skis are light, thin skis. They can be made of solid hickory (heavy), beechwood (medium) or birch (light). The hickory is the strongest ski but the heaviest. Though the birch ski is the lightest, it is the easiest to break. To solve this problem the skis are laminated with layers of one wood on top of the other, giving the strength of hickory, the weight of birch. A ski may contain as many as sixty laminations. The racer may even have a ski which is made up of sixty layers of

to try this sport, check out the navy surplus stores.

A few tips for your new found sport. Clothing: a sweat suit is fine. You will find that with all your muscles in motion, you won't be getting cold. When you go up hills, sit back and center your weight over the center of the skis, this will keep you from sliding down.

Sometime you may find yourself going down a hill with a little more speed than you want. If you can't snow plow, stop, then place both ski poles between your legs (baskets behind you digging into the snow) and sit gently on the poles. If it doesn't kill you, it will slow you down. If you are having a hard time with your rhythm it is probably because you are more worried about kicking your leg forward. This will cause a jerky stride, and be tiring and inefficient. Concentrate more on driving your back leg forward and it will come to you.

Cross-country skiing can be effectively used to combat the blahs, just by getting out and relaxing. There are two main things to remember, relax and rhythm. If you get these down, well, see you in Utah. ■

# SOBOTS

## Continuing Adventures of Rhube & Co.

As you may well know, Rhube & Co. like to travel (sometimes we have to, to avoid unpleasant . . . ah . . . incidents.) One of our more exciting adventures was our trip to Canada. Pete and I were sitting around tuning our G-strings and getting pretty bored when we decided to go. This was the Sunday before "Welcome Week" (you know, that's when everyone caters to the freshmen). We threw some clothes, 3 jars of pickles, and a whole flock of credit cards in a tent trailer, and headed north in search of fresh air, freedom, and a place to hide from Pete's girl friend's older sister. (She kept saying things like, "Marriage is a great institution", or "Won't you come to the church and meet our minister? He's good at weddings.") Besides, if the chick won't truck with 'ya, drop her.

I don't say that the trip up was pretty dull (except where we almost killed a guy in a blue Mustang) until we stopped in Little Spoon to have lunch. I didn't know it, but everyone in that town is related to Pete. Now, I'll be the first to admit that I'm not that good lookin' (Pete'll be the second, and everyone else will agree, except maybe my mom) but Pete's not much (any) better. All the people in town kept saying things like "Didja' see 'im? Good 'ol Pete's in town and he brought some Commie-Pinko-hippy freak with 'im." We went to Grandma Pete's for lunch. Peter had a seven course meal and Grandma gave me an old soup bone and a pan of water.

The ride to the border took only another ½ hour where we had to pass through customs. Entering Canada was no real problem except for the pay bridge. This has got to be the most expensive 50 yards ever traveled. We paid our five dollars and somehow managed to jockey the car and trailer across a bridge that was half a foot narrower than the car. Once in Canada we stopped at a trading post for food. Pete picked out some "ground beef" and I bought the latest "Playboy" (the one with the

twins in it). The hamburger "looked" okay, and it wasn't until three days later that we discovered it was 30% oatmeal, 15% sawdust and the rest was meat (of sorts). The owner of the place said the bill came to two beaver skins and half a fox tail. As luck would have it, we'd just used our last beaver skin at the customs office. Well, she (the owner) would'nt take cash unless we could furnish proper identification, so we used credit cards. We arrived at our campsite in Sioux Narrows.

Sioux Narrows was an ideal campsite for us (no one for miles) and we soon grew to love it. In true style (Rhube & Co. style, that is) we got into trouble just ten minutes after we got there. I knew nothing about setting up tent trailers (and Craig knows nothing about anything) so we had to use our ingenuity to solve this dilemma. Only fifteen minutes had passed before we had it up (or should I say sideways). But after finding the top of the instructions and doing it right (which took us another three hours) we decided it was about time to relieve our . . . oh . . . pressures. It only took us a jiffy to find the little brown shack (a jiffy was all we had). But . . . I feel it my patriotic duty to inform anyone who goes to Canada to watch out for sabotage. It seems that the Canadians, although claiming to be our friends are really trying to demoralize us unsuspectedly. For all of you who are planning a trip to Canada in the near future (for 1 reason or A nother!) I will outline the Canadian plan. First they open the great and glorious National parks for the enjoyment of all Canadians. With this type of recreation, Canadians flock to the parks with picnic lunches. This tends to lead to certain bodily functions that are relieved in the little brown shacks, which quickly fills up. Now nobody likes a filled up little brown shack, right? Wrong! Canada loves them, because they are the basic part of their plan (remember the plan? if so read on, if not go to the joke page — it's much funnier). Now the Canadians remove the above ground portion of the little brown shack (and we all know what that leaves!). They move the above ground portion exactly six feet backwards (just about the width of a car) and they build a nice road in front of the new little brown shack. Now do you know what we have? We have the

by Rhube & Co.

basic ingredients of the Canadian pit trap (or crap trap). The only other ingredients are three inches of rain, one bombed out brown Chevy, and two idiots, one of which has to use the little brown shack. It took about 3.713562 seconds for our car to sink out of sight in the . . . ah . . . er . . . that is, the . . . ah . . . crud. Totally dejected and without any way of getting back to the U.S.A., we are now sitting around the old campfire whistling dirty songs, eating Canadian hamburger, very carefully using the little brown shack, (remembering to pour three quarts of oil on the six feet of road in front in memorial tribute of a fifty brown bombed out Chevy), and letting our hairs grow. The last point is of great importance because this is our ticket home. We figured (for two days) that if we got real grubby looking (or shall we say grubbier) we will get deported as undesirable. So don't give up hope, Rhube & Co. will be back folks, this isn't the end, just a little setback. Besides we have to be back to get all our Christmas presents (in Pete's case, maybe wedding presents).



... AND BE PARTICLER!

**From the 'ol Country**

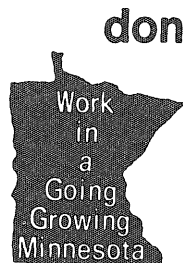
Speaking of Christmas, contrary to popular opinion, Lars is not dead! In case you're not familiar with him, he's Craig's first cousin, twice removed (deported) on his father's side, from the "ol' country." The following is an exclusive interview with Lars as he tells of his alleged murder. "It vas da nite dat Helga's ship came in. I vas yust gettin' ta sleep wen I heard a moise in da shicken coop. It vas late and I yust had on my nite-shirt. I took my shootin' gun and Roover and vent out to investigate. Vell, I yust puit my head in da shicken coop ven Roover puit his nose on my . . . oh . . . self. Da shootin' gun vent off and ve vere plukin' shickens for days. I knew Helga would be a bit upset, so Roover and I took off to Canada to hide. Tings vere yust dandy, 'til Craig found me and da authorities are now sending me back to Helga."

The Log's Staph, Ole and Lars, and Ace and Zeus would like to join Rhube & Co. in wishing all of you a Merry Christmas and a Happy and Peaceful New Year. ■

One of the real contributions we make to the industrial complex of this world is filtration — primarily for engine air intake systems. Particle technology is an advanced science with us at the Donaldson Company, Inc. . . . talk to any of our old pros!

Clean air is a way of life with us — both in our work and in our living . . . possibly you could find a better place to live, but we do know why we're tops. Explore this fabulous country with us and you'll know too. Every conceivable element of gracious living is here for you to enjoy. All the rewarding contributions that a satisfying association can offer will be yours as well, where a sophisticated group of talented senior professionals are anxious to interchange their knowledgeable experience with your fresh ideas . . . which we desperately need!

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## Cartons From Page 21

of waste paper that is incinerated and/or bulldozed into landfill operations. Of all the paper produced in the United States each year, only about 20 percent is made from waste paper.

As more paper is made from waste paper, less will be burned or buried. It's as simple as that.

But what is the American consumer, increasingly conscious of his environment as he may be, doing to force the paper industry to produce more than a mere 20 percent of its total output as recycled paper? Too little, is the only answer that can be given truthfully.

"I am concerned," he says, but when confronted by the fact that recycling is still in its infancy technologically, he changes his tune. "Recycled paper costs more," he says. "I can't afford it."

He might as well say that he is concerned, but not very much so. He would apparently rather spend a little bit less and let somebody else worry about supporting the recycling efforts.

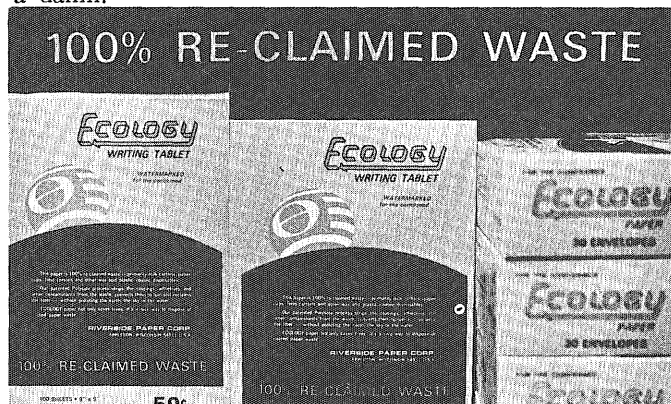
A good "for instance" can be shown here at the University. Riverside's Ecology paper, a 100 percent recycled paper, was placed on sale in four bookstores (Main Engineering, Nicholson, Harold D. Smith on the West Bank, and Coffey in St. Paul) in August, shortly after it came on the market.

James L. Duffy, director of University Bookstores, described the response to Ecology paper as "not too exciting." "Students have been interested in it," he said, "but not overwhelmingly so."

Duffy's comments are a masterpiece of understatement. In the four bookstores, 624 notebooks containing 100 percent recycled paper were placed on sale. These notebooks contain 80 sheets of paper and cost 79 cents, while virgin-fiber notebooks of the same size cost only 50 cents. During a period of time in which roughly 43,000 students were getting ready to begin a new school year, 245 of those notebooks were sold.

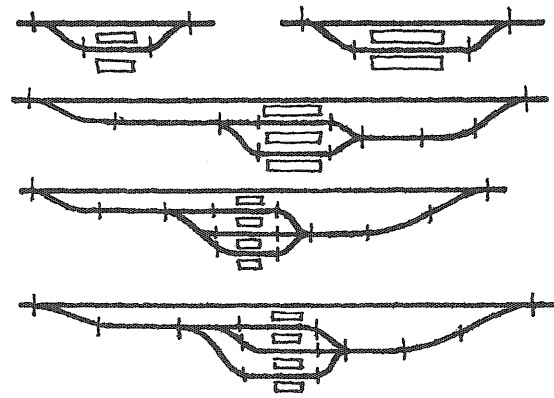
So who knows or cares about recycling, or even that recycled paper is available? In an informal campus survey, only 34 percent of the 50 people questioned had noticed that recycled paper is sold in University bookstores.

Maybe it is the bookstores' fault for not letting people know. Or maybe it is because people just don't give a damn.



Next time taxes go up, and one of the reasons given is the mounting cost of solid waste disposal, remember that a truckload of city trash contains about the same amount of recyclable cellulose fiber as a pulpwood tree. It could be hauled away and burned or buried. It *could* be recycled. ■

## Mass Transit From Page 19



Alternative cab stop layout; dimensions determined by capacity required, number of cabs to each platform, acceleration and merging.

Most promising of the new urban transit technology is the generic set of systems termed Personal Rapid Transit (PRT). Several features are fundamental to the PRT concept and are therefore common to all the PRT systems now proposed or under development. These features are: 1) fixed-guideways which have fixed track, rail, or smooth bed routes equipped with some guidance device, 2) stations (the only points where vehicles stop) which are off the main line on by-pass guideway sections, 3) small vehicles which hold only four to six passengers, and 4) automatic control allowing vehicles to travel at comparatively high speeds with close spacing between vehicles. Vehicles are merged from various stations by automatic control. Route selection and vehicle dispatching are assisted by system computers. (The safety and reliability of this PRT service, made available on a 24 hour basis, are increased with automatic control.) Automation also reduces the cost of operation to an acceptable level.

Now examine the potential of a transit system with the above mentioned characteristics. The fixed-guideway is an exclusive path for the vehicles of this system only. These vehicles would be captive on the guideway, or could be designed to operate both on the guideway and on normal streets. A dual system would operate in the same manner as the completely captive system except that the dual vehicles could enter or leave at certain regulated points along the guideway. An exclusive guideway insures constant traffic flow. Combined with the off-line station concept and methodical operation, these guideways would be able to transport many passengers.

The off-line station is analogous to urban freeway exit and entrance ramps. On a true freeway, no stops can be made on the through lanes. When a vehicle nears its destination, it leaves traffic by a special lane and stops where it will not interrupt vehicles following it. The same concept can be used in the design of a transit system if the vehicles are small and light enough to switch from the through guideway into the station at fixed speeds. Switching techniques vary a great deal, but with all other factors con-

sidered, it appears that vehicles would have to be designed for four to six passengers to allow switching at about 50 mph.

There are several corollary advantages to off-line stations. First of all, most trips could be non-stop. Conventional transit with large vehicles subjects the rider to frequent stops unrelated to his own needs. Secondly, the average line speed is almost independent of station spacing along the guideway. Frequent stops in an "on-line transit system" result in a low average speed for the vehicle. With a given comfort limit to acceleration and deceleration, and a specified stopping time in the station, the station spacing/average speed relation for an **off-line** station system can be easily obtained if the peak speed is known. Thirdly, with off-line stations the service can be demand-activated. With no large vehicles or regular stops, there is no need for schedules — the PRT vehicle is called in from the main line when the user presses a button registering his desired destination.

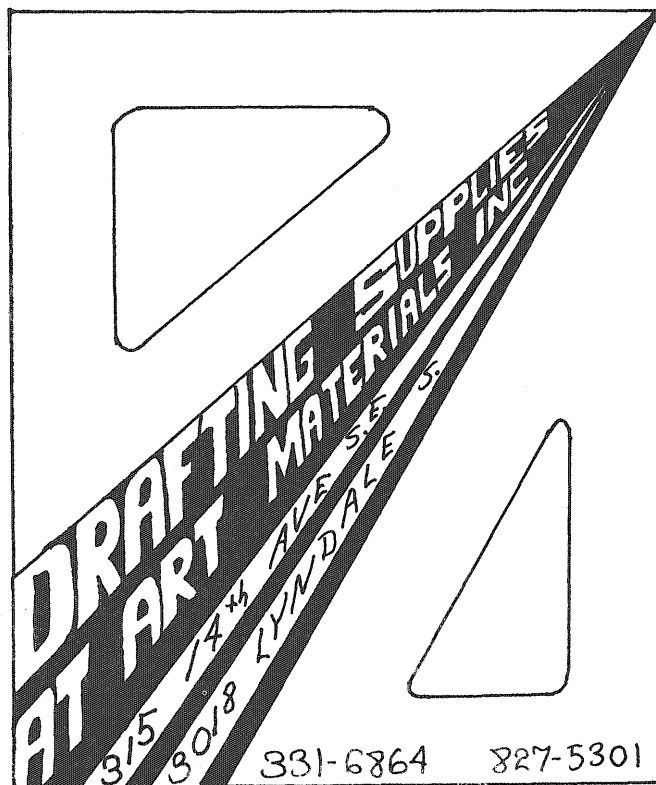
The small vehicle has distinct advantages in addition to its convenience in switching; it also would provide a friendly atmosphere. Passengers could ride by themselves or with acquaintances and every one would have a comfortable seat. It is often asked how a system of auto-sized vehicles can meet urban travel needs better than the existing auto-highway system. Conversely stated, how does a small vehicle PRT system compare with the capacity of a rail or bus system? The key is automatic control. The position of vehicles is followed by sensors in the guideway, sometimes called "speed-and-spacing" control. The system will control the propulsion means to provide properly timed acceleration and braking. With such automated operation the vehicles could travel at two-second spacings at a speed of 50 mph. If each vehicle holds four passengers, the line capacity is 50,000 people/hr. — more than is needed in the Twin Cities metropolitan area. Transportation planning must determine the capacity needed in future vehicles. PRT has the advantage of being much less disruptive to the urban community, so a finer network of lines can be built. Also PRT costs less per mile of line, which would allow more miles of line to be built.

Thus far we have discussed only the most fundamental concepts which define PRT. In simple terms, PRT is like a horizontal elevator except that no intermediate stops are made because a vehicle carries all passengers to the same destination. Using the system is no more difficult than using an elevator. There are many other features of PRT systems in addition to the fundamental concepts. Personal security in stations could be provided by various surveillance methods and emergency communications. If there were any problems, e.g., a person forcing entry into another's vehicle at a station, a "panic" button inside the vehicle would immediately route it to the nearest police station. The intruder

would have no way of escaping the vehicle, and would have to answer for his actions to policemen waiting at the next stop.

The reliability of these vehicles is also the source of many questions. What if a mechanical failure should disable a vehicle? First of all, such failures would be rare because vehicles would be constantly inspected and a schedule for parts replacement would be based on reliability testing. The techniques for maintaining reliable service have been well developed in the aerospace industry and this industry provides ideas in solving many of the problems in designing PRT systems. In fact, the aerospace technology is the foundation for PRT. In the event a failure did occur, the following vehicle would sense the deceleration and react accordingly. Even with a brick-wall stop, the following vehicle would collide at a greatly reduced velocity and the second following vehicle would "collide" at zero velocity. Accommodation for a failure in the system would be redundant. The system computer would also close off that branch of the network and route vehicles through adjacent branches, much in the same way as it chooses optimum time routes through the network in normal operation.

The various suspension and propulsion schemes will not be covered in this article because my focus is the importance of the PRT concept in the urban future. The hardware considerations of PRT offer some fascinating engineering challenges, but are completely within the abilities of current technology. The prerequisite is a strong interest on the part of the public and the appropriate government agencies. After all, who ever thought we could land on the moon? ■



# SPLITTERS

FELLOW: "Ya know something honey? I'm going to call you jello from now on because you're so easy to make."

GIRL: "That's all right dear. From now on I'll call you oatmeal because you're done in two minutes."

\* \* \*

The M.E. professor was lecturing to his 8:00 o'clock class on the virtues of wide awake. "I have found that the best way to start a day is to exercise for ten minutes after rising, breathe deeply, and finish with an ice cold shower. Then I feel rosy all over."

Just then a sleepy voice from the back of the room was heard to mutter, "Tell us More about Rosy."

\* \* \*

QUESTION: If a light sleeper sleeps with a light on, does a hard sleeper sleep with a light off?

\* \* \*

During a recent expedition into the deepest part of darkest Africa, a group of explorers came upon a village of savage natives. In an attempt to make friends the leader of the explorers started telling the natives about the civilized world.

"Out there," he said, "we love our fellow man". To this the natives gave a ringing cry of "Huzzanga!"

Encouraged by this, the explorer continued, "We treat our fellow man as we would want them to treat us."

"Huzzanga!" exclaimed the natives, with much enthusiasm.

"Our world is peaceful!" said the explorer. "Huzzanga!" cried the natives.

With a tear running down his cheek, the explorer ended his fine speech: "We have come to you as friends and brothers. So trust us. Open your arms to us, your houses, and above all your hearts. What do you say?"

The ground rumbled with one long, powerful "HUZZANGA!"

Extremely pleased with the reception, the leader of the explorers then began talking with the chief of the village. "I see that you have some unusual cattle here," he said. "They are species with which I am unfamiliar. May I inspect them?"

"Of course," replied the chief, "come this way, but be careful not to step in the huzzanga."

\* \* \*

"Hey Mack, what are you putting in your vest pocket?"

"A stick of dynamite. Everytime O'Maley sees me, he smack's me on the chest, and smashes my cigarettes. The next time he tries it, he'll blow his goddamn arm off."

\* \* \*

FACT: Most college campuses are so crowded that in order for a student to be alone he has to go to class.

\* \* \*

A city slicker bought a farm with the intention of raising pigs. His farm was just three miles from the farm with the county champion pigs, seven miles from the farm with the state champion pigs, and fifteen miles from the farm with the national champion pigs. After settling down, he put his only sow in a wheelbarrow, walked three miles to the county champion pigs, had her bred, and walked home. The next morning he awoke, but to his disappointment he found no little pigs. So he proceeded to put the sow back into the wheelbarrow, took her seven miles to the state champion pigs, had her bred and walked back. The next morning he awoke, but again found no piglets. He once more put the sow in the wheelbarrow and walked fifteen miles to the national champion pig farm, had her bred and walked home. The next morning he awoke and asked his wife, "Honey, do you see any little piglets out there in the yard?"

"No dear," she replied, looking out the window, "but that old sow is back in the wheelbarrow again."

\* \* \*

LECTURER: If I talk too long its because I misplaced my watch and there's no clock in this room. Please bear with me.

VOICE FROM THE BACK OF THE ROOM: "There's a calander behind you!"

\* \* \*

**Harry E. Adams, Assoc.**

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ST. PAUL, MINNESOTA 55113

by Greg Smetana & Kris Kampf



## What's New From Page 20

in span and nearly 40 feet wide at the base.

The plane could also operate as a CTOL (conventional) craft, carrying more fuel for longer cross-country flights.

On a commuter schedule, it might make three round trips per rush hour transporting a total of 912 people. After the rush hour, the seats would be removed in half an hour in palletized units — 15 seats per pallet, riding on tracks inside the fuselage.

It would go the day's first load of cargo, and the plane would haul freight around the metropolitan area til 3:30 or 4:00 p.m., when it would be converted back into a passenger shuttle to serve the afternoon rush-hour traffic.

Still later, it could become a cargo plane again and work all night. The craft would be designed so that it need never sit idle on the ground except for maintenance.

The carrier would be 158 feet long, with a fuselage 21 feet wide and 14 feet high from belly to roof. Its maximum take-off weight is 195,000 pounds, and its payload is 64,000 pounds.

Although it would leave the ground in 500 feet, FAA requirements would stipulate a minimum runway length of 1800 feet — or about seven city blocks. (The plane itself would be just over three quarters of a block long.)

The plane is flexible in its basic design. Rather than plan a number of aircraft, one multipurpose design concept could be used with one fuselage to handle commuter transportation, and with another to carry intercity traffic.

### "Of sewage and fly ash"

A new technique using fly-ash, a major airpollutant, for purifying waste water and sewage has been announced.

Fly-ash makes up most of the solids in smoke from large furnaces, such as in power plants. When removed from stack gases, activated by treatment with acid and used with lime and small amounts of chemicals — called polyelectrolytes — it removes most of the pollutants of domestic or industrial sewage.

Speed and economy of treatment

are other advantages of the process. Within 30 minutes, raw effluent treated with fly-ash is as clear, and often as free of harmful bacteria, as distilled water. Working like activated carbon, the fly-ash — an essentially valueless by-product — is discarded after it is used to treat sewage. Carbon, however, is expensive, and needs to be recycled and used over, adding to costs.

The new process removes all phosphates from the waste waters, another important advantage, since phosphates may continue to cause major pollution of streams and lakes.

Phosphates, for which no substitute in detergents has been found, may be used in communities treating sewage by this process with the assurance that phosphates will not remain as a pollutant in the effluent. Instead they end up in the sludge as a bonus — of fertilizer value — if the sludge is used for organic agriculture.

This new separation process removes practically 100% of the suspended solids, also most of the dissolved organic pollutants, while destroying viruses and bacteria. Slight additional treatment gives 99+ per-

cent of the sewage water back in a sterile form for reuse.

Because of the short time sewage water is retained in the plant — a half hour, instead of ten to thirty hours as in many plants — the size and cost of equipment is relatively small, as is its cost of operation.

Since the process handles industrial wastes which destroy the bacteria required in conventional processing, it is adaptable to installation at industrial plants or in those places where a mixture of domestic and industrial sewage are handled.

### Poet's Corner

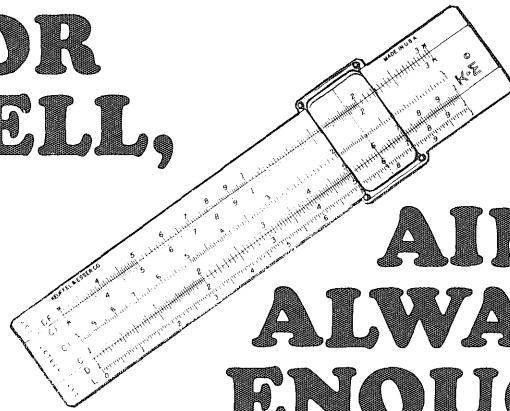
Sung to "Hark! The Herald  
Angels Sing"

"God;" we hear the editors scream,  
Copy's late for the magazine.  
Photo's blurred, the mag's not thick,  
And the jokes are always sick.  
Printer has reversed three pages,  
Color hasn't been right for ages,  
Yet through all this toil and murk,  
We all seem to do our work.

And with these things obscene,  
We turn out this magazine.

Courtesy Rhube & Co.

# FOR BELL,



# IT AIN'T ALWAYS ENOUGH\*

We're looking for engineers who don't wear their slide rule holders like holsters. They don't have to. Their non-technical abilities and interests pretty well match their technical ones. Like handling details. Or selling ideas. Or motivating people. They can have darn near any engineering degree. They *must* have a desire to get into management — quickly.

Sound like you? Check with us; we'll listen closely. It might be the best move either of us will make.

*The Bell System recruiting team will be visiting your campus*

**JANUARY 25, 26, 27.**

*Sign up in your placement office for an interview.*



**Northwestern Bell**  
an equal opportunity employer

\*But we sure don't knock it. Limited opportunities are available in Research and Development. Contact the Placement Office for specifics.

# NEXT MONTH

## **Power Consumption**

Life is threatened by the ever-increasing demand for energy.

## **Apollo 15**

An appraisal of the most ambitious moon landing.

## **Technolog Exposed**

A "behind the scenes" look at what goes into the Technolog.

## **A Night on the Campus**

A photo essay.

## **STORE HOURS**

**8:00 A.M. TO 4:30 P.M.**

**MONDAY THROUGH FRIDAY**

# **ENGINEER'S BOOKSTORE**

The ad shown below has told the public about a Kodak product intended to save people from a life of mental retardation.

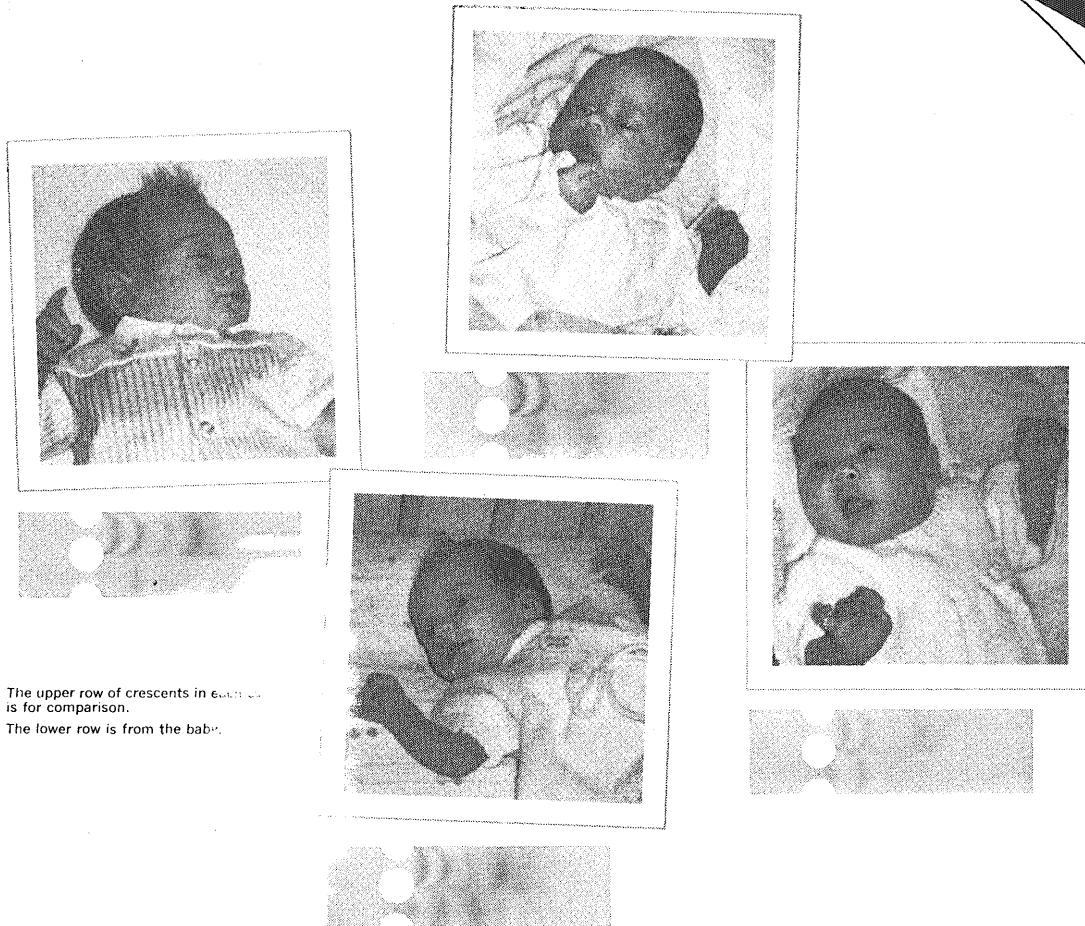
A young Kodak technical guy convinced us we ought to market that product.

Convincing us was not easy.

*Nobody who wants to do a little good in the world ever has an easy time of it, any place.*

EASTMAN KODAK COMPANY

Kodak



The upper row of crescents in each strip is for comparison. The lower row is from the baby.

### Baby pictures

Seen here as strips beneath the familiar kind of baby snapshots is a new kind, made from urine samples donated by these healthy new citizens. (A test of blood plasma is also desirable.) The strips tell about body chemistry. One out of many thousands of such patterns may turn up with a prominent crescent in the lower row at this particular point



Such is the hint that the infant's body is mishandling phenylalanine, a required substance that results from digestion of any natural protein food, like milk. If this continues, the child will probably suffer mental retardation.

Most states already require a test for this condition. If after the first weeks at home babies had an additional blood test

with one of these snapshots, chances would increase of detecting other such metabolic defects. Unrecognized and untreated, many of these also lead to retardation and other severe impairments.

Treatment consists of precise regulation of diet.

Kodak, long known for simple snapshots, also makes the material on which these simple non-photographic ones are taken. (Thin-layer chromatograms, they're called.) No camera, only a few plastic accessories.

The physician's time and insight are required only for the infant whose test falls outside the common range of variation—to decide on more detailed confirmation of abnormality and, if confirmed, on remedial measures.

Cute baby pictures are both priceless and remarkably inexpensive. So is this less cute, biochemical kind. Who ought to pay for it is an interesting question in ethics, politics, and economics. Here is one place where industry's ambitions for efficient production may encounter little opposition.



# HOW CAN A MICROBE HELP TURN GARBAGE INTO FOOD?

The petri dish at the bottom of the page holds a special strain of thermophilic microbes. What does it have to do with garbage?

The microbes digest cellulose. And cellulose is what nearly two-thirds of all municipal garbage and farm refuse are made of.

So the microbes can digest your garbage. But that's not all they can do. They can convert it into a high-protein substance that livestock will accept as food.

This strain of microbes was first isolated in a General Electric research lab a few years back.

Today, our engineers are working to design a pilot plant to make the waste-conversion

process work on a large scale.

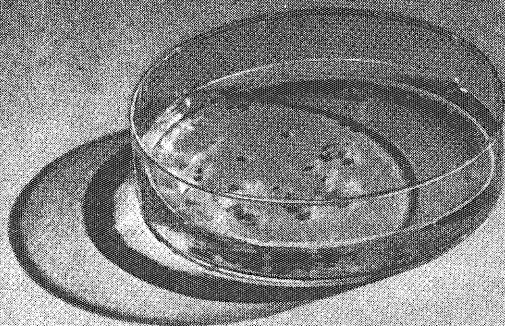
It's a technological innovation with a good chance of solving one of the biggest problems facing the country today. But, then, that's hardly surprising. Technology is one of the surest ways of solving social problems.

That's why, at General Electric, we judge innovations more by the impact they'll have on people's lives than by their sheer technical wizardry.

Maybe that's a standard you should apply to the work you'll be doing. Whether or not you ever work at General Electric.

Because, as our engineers will tell you, it's not so much what you do that counts. It's what it means.

GENERAL  ELECTRIC



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# TECHNOLOG

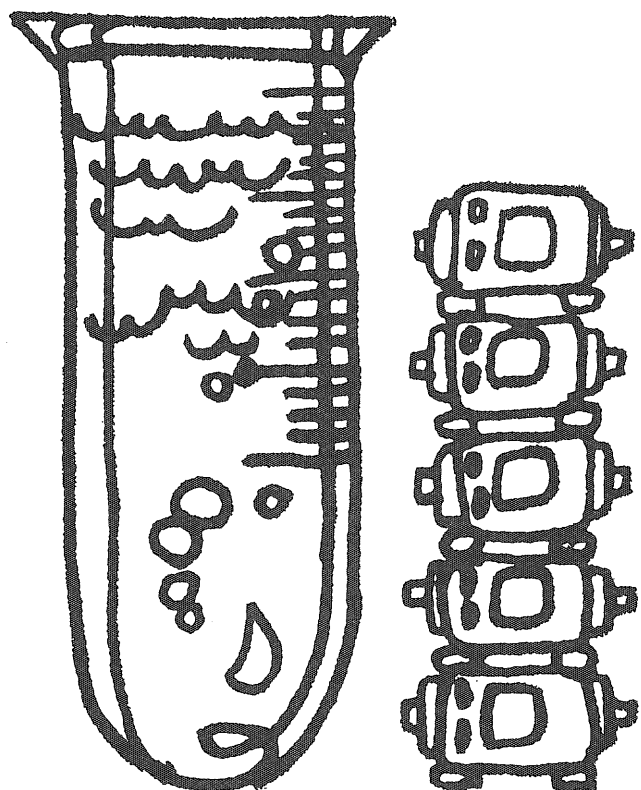
UNIVERSITY OF MINNESOTA JANUARY, 1972

**Name a major maker  
of equipment to clean up  
water pollution.**

**Then name a major  
contractor on water  
pollution plants.**

**Westinghouse.  
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**You bet we're hiring.**



If you can't wait for the recruiter,  
write today to George Garvey,  
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opportunity employer.

**You can be sure ... if it's  
Westinghouse**







Photo by Menken/Seltzer.

# Get to know the two of you before you become the three of you.

Get to know what you both really like.

What you both really want out of life.

Get to enjoy your freedom together until you both decide you want to let go of a little bit of it.

But make it your choice.

Research statistics show that more than half of all the pregnancies each year are accidental. Too many of them, to couples who thought they knew all about family planning methods.

Get to know how the two of you don't have to become the three of you.

Or the four of you. Or...

## **Planned Parenthood** Children by choice. Not chance.

For further information, write Planned Parenthood,  
Box 431, Radio City Station, New York, N.Y. 10019.

Planned Parenthood is a national, non-profit organization dedicated to providing information and effective means of family planning to all who want and need it.

advertising contributed for the public good



# energy

The energy to keep straining toward your chosen goal—and even as you attain it, look forward to the ones beyond.

The energy to explore, evaluate, create, bring needed changes.

Energy to burn, figuratively—that wealth possessed by the young, in mind no less than body.

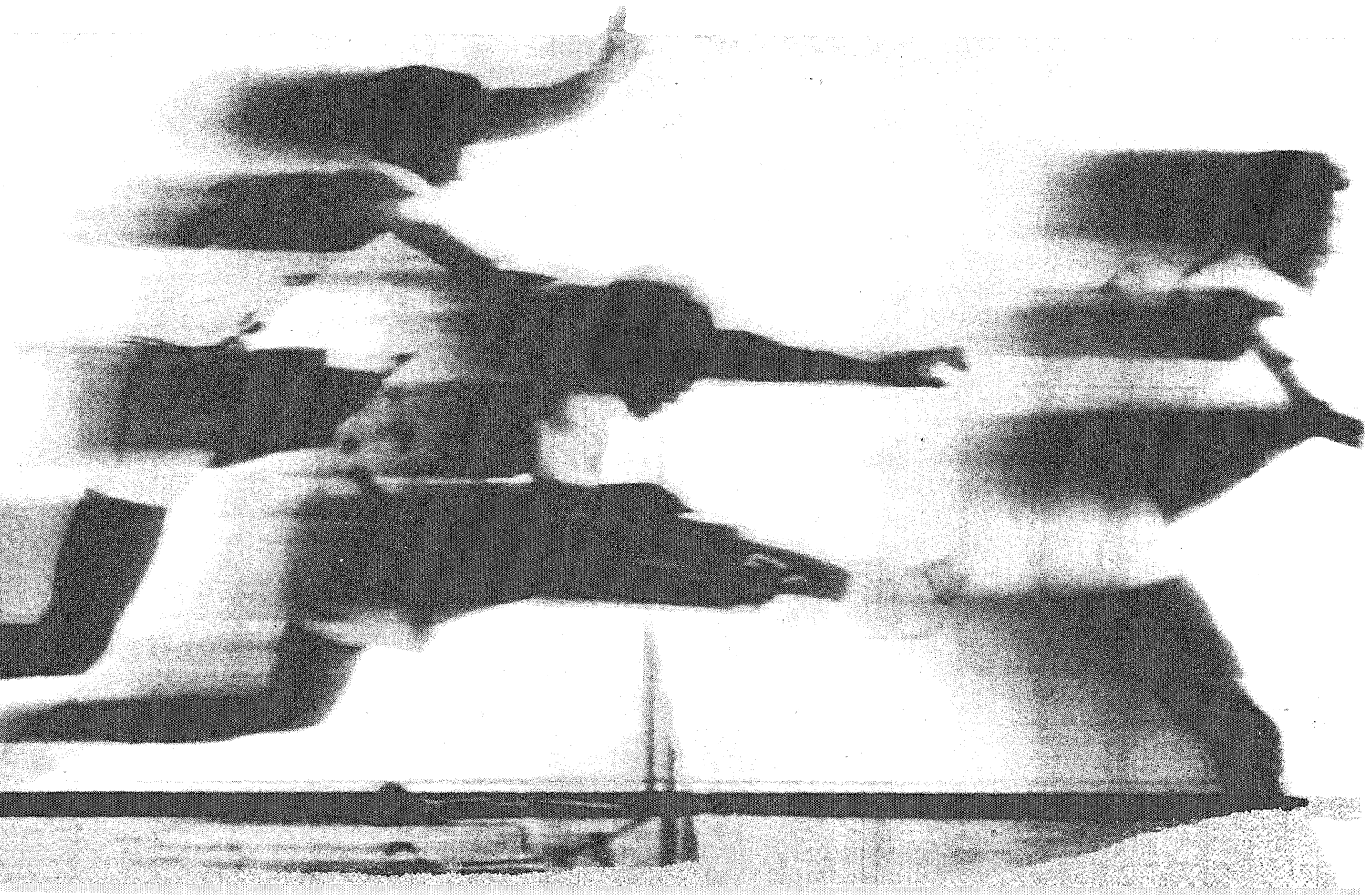
Energy to burn, literally, because ideas—freedom, equality, well-being, conservation of our natural environment—must be turned into realities—food, shelter, warmth, access, economic independence and the physical means to accomplish our goals. Atlantic Richfield is an energy company—in all these ways. One of the nation's thirty leading industrial corporations, and one of the ten companies producing most of our energy needs, with a strong position in diversified chemical products as well as in oil and gas.

A young company still extending its boundaries as it joins the efforts and resources of the Atlantic, the Richfield and now the Sinclair Oil Companies. Aggressive and imaginative in management. Flexible in organization and operation. Open to fresh thinking. Responsible in outlook. Offering new opportunities to financial and systems analysts, accountants, auditors, engineers, geologists, geophysicists, sales representatives, agronomists and programmers.

We invite your interest. See our representative on campus or your Placement Director.

**AtlanticRichfieldCompany** 

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# TECHNOLOG

VOL 52; NO. 4

Official Student Publication of the Institute of Technology, University of Minnesota

JANUARY, 1972

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## MEMBER OF ECMA

Published monthly, October through May. Second class postage paid at Minneapolis, Minnesota. Office: Room 2, Mechanical Engineering Building, University of Minnesota, Minneapolis, Minnesota 55455. Telephone: 373-3298. Printer: Aircraft Press, 425 South Fifth Street, Minneapolis, Minnesota 55415. Publisher's National Representative: Littell-Murray-Barnhill, Inc., 60 East 42nd Street, New York, N. Y. 10017. Publisher's State and Local Representative: University Engineering Magazine Advertising, F. P. McGrath, Manager, Box 14026 University Station, Minneapolis, Minnesota 55455. Telephone: 612-225-0708. Member of the Engineering College Magazines Associated, Chairman: Daniel L. Griffen, Iowa State University. Subscription rate: \$6.00 per year, single copies 50¢. Advertising rates upon request. Any opinions expressed herein are not necessarily those of the Institute of Technology or of the University of Minnesota. Copyright © 1972 by the Minnesota Technology Board. All rights reserved. Reproduction in whole or in part without written permission is prohibited.

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This month's cover is a photo-mechanical line conversion. Photos by Mary Lee Slettehaugh. Design by Bruce Wright.



# FORUM

## Puppet Master?

Greetings and Salutations! We would like, first, to wish you a successful new year. Beginnings of a new year bring the traditional "resolutions" for the future and thoughts of the past. Having made or renewed our resolutions for the remainder of the publishing year, we have reviewed our past (the past three months). First, there were successes, potential successes waiting for a chance to happen, and new problems.

In October, we stated our goals for the year. Some have become a reality; some have not. Probably the most important reality are articles that have been "relevant" to the times. These articles pointed out problems that exist, presented hopeful solutions to other problems, or were of just casual interest. (We hope they were. Suggestions from our readers for future articles are always welcome.)

Secondly, the magazine has come out on time, that is, no later than the first full week of the month. And, graphics have been more appealing. Visuals were used more freely for more effective communication.

So those are the accomplishments to date. What about those goals that are still in limbo? "Reverb" has not had the success we hoped for, because of student apathy. We cannot stress too strongly that the *Technolog* is not just the staff's magazine — it is yours! Before we can produce what you want to read we must know what it is that you want. It is socially rude to say things behind one's back. If you have something to say about us, good or bad, tell it to us.

Through the past few months, unexpected problems have ap-

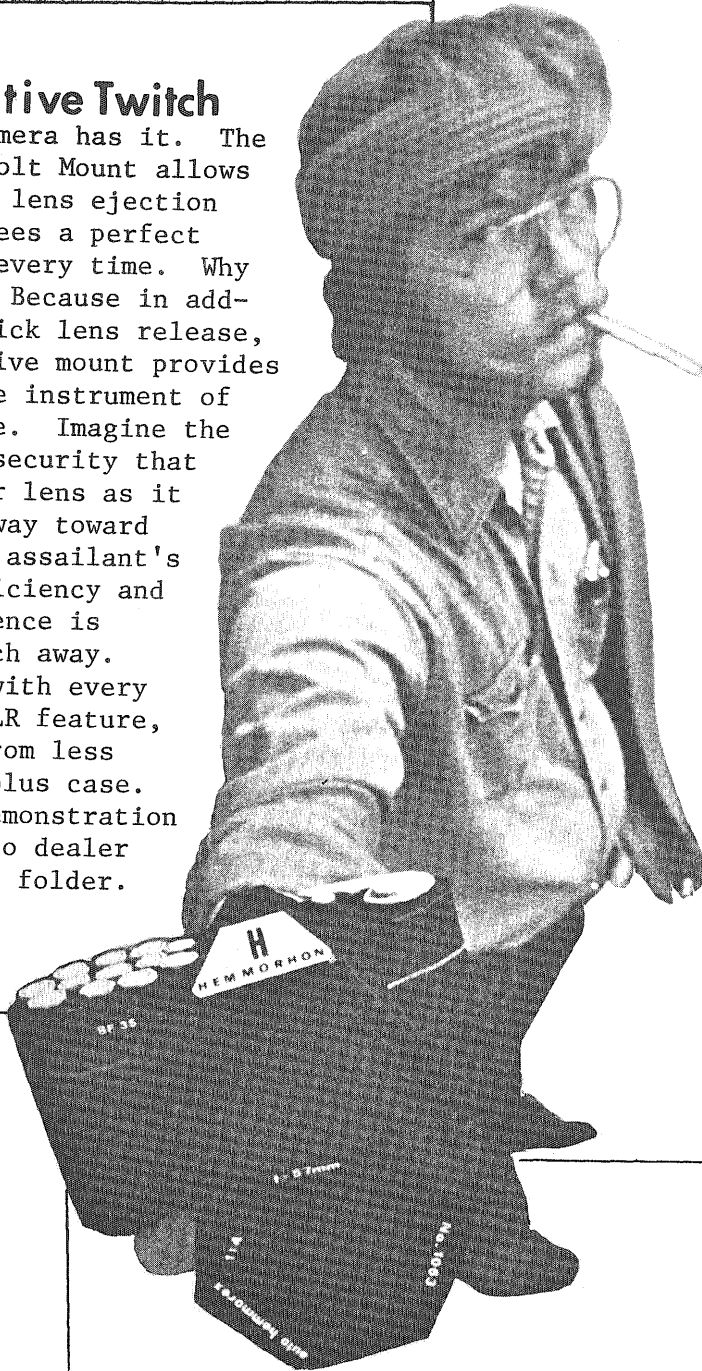
peared. The problems that we have experienced since October are production-related. One is money. The economic slow-down has unfortunately not overlooked the *Technolog*. Continuing to publish a (minimum 28 page magazine presently forces us to go slightly into the red, even with the 85 cents per quarter per IT student in the incidental fees. To add to the problem of money, the Tech Commission, of which the *Technolog* is a subordinate, is requesting to draw from the *Technolog* reserves — money which helps the magazine through these financially bad years — to finance E-Week. We feel this is totally unreasonable, because the amount of money that could be spent in one week could assist the magazine for a whole year.

Finally, apathy has affected us in another way. The *Technolog* would like to have more staff members. Unfortunately, too few have joined this year. The effects are not immediately obvious but still detrimental to the *'Log*. For instance, the variety of content is affected by the variety of the staff. Continued on-time production depends on the staff available to do the work, even under the best of managements. Most important, any organization must have new members continually to insure its future survival.

Through the last three issues, we've headed in the direction we stated in October: presenting articles on controversial subjects that affect the engineer as a human being, rather than merely a manipulator of technology. We resolved to continue. But what have you done in the past three months, besides studying? According to the amount of student participation in organizations, and comments to "Reverb", IT is still the capitol of apathy. We hope that you resolve to become involved in activities and do something for yourself and others./RR,BJ

## The Creative Twitch

No other camera has it. The Explosive Bolt Mount allows you instant lens ejection and guarantees a perfect detonation every time. Why explosive? Because in addition to quick lens release, this exclusive mount provides a formidable instrument of self defense. Imagine the feeling of security that follows your lens as it speeds its way toward your unwary assailant's heart. Efficiency and self confidence is just a twitch away. The SF 35, with every important SLR feature, is priced from less than \$570, plus case. Ask for a demonstration at your photo dealer or write for folder.



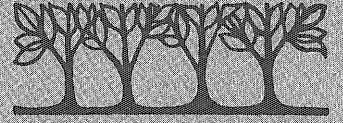
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*Editors Note: The following is a letter from the Tech Commission which we feel is important to all IT students.*

## **Students Are Sheep**

How often have you been walking down the hall and wondered what you are doing in college? Does it ever occur to you that you are the only person on this campus who can answer that? Many of this University's highest-ranking officials are making decisions, day by day, which cumulatively exert a profound effect on your life. And the reason they quote to justify their program and their way of thinking is that "It is best for the student." More frequently than not, no student is ever consulted for his opinion. Why? Not because there aren't any students around when the decision is made. Not because the administrator can't stand to listen to the voice of an undergraduate (or graduate). But, fundamentally, because the student himself has decided not to express an opinion to the administrator, not to become involved in the process, not to put himself in charge of his affairs.

## **The Student in the Decision-Making Process**

The Interviewing and Placement Task Force of the Technical Commission has, with the support of the Dean and the Department Heads in IT, compiled a listing of openings on the major college and departmental committees for student representatives. The College has two major committees on which students have been encouraged to serve in the past: the Curriculum Committee and the Scholastic Standards Committee. The first has to approve changes in the curricula before they are made official. The

second is responsible for the academic standards to be followed by the Departments with respect to undergraduates. A minor college committee is the Graduation Committee which, for the first time this year, is required to have more student members than faculty. This committee sets the time, place, and ceremony to be followed in the special IT Graduation Ceremony. As soon as the Interviewing and Placement Task Force has standardized its procedures, it expects to have a waiting list of students who want to serve on these and other committees.

One program of interest to students who are laboratory-oriented is the IT Student-Faculty Undergraduate Laboratory Funding Committee, which is composed of students and faculty who visit the undergraduate labs to determine if a department is utilizing its resources effectively.

One of the larger departments in IT, Mechanical Engineering, has openings for students on nine of its committees. They are: Computer; Curriculum; Display; Engineering Intern; Graduate; Honors; Library; Scholarship and Assistantship (graduate); and Scholastic Standards (undergraduate). Although some departments like to name their own choices for membership on committees, any name submitted by the Tech Commission stands a better than ordinary chance for acceptance, simply because it is time-consuming for the Department to run through a list of its students looking for the one who is both qualified and willing to serve. The procedure is: Identify an area in your department in which you would like to work, and submit your name to Ron Ezuck, care of the Tech Commission, Rm 230 TNCE.

Some students think that to work on E-Day, or the *Technolog* for that matter, you have to know one of the people involved. This is not true. The people organize and run E-Day are taken from the undergraduate body. There are many openings for students on E-Week committees on departmental displays, tours for High School seniors, tournaments, and the Concert. There are also openings on the Technolog Board for interested students.



The Tech Commission receives numerous other requests for student representatives during the school year. The Center for Studies of the Physical Environment likes to have at least one IT student on its governing board; while SOS (Student Ombudsman Service), the student-run, student-financed service in Johnston Hall, recently has requested an IT student to serve on its advisory board for 1971-72.

## E-Week

Due to an unusual amount of student interest early in the school year, planning for Engineer's Week started in earnest around the middle of Fall Quarter. Most of the early planning revolved about the two student groups most interested in E-Day planning, the Tech Commission and Plumb Bob, and the office of Dean Paul Cartwright.

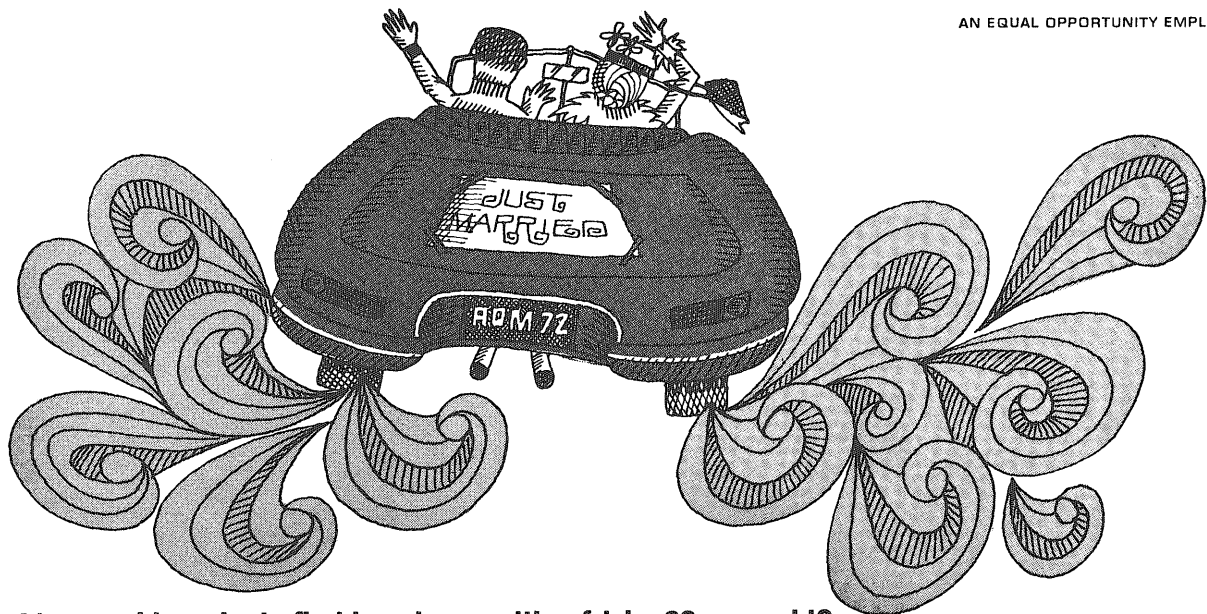
The dates are set as the first week in May, 1972, with E-Day falling on Friday, May 5. Plumb Bob, the honorary senior engineering society, has elected to take overall responsibility for coordinating E-Week, along with its more traditional duty — publishing Blarney's Castle.

The Planning Group agreed to pursue its negotiations with the Program Council of Coffman Union to see if the Program Council will co-sponsor with IT a special concert to be held during E-Week. Although the name of the band, the specific date, and the place have not been picked, some special requirements have been identified. Of the team required to organize this event, some 25 students are needed to work "full-time" on such activities as tickets, publicity, and taking care of the band when they arrive in Minneapolis. Another 125 students will be required for ushering and ticket-taking (depending on whether the concert is held outside or inside, or whether Williams Arena or Northrup Auditorium are used if the concert is indoors).

It has been cleared with Deans Swalin and Cartwright to invite the students in neighboring High Schools to the Institute for guided tours of the Engineering complex, as well as tours of the displays and demonstrations to be offered. If, as is hoped by the administration, special interest firms and agencies (Northern States Power, Minnesota Pollution Control Agency, etc.) can be persuaded to bring displays for the Architecture Courtyard, the combination of industry and government displays, and our own departmental demonstrations should provide an attractive and informative program for the University community and the metropolitan area.

Although a tremendous amount of work remains to be done, it seems reasonable to think that our Engineer's Week this year will be more fun for students, more attractive to the public, and more comprehensive a demonstration of the relation of technology to society than it has in the past. ■

Tech. Commission



AN EQUAL OPPORTUNITY EMPLOYER

### Can a 21-year-old graduate find happiness with a frisky 69-year-old?

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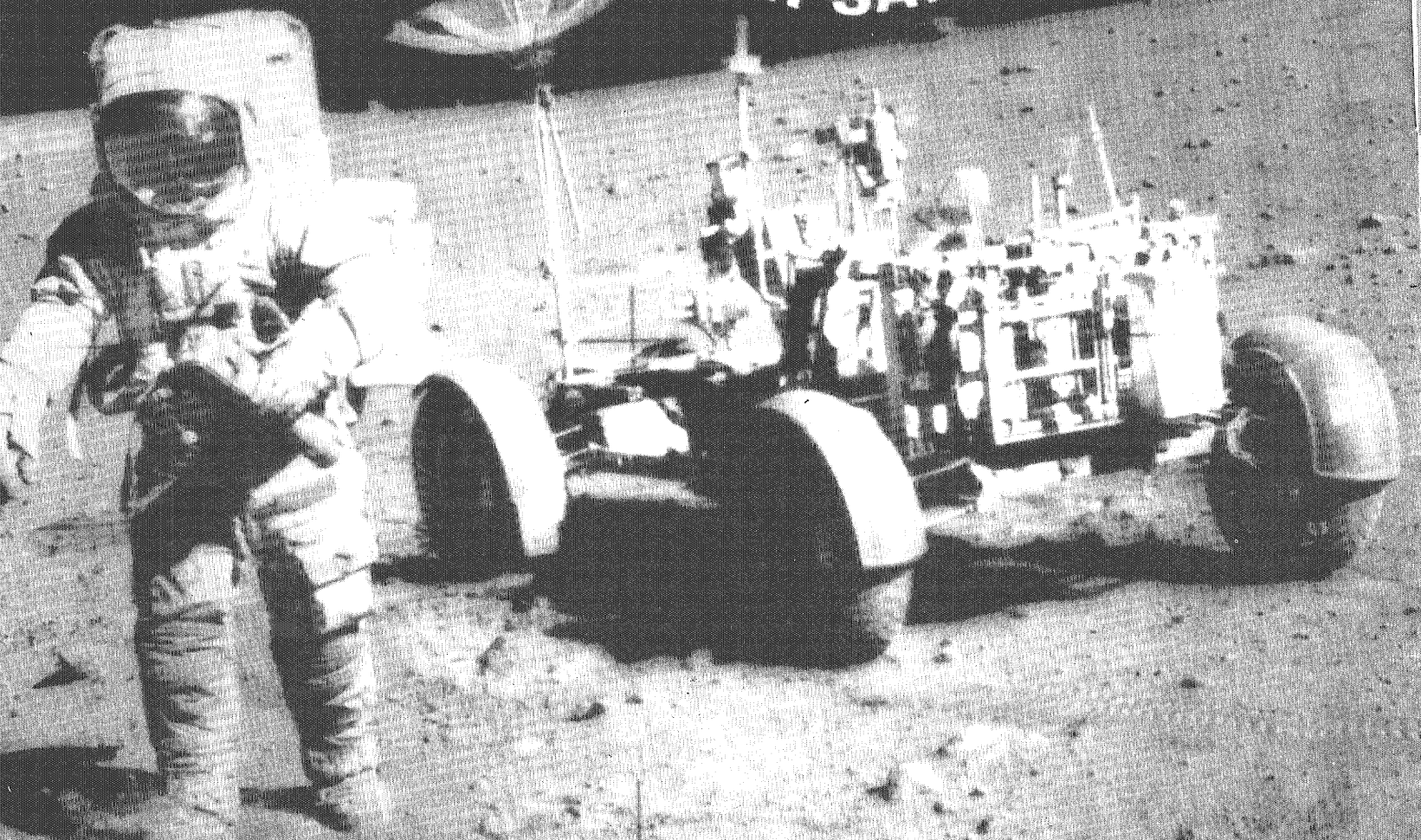
Can he enjoy living in areas where recreational and civic opportunities abound?

If we interest you, let your resume serve as a proper introduction. Write now to **Manager of Employment**, or contact your placement office to arrange a campus interview. It might lead to a beautiful marriage.



ARCHER DANIELS MIDLAND COMPANY  
DECATUR, ILLINOIS 62525

# LUNAR SAND BLAST!



by Kiki Koras

The Apollo 15 lunar landing mission was man's most ambitious and scientifically productive lunar expedition to date.

At its launch on July 26, 1971, Apollo 15's objectives were listed as: 1) perform selenological inspection, survey and sample materials and surface features in the Hadley Apennine region, 2) evaluate the capability of the Apollo equipment to provide extended lunar stay time, increased EVA operations, and surface mobility, and 3) conduct in-flight experiments and photographic tasks from lunar orbit. At its conclusion on August 7, all of these tasks had been completed and were providing sci-

entists with a wealth of information on deep-space and lunar conditions.

Apollo 15 astronauts David Scott and James Irwin spent more than 17 hours driving around the moon's surface in their Lunar Rover, the first car ever driven on the moon. They traveled over 17 miles with the rover taking them to places they could never have reached on foot and even approached a 12,000 ft. peak—Hadley Delta—the highest mountain in the area. While roving about the moon, Scott and Irwin collected 180 lbs. of rock, conducted several experiments, and kept up a running commentary on the geology of the moon.

Included in the "rock collection" were what appeared to be a piece of lunar bedrock and a large crystalline rock that was immediately named the "Genesis rock" because it was believed it might be a piece of the moon's original crust. Study showed that the sample is made of anorthosite, a rock thought to have been prevalent in early lunar crust. Its large crystals indicate that it was once molten and cooled slowly far below the surface.



On-the-surface experiments included the ALSEP (Apollo Lunar Science Experiments Package). This contained seven separate experiments designed to survey the lunar surface. Included in this was a heat flow experiment in which probes were buried in the moon's surface in order to measure the thermal conductivity of lunar material. Early results seemed to indicate that the thermal conductivity is low with a net heat flow out of the surface. Also left on the moon as part of ALSEP were a solar wind spectrometer (the second on the moon, there is one there from the Apollo 12 flight), a lunar magnetometer, and a seismograph. This seismograph is the third on the moon and with it a network was established. The network has already detected moonquakes and a possible meteor impact and measurements during the crash of the lunar module Falcon on the moon indicate that the moon has a crustlike surface at least fifteen miles thick.

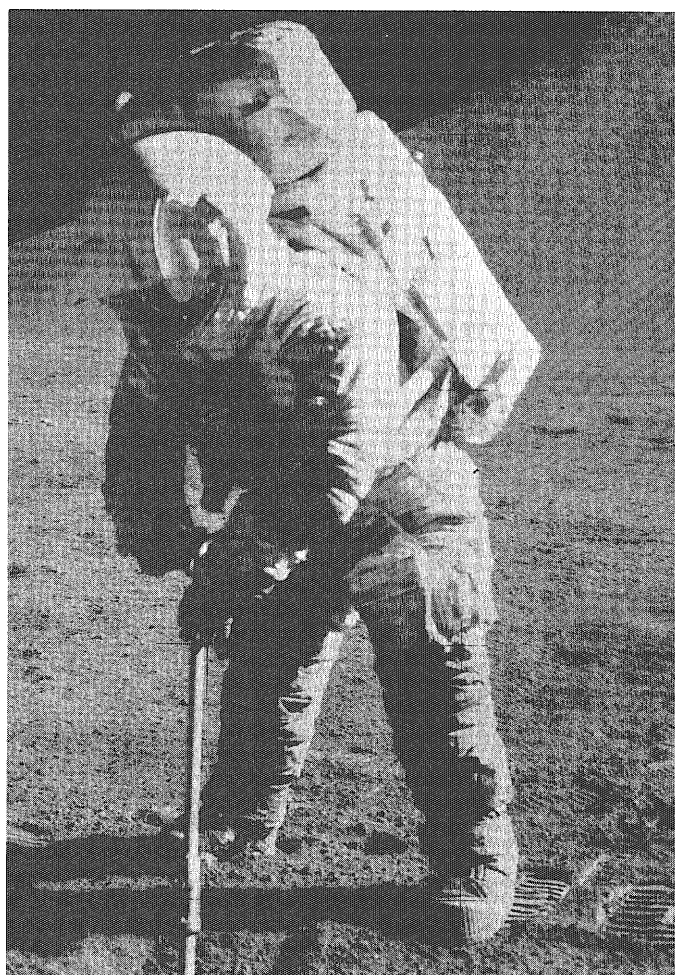
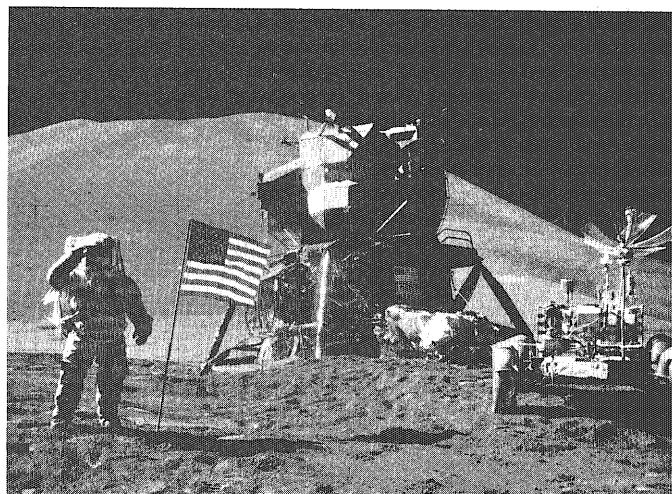
Scott and Irwin also left a laser ranging retro-reflector on the moon. There are now three there and good signals are being reported from each. They also conducted a core sample experiment. One core, when studied, showed 24 layers of lunar material in only its top half. Core samples can also provide a record of sun activity. Scientists are able to study cosmic-ray tracks in the layers and determine whether the sun has flared up or diminished in the past few billion years.

The astronauts also saw features that they couldn't bring back to earth (except as one of 1400 pictures taken during the flight.) They reported that Hadley Rille, a 1200-ft.-deep canyon had at least two major layers of material with the second layer containing at least ten subordinate layers. Scientists believe that this points to a fracture formation of the rille rather than by a number of separate lava flows.

Meanwhile, back at the command module Endeavour, the third Apollo 15 astronaut, Alfred Worden, was conducting his own set of experiments. These included the SIM (Scientific Instrument Module)-Bay experiments, performed by a package of instruments crammed into the Endeavour's service module. A mass spectrometer detected carbon dioxide gas and traces of hydrocarbons on the moon's far side. These may be evidence of continued volcanic activity (or, according to some scientists, just discharges from the command module). Gamma-ray and X-ray spectrometers continually radioed evidence of the moon's chemical composition. They showed a greater concentration of aluminum in the highland areas than in the maria. Sensors also detected a radioactive "hot spot" in the Sea of Storms.

Worden also reported on what he could see of the moon's surface. He detected cinder cones and traces of lava flows that are evidence of volcanoes. Scientists believe that these may indicate that the moon was volcanically active as recently as a billion years ago. Worden also saw a great deal of the backside of the moon. It seemed much smoother, more eroded than the frontside. His impression of it is "of roundness, softness, a kind of fluffiness."

Before they left lunar orbit, the Apollo 15 astronauts did one more thing never done before. They launched a subsatellite into orbit about the moon. The satellite is to provide information about the plasmas and magnetic field around the moon and irregularities in its orbit will



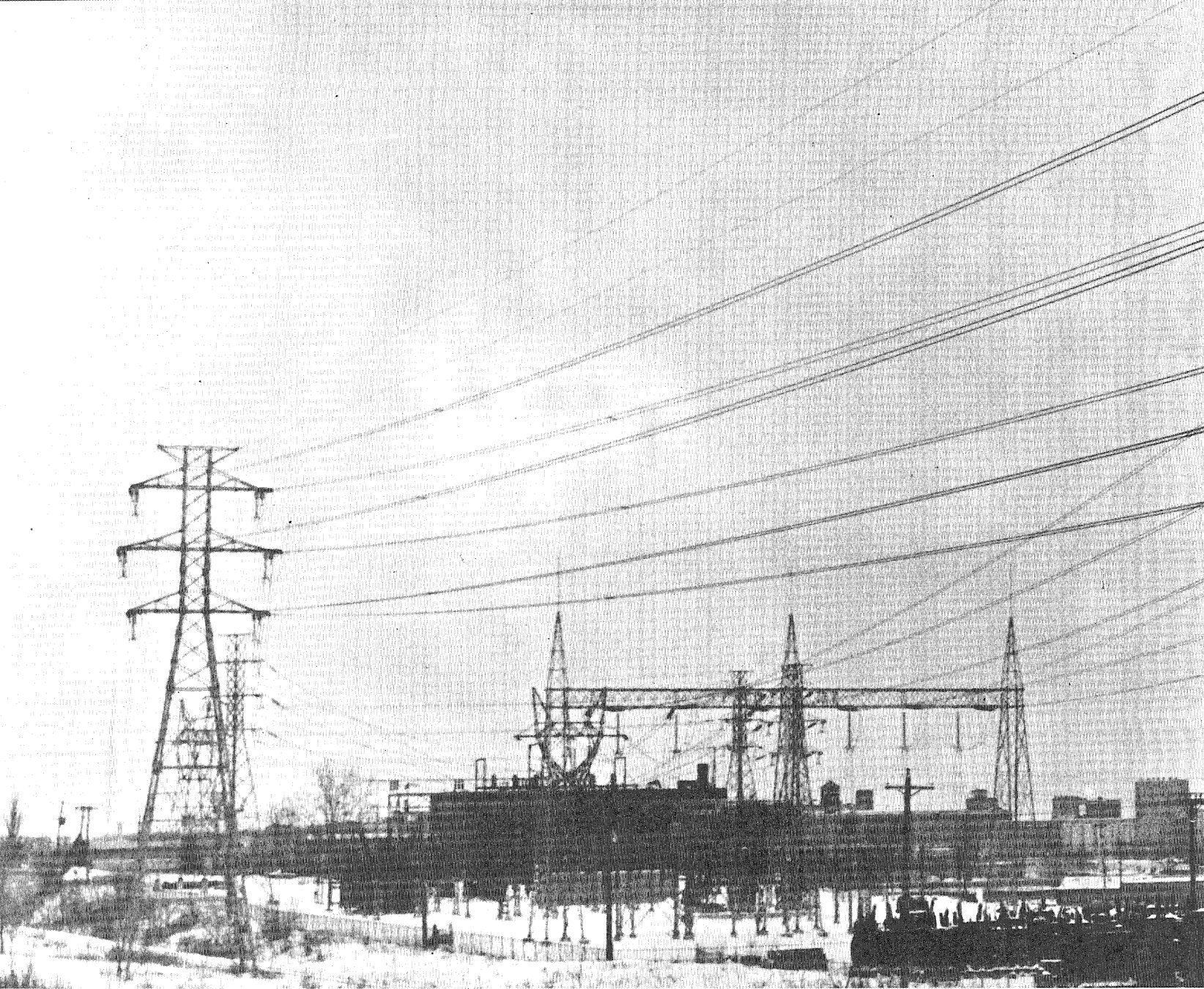
Photos Courtesy of NASA

allow ground trackers to map gravitational variations due to mascons.

On the return voyage to earth, one more pure science experiment was conducted. Worden pointed his instruments at X-ray sources deep in the galaxy and recorded emissions that might confirm the existence of black holes, the remnants of huge collapsed stars. ■

Continued on page 17



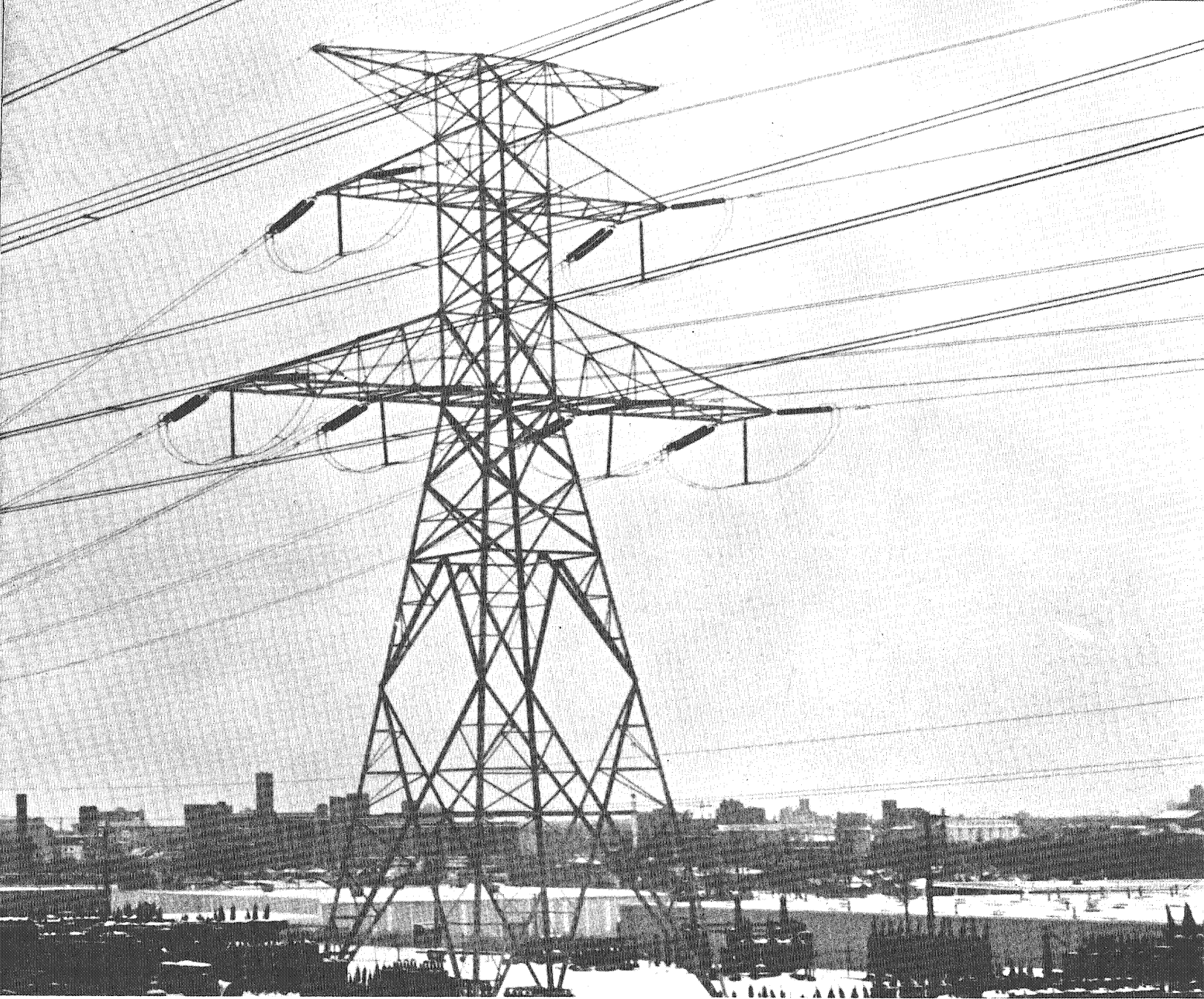


# terminus? 2002

**U.S. power consumption doubles every ten years while the population doubles every seventy. How can we afford to supply this demand when the fuel reserves diminish in 30 years?**

by Weston Fisher

Photos by John Johnson



In 1971 the U.S. imported 23 percent of its oil, and Europe and Japan were almost totally dependent on foreign oil to meet their demand for petroleum liquids. In the next decade the world demand for petroleum is expected to almost double. In this same period, U.S. domestic oil and gas resources are predicted to near depletion. These projections are important because of petroleum's role as an energy resource in the U.S. economy.

Oil and gas together presently contribute approximately 76 percent of our total energy supply, coal 19 percent, nuclear power about 1 percent, and hydroelectric power about 4 percent. The exhaustion of our domestic oil and gas, combined with a doubling U.S. demand for energy in the next ten years, requires that the U.S. energy industries quickly discover and develop alternatives to domestic oil and gas. Government and the industries look to coal, nuclear power, and increased oil imports as the only significant alternatives over at least the next thirty years.

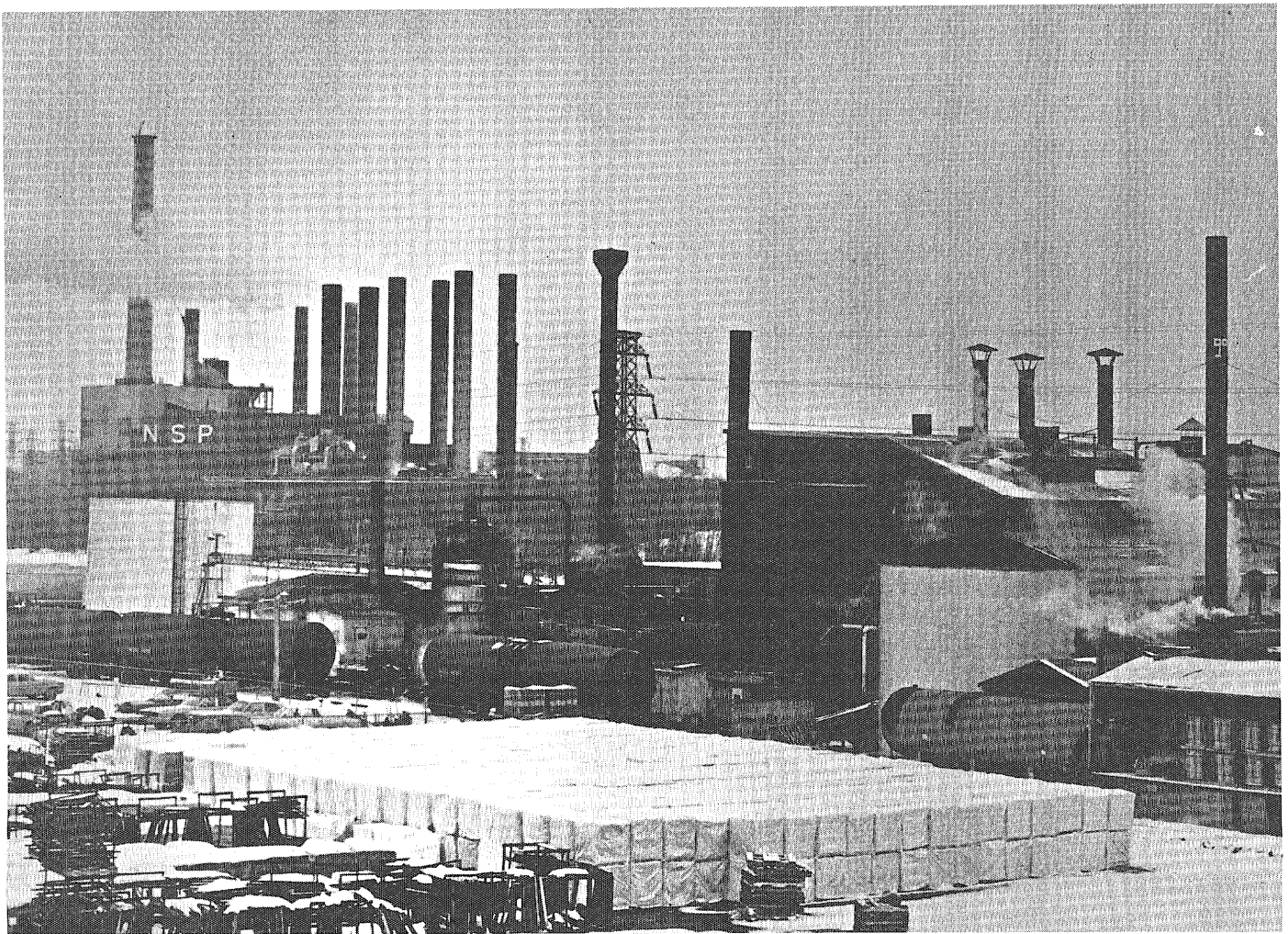
Oil imports are expected to rise from the 23 percent at present to 40 percent by 1980. To prevent dependency on foreign oil above the 40 percent level will require:

- rapid development of Alaskan and offshore oil,
- massive development of the coal reserves of the Rocky Mountain Region from North Dakota to the Four Corners,
- Federal support and encouragement to the development of the Colorado, Utah, and Wyoming oil shale lands, coal gasification, and nuclear power.

The role of nuclear power is expected to be crucial. To make up the difference between energy demand and the diminishing supply of domestic oil and gas, planners project that nuclear energy use will rise from the present 1 percent to an estimated 30 percent by the century's end, with as many as 950,000+ megawatt reactors, of primarily breeder design.

Continued



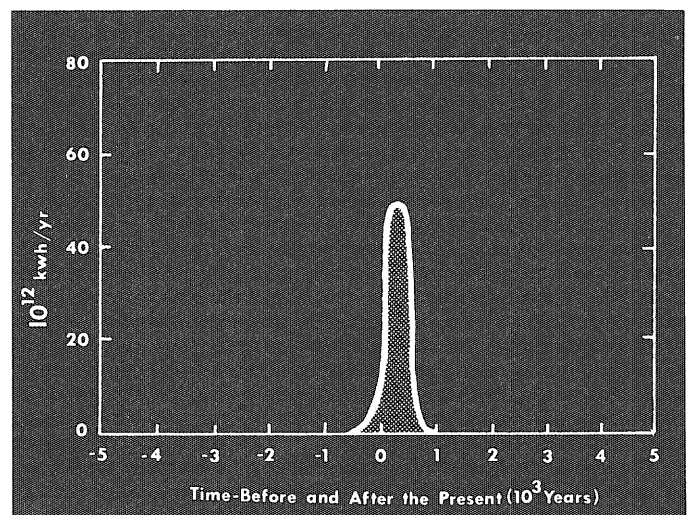


It does not appear the transition to these energy sources will be smooth. Already environmental opposition to nuclear power has produced a slowdown in the entire commercial reactor program, and with problems of solidification and disposal of high level wastes yet to be overcome, as well as radioactive emissions at plant sites and other technical problems, the slowdown is likely to continue. A massive commitment to electrical energy from breeder reactors might not be possible if the reactor program is indefinitely delayed for environmental reasons.

Similar opposition from environmental "intervenors" is beginning to be felt by the coal industry and is intensifying as strip-mining for coal increases in the Rocky Mountain States. Coal gasification programs and major strip-mining operations for oil shale may also be jeopardized by environmental opposition.

Of major concern are the international, political and economic implications of a 40 percent dependency on foreign oil by 1980. Because of rising world demand, and because the Organization of Petroleum Exporting Countries (OPEC) is bargaining more effectively, the price for foreign oil is likely to rise considerably over the next ten years. While the U.S. population will be able to absorb major price increases

Continued on page 21



*Epoch of exploitation of fossil fuels in historical perspective from minus to plus 5,000 years from present.*





# PRINT!

the young detective yelled, as  
the voluptuous blond leaned  
closer . . .

by Bruce Wright

This thumbprint represents letterpress, the old technology in printing. This is a process in which an impression is transferred by means of inked raised surfaces making direct contact with the printing surface. This is the original printing technique developed by Gutenberg in the fifteenth century.

Until last May, the Tech-

nolog was printed by this method. Starting this Fall, we switched to a more modern printing method called offset lithography. The basic difference between letterpress and "offset" is the fact that the printing plate never directly touches the printing surface in offset. Also in offset, the printing plate has no raised surfaces

Continued

The idea for an article comes to mind!

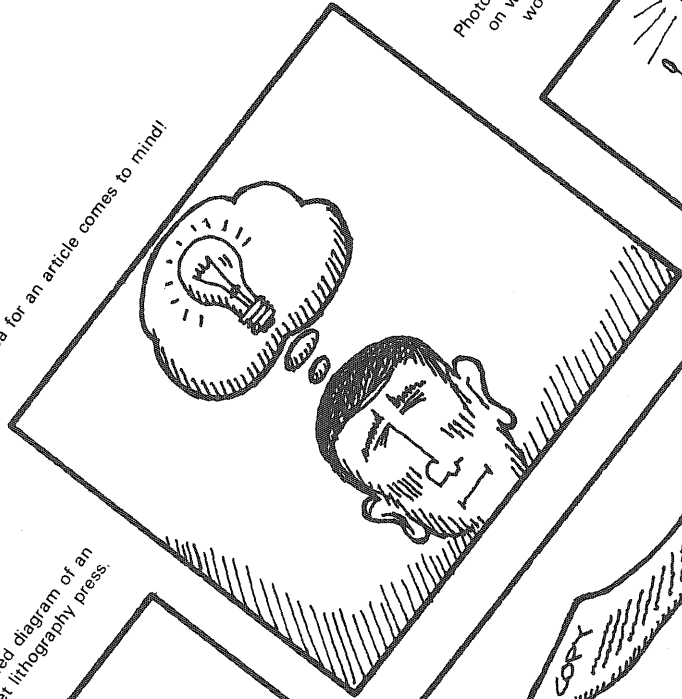
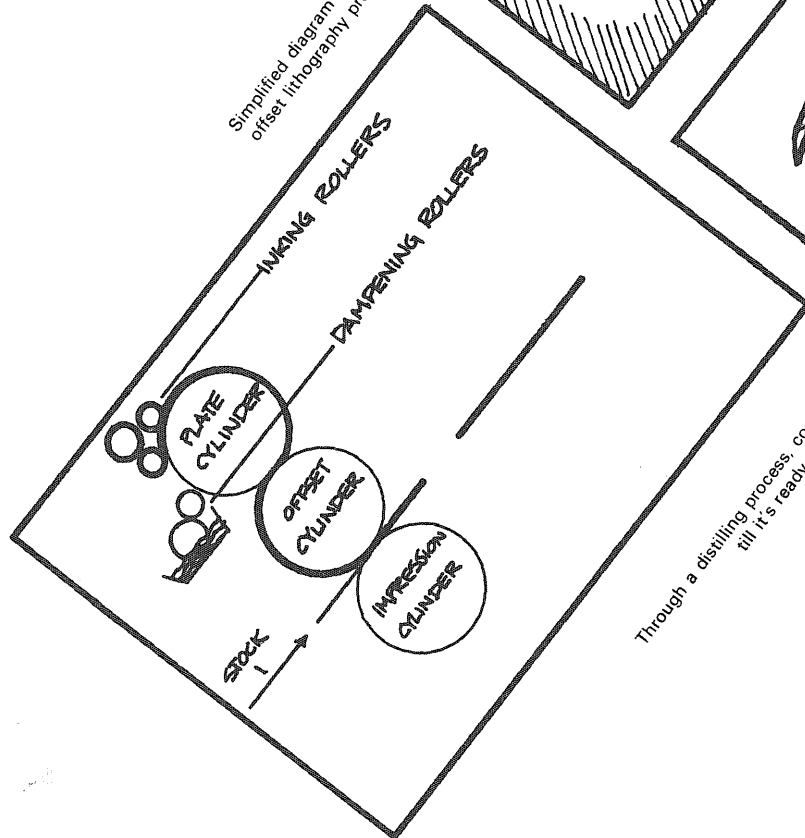


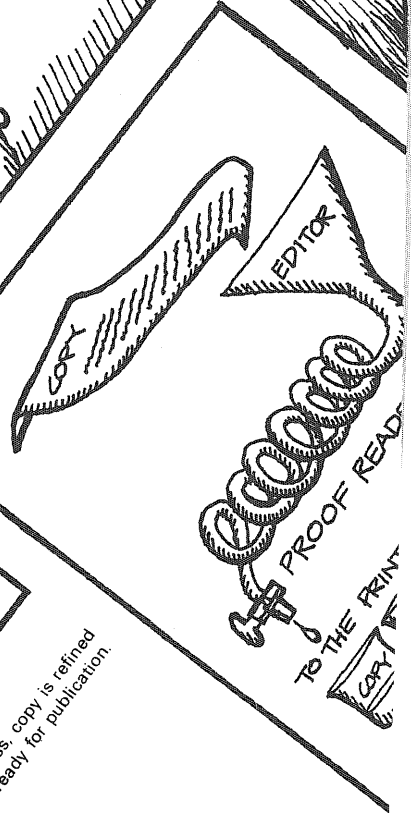
Photo Art Editor and Editor decide on which photographer or artist would be best for an article

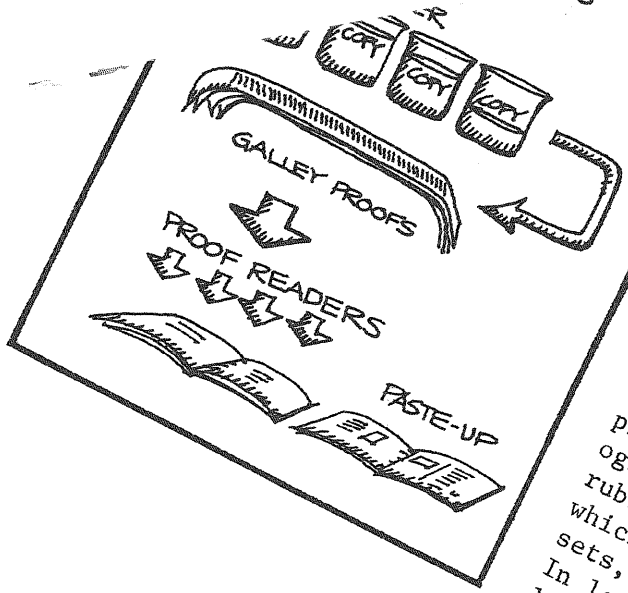


Simplified diagram of an offset lithography press.



Through a distilling process, copy is refined till it's ready for publication.





"suddenly she stepped out of the shower . . ."

and utilizes the basic fact that grease and water do not mix. That is, the image to be printed is etched on a thin aluminum sheet on a plate. The plate is chemically sensitized to accept ink and reject water in the printing areas (greasy areas and to accept water in lith-ink in the non-printing areas). To transfer the image from plate to paper, an offset lithography uses an intermediate rubber-blanketed cylinder, which in turn transfers, off-plate to paper, the image from rubber-blanketed intermediate sets, the ink transfers, off-limited to only the paper. In letterpress, the printer is and sizes he has on hand. that can be photographed can be used for printing. This center spread contains many examples of the versatility of offset. Diagonal placement of copy and pictures would be nearly impossible, or at best expensive, in letterpress. These words you are reading were typed on an IBM selectric typewriter to prove this versatility of the medium.

What actually goes into the production and planning of a magazine such as the *Technolog*? A great deal more than is visible. Usually the idea for an article originates from the staff members. A writer is then assigned to produce the article.

Under the coordination of the editor, artists and/or photographers are brought in to add visuals to the story. Next, typed copy from the writer is submitted to the editors for proofreading and editing. After being checked at least twice by the staff, the copy is sent to the printer.

When several columns of type have been set by the printer, transferred to long narrow trays called "galleys" and using a long strip of paper the type is inked and an impression (or proof) is made. Here the old technology still has a role, since these galley proofs are done by the letterpress process.

After all corrections have been made on the galleys, the biggest job of magazine production begins; that process called "paste-up" and "dummying". This "dummying" is a detailed plan for the issue. It is a model of how the magazine is supposed to appear.

Continued on page 20

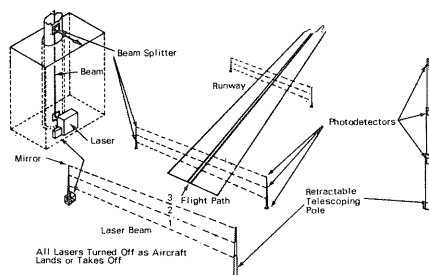


# WHAT'S NEW

## Closely Watched Runways

A laser net that can be used for monitoring the wingtip vortices created over a runway by a moving airplane has been proposed. These vortices can cause unsafe flying conditions for several minutes after an airplane has taken off or landed, and appropriate warnings must be issued to provide more efficient and safer use of a runway. Although in time the vortices will decay and move off the runway, uncontrollable variables such as crosswind speed can influence the duration of the vortex hazard.

The laser net consists of a network of laser beams passing over the runway. The net requires towers or poles (rigid or telescoping) positioned along the runway. The laser beam is directed across the path of the aircraft to photodetectors on the opposite side of the runway. A vortex wake passing through one or more of the beams in the net is detected by continuously monitoring the difference between two rms values of the composite signal, one averaged over a much longer period of time than the other. The path of the beam from the laser to the detector is a straight line only when the air is undisturbed. If, during transit from laser to detector, the beam encounters disturbances characterized by density gradients, the laser beam will be deflected from its undisturbed path, and the magnitude of the deflection can be related to the magnitude of the density gradients encountered. A go/no-go decision for takeoff and landing can then be made from a visual display of the laser beam deflections.



## “The Upper Midwest grows on us”



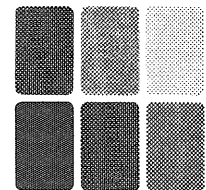
During the last ten years the population of this great land NSP serves grew by close to 21%.

The Dakotas, Minnesota and Wisconsin also rank high nationally in terms of economic growth.

It's a great place to live and work.

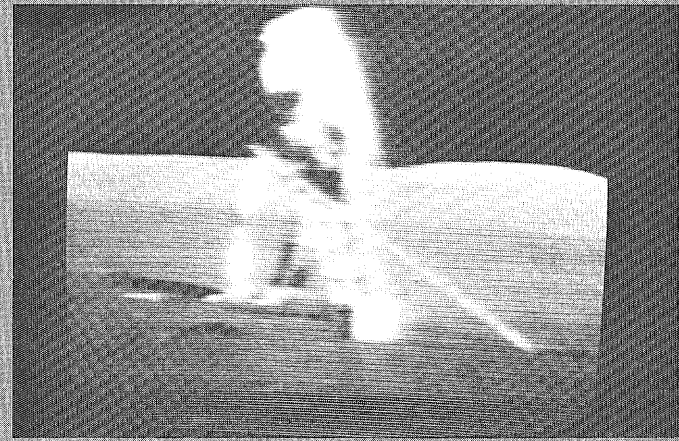
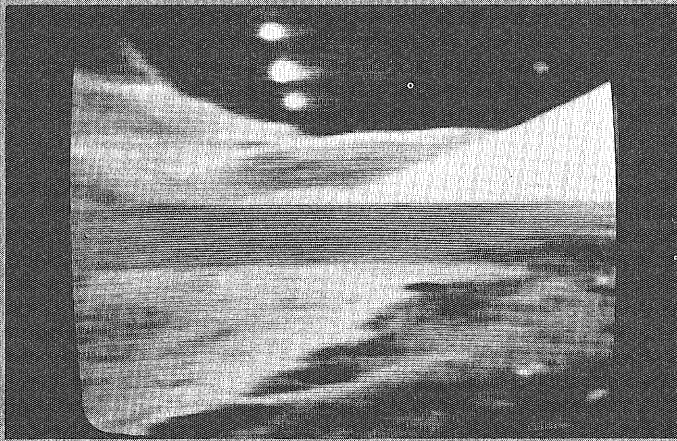
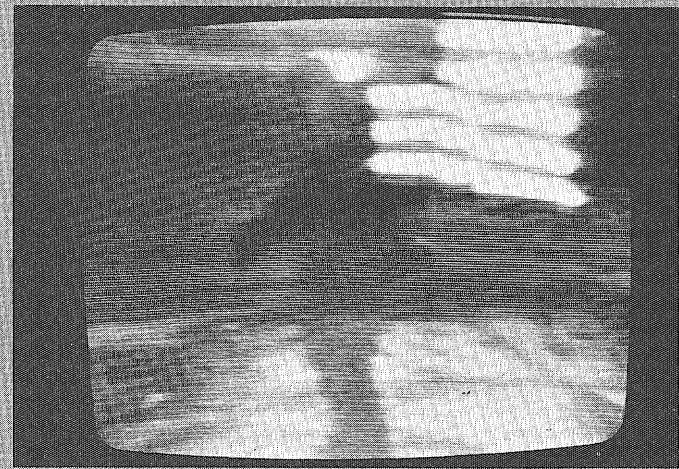
And we at NSP are dedicated to keeping it that way . . . and at the same time fulfilling our responsibility to supply your power needs.

# NSP



*a brighter life for you*





*Top: Astronauts collecting rock samples.  
About: Moonscape of Hadley Rille.*

*Top: Astronaut saluting the American flag on the moon.  
Above: Astronaut setting up test apparatus.*

## Video Impressions

Photos/Text by Don Neal

The photographs shown earlier were taken by the astronauts on the moon. Viewers on earth saw a somewhat different picture (above). The television pictures that the astronauts sent back to earth were taken by an RCA designed color television camera, controlled by NASA engineers in Houston. By radio the camera can be turned on and off, swung around, and tilted up and down to follow the astronauts activities. If the astronauts go into a shadowed area, the engineers can adjust the light control, by earth-moon radio link, to obtain the best picture. Damage to the camera from sunlight was not a problem due to the camera's silicon intensifier tube, which cannot be harmed by bright light — even when pointed directly into the sun. The tube also performed well

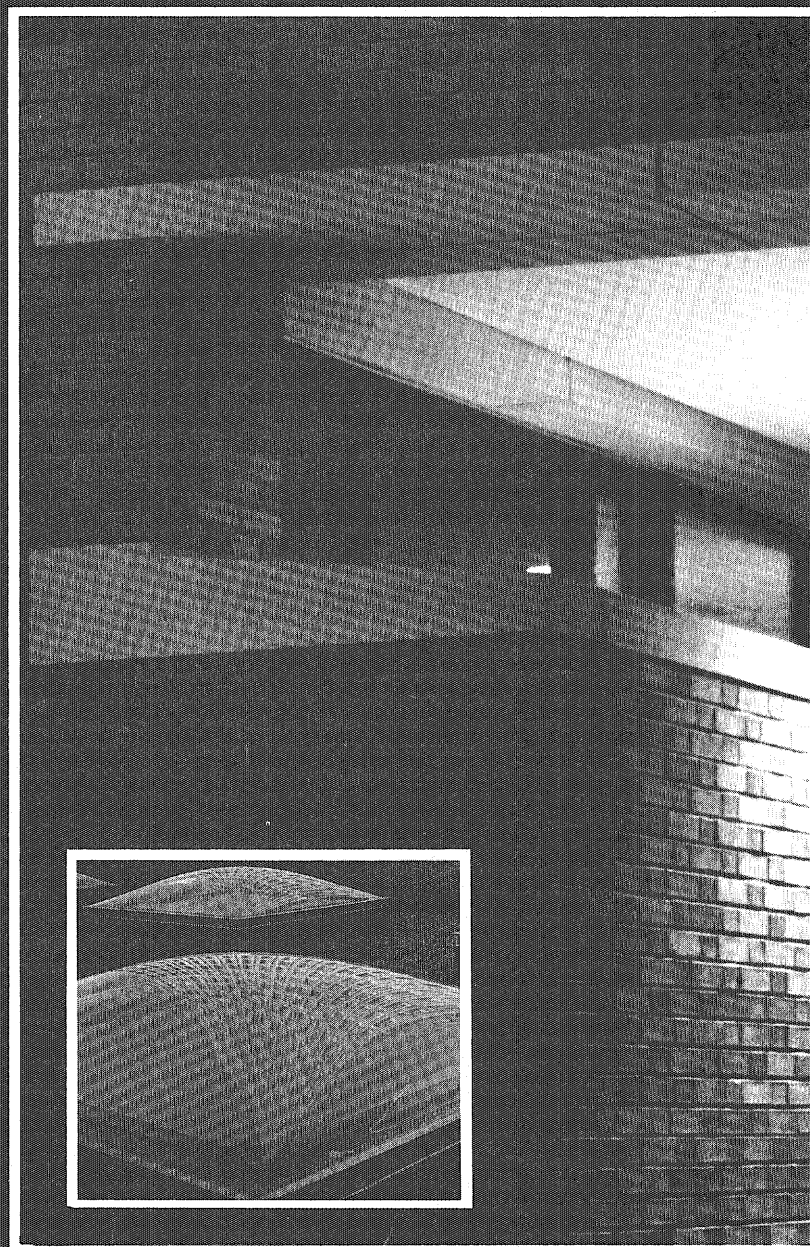
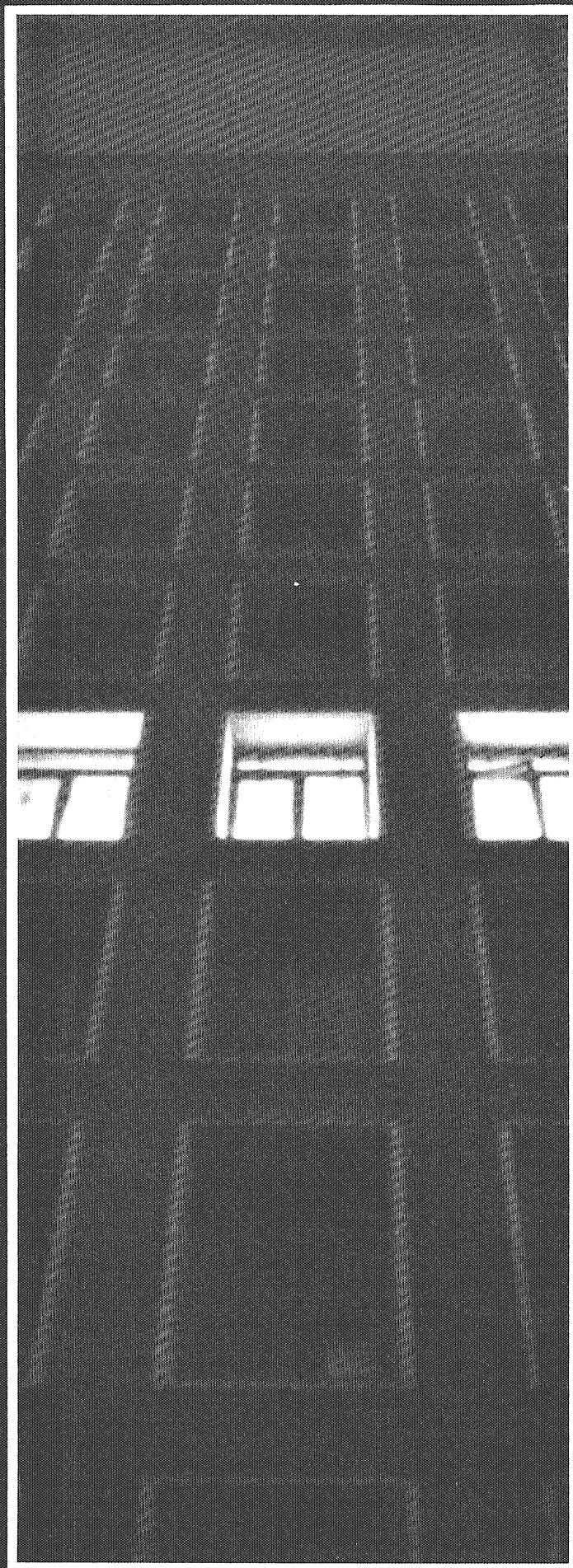
under low light levels such as heavy shadow areas.

The television signal was relayed to earth via radio links, telephone lines, and satellites from the receiving sites to Mission Control in Houston. There, the TV signals were converted to commercial television standards and released for broadcast. Transmission from the moon took less than two seconds, and conversion of the TV signal to commercial standards took about four seconds more. In reaching the viewers' home set, the TV signal passed through six or more interfaces. The distortions in the above photographs are due to optical phenomena (lens flare), electronic distortion, and image degradation in converting the video signal to commercial standards. ■

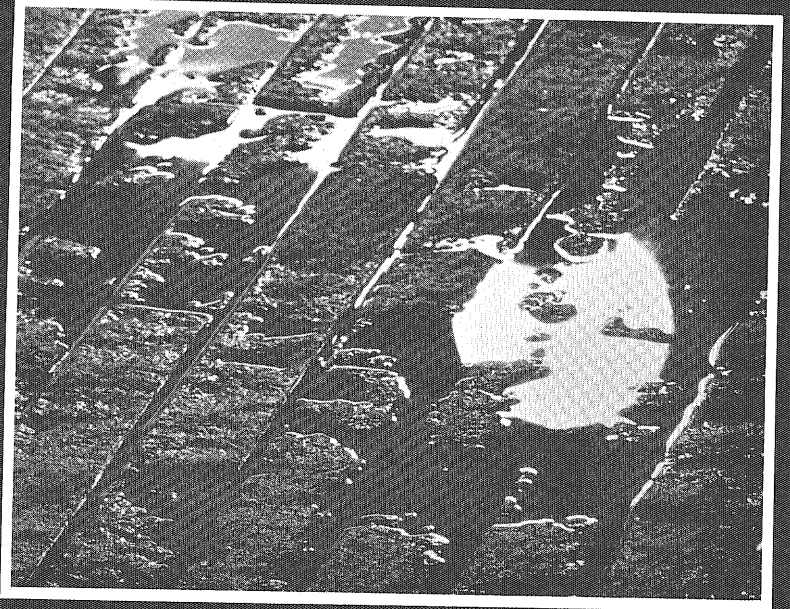
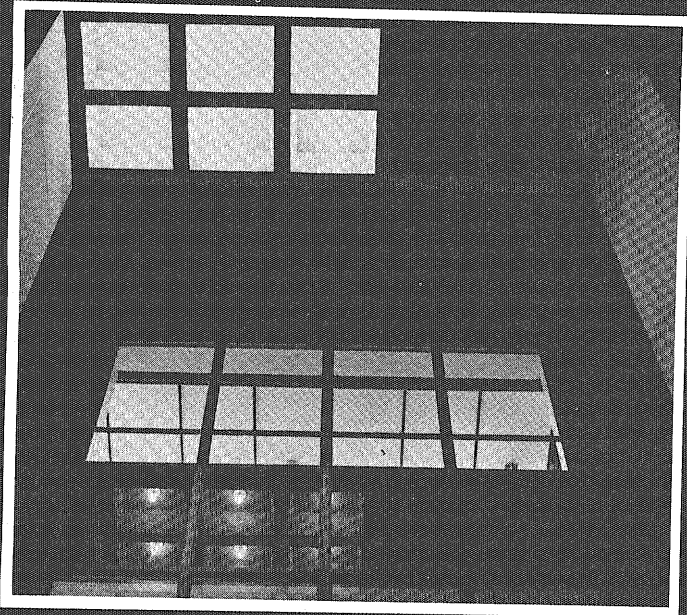


# All Quiet on the West Bank

Photos by Kevin Strandberg



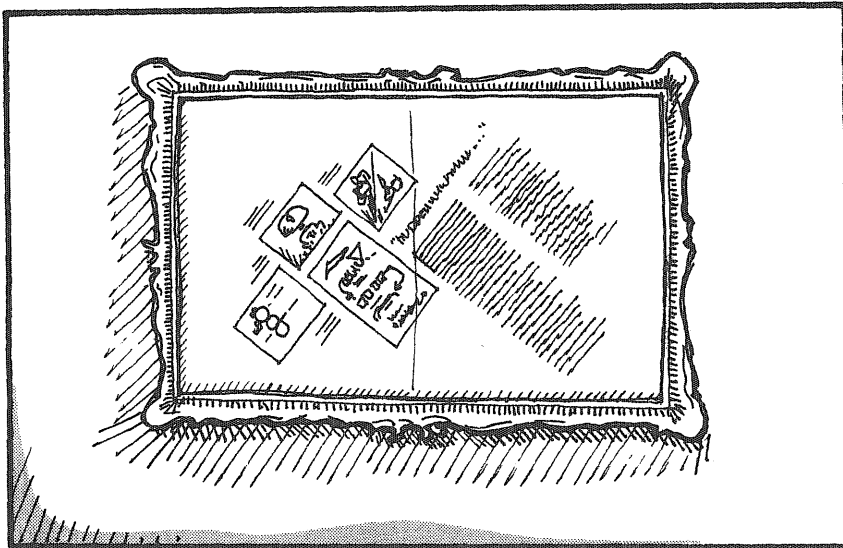




### Print from page 15

Like a road map, the dummy guides the printer in putting the publication together.

Several methods are employed by various magazines but the one we use is called the thumbnail. A thumbnail is the term used for any small scale sketch of a design. For us, the thumbnail is the most useful tool in planning the overall publication. Several dozen ideas and plans can be quickly sketched out in



The finished magazine! But now it's time to start on the next issue! Oh well.

the amount of time normally spent in drawing a full size layout.

After the editors are satisfied with the general layout of the total publication, the actual physical work begins. This stage is called the "paste-up" and involves many hours of work, usually leading to late night sessions in order to complete the work by scheduled deadlines.

After all paste-ups are finished they are sent down to the printer along with all art work and photographs to be included. From then on it is a matter of waiting for the printer to print the magazine and return them for distribution. Then, with a little luck, the magazine reaches it's readers, with very few or very minor mistakes, on time.■



by switching to smaller automobiles, electrified mass transit, train rather than truck transport for produce and manufactured goods, and expanded rail passenger service. The same is not true for Japanese and European consumers; since they are already efficient in their use of fuels and yet will have to face still higher petroleum prices.

For example, with the price of gasoline in France at \$1.20 per gallon, small cars, subways, and electrified rail have become common features of the French transportation system. As a result, further price increases may only be partially absorbed by greater transportation efficiencies; thus making it probable that further increases would have very adverse effects on the French economy.

Rising prices for imported oil may have a greater impact on the economies of the petroleum importing, developing, countries than on the developed nations, because import payments for oil represents such a high proportion of their total import expenditures. Wherever possible, the developing countries should design their transpor-

tation systems and industries to utilize indigenous hydroelectric and geothermal power and fuel resources. It is ironic that several of the developing countries which import petroleum already have extensive highway systems, but little or no electrified rail systems. This is partly the result of the support of highway construction by international aid organizations like USAID and the World Bank.

For all countries without large reserves of fossil fuels or hydroelectric power, nuclear power appears to be the only alternative to deteriorating balance of payments positions. Thus most of the world's developed and developing countries are attracted to nuclear power, even though the technology of commercial reactors is barely twenty years old and many unsolved social and environmental problems remain associated with it. Will the obvious near-term benefits outweigh long-term costs, or are the developed and developing countries taking nuclear power for their bride with only half a promise that their house will be kept clean and that there is nothing behind the doors?

Continued on page 24

**Institute of Technology Equipment Allocations Comm.**  
5 students and 5 faculty meet with administrators to allocate budgets for undergraduate laboratories. Departments provide tours of labs to Comm members.

**Institute of Technology Graduation Comm.**  
meets to plan graduation ceremonies, speakers, etc.  
Seniors only please.

**GRADUATE STUDENTS**  
in  
**Mechanical Engineering and other disciplines:**  
Curriculum Committee, Comm. on Computers, Graduate Assistantship Comm., Graduate Honors Comm., Teaching Assistant Awards and Evaluation, Library Comm.

**S.O.S. Board**  
meets occasionally to set up procedures for the student Ombudsman Service.

**INTERESTED?**  
Sign up for an appointment with student interviewers on one of the 3 Technical Commission billboards in Vincent Hall, Main Engin. and the Architecture hallway.

**ERIN GO BRAGH**  
Students are needed to run E-week activities: Monte Carlo-type bike race, home-made car race, home-made Brew contest, department displays, industry displays, and others.

**Institute of Technology Grievance Comm.**  
meets once a quarter to hear student grievances that are appealed from a lower level.

**Technology Trustees**  
meets once a month to review the Technog; graduate and foreign students desired.

This ad is made possible by an MSA Grant for the purpose of encouraging student governance.  
Tech. Commission.



# NOT LOGS NOT

## Ready, Aim, . . . Frap!

In the last few years, technology has come under attack by many people saying that there have been no significant applications of the body of science that we now have. (Try to say that fast!) But now we are pleased to introduce a new product that incorporates many new and advanced concepts — the Hemmorhon Camera\* with the patented Auto Hemmorex Lens system\*. We feel that this appliance (it can also be used as a waffle iron) is the best in its class. Produced and designed over the years by leaders in scientific design and production, Ron, Kevin and Aunt Stella, it stands apart (as far apart as possible) in its own right. Last weekend, Rhube & Co. were sent by the 'Log hierarchy to Twig, Minnesota to test the renowned Hemmorhon.

Our report follows:

**Model:** Skinflex 35 (SF35)

**Lens:** 57mm, f/4, 72 element lens, coated with refined llama sweat for greater resolution.

**Meter:** CDS system (30% spot, 30% averaging, 30% barometric pressure, 22% horrorscope, and the rest is blind luck)

**Vibration:** far above standard levels.

**Shutter Speed:** 2-7 sec.

**Focus Range:** 17 feet (to infinity minus one) miles.

**Source:** Made in Tibet by virgin monks.

**Weight:**  $e/174.13 \pm .05$  metric tons.

**Power Consumption:** 3 terawatts.

**Power Source:** 106 Carbon-Zinc battery pack or Grand Coulee Dam.

The test was conducted on a clear day in an abandoned open-pit mine. We found all of the necessary adjustment controls located on the top right of the camera body. All buttons are color-coded and are capacitance sensitive switches except the shutter release. We had the hair-trigger setup that requires 20 pounds of pressure to trigger the shutter. The f stops are changed by use of a recessed set screw made

for a pentagon allen wrench. The self timer is located next to the film advance lever. Unfortunately, it is accidentally tripped when advancing film for the next shot. But that still allows the photographer 12 seconds to find, compose, and focus his picture.

Craig posed and Pete took the shot. Taking the proper stance, camera held at arm's length over the head and eyes closed, Pete tripped what he thought to be the shutter release and waited for the rich "frap" sound, as contrasted with the cheap "crick" of the imported models. There was a small explosion as the explosive bolts detonated and the lens sailed five feet over Craig's head. Pete had accidentally touched the lens eject button. (The monks had abandoned the hexagonal screw mount after many unsuccessful attempts. The explosive bolt mount was used as a last resort.) We later found the lens buried in a pile of taconite tailings. (No doubt left on land by mistake.)

After finishing the film (17.5 exposures), we sent the roll to Tibet and are currently waiting for the exposures to be developed and sent back.

We feel that in spite of the minor drawbacks, the Hemmorhon is truly a unique instrument and will surely be a major factor in the photographic scene.

(\*Hemmorhon and Auto Hemmorex are trademarks of Blundr & Pest. Local office M.E. 2, U of M. Locally distributed by Rhube & Co.)

## My First Frigid Adventure

Joe Smedlock (not his real name, that's Aloiscious Smedlock) is a Log staff fiend from Alabama who is a frosh this year. Joe is studying to be president of the new Dixie. Last month while Joe was walking to his Basic Government Disruption class, he felt something cold on his face. He looked up (which seemed to him to be the logical direction to look, since he's only 4ft. 3in. tall) and saw something he had never

by Rhube & Co.

seen before; that is, tiny little white flakes falling from the sky by the hundreds (actually it was by the millions, but Joe can't count past one hundred and thirty-seven). Thinking that the FBI were just seeding the campus with radical reducer, he dismissed the occurrence without the slightest consideration. After he was done with classes, he went home, did his homework (which consisted of constructing two bombs to be planted in the Atomic Eng. Bldg.) and went to bed. The next day he woke up (a good thing to do in the morning, I'm



told) and proceeded to dress. Looking out the window trying to decide what to wear, he discovered that he couldn't (look out the window, that is). Deciding to go outside to study this new dilemma more closely, Joe opened the door and promptly got buried by the same white fluffy stuff he had seen at school the other day. After doing some research on the stuff, he found out it was called snow. Now when he had moved from Alabama, his friends had told him that it got real cold up in Minnesota (they told him it even gets down to zero some nights!) but no one had said anything about snow. Since it was now eleven o'clock, and he had already missed two of his classes, Joe decided to skip the day and clean up the snow. After breaking his bod shovelling the sidewalks, Joe decided to dig his car out. Finding a large lump in the vicinity of where the street had been (last time he saw it), he started to dig. After about 15 minutes he had unearthed (unsnowed??) the neighbors dog which had frozen the night before. After panicking for a few hours trying to find his car, Joe found the mail which contained a little

computer card stating that any cars left on the street overnight on any weekday after having 12 or more feet of snow would be towed and tagged by the city. Joe called the city police and found out that his car had indeed been towed and was in storage in Hinckley because city lots were full. Joe finally managed to get up to Hinckley and found out the charges were \$100.00 and another \$100.00 for towing back to the cities (Joe didn't have any snow tires, which are a necessity in 12 ft. of snow). This brought the bill up to \$200.25 (Joe tipped the tow truck driver) which wasn't bad considering Joe only paid \$150.00 for the car in the first place. After having the tow truck put his car in the garage, Joe finally went in the the house and callapsed in the nearest chair to study for his Basic Bigotry class. Just as Joe started studying, he heard a funny rumbling outside, and got to the window just in time to see the snow plow cover up his nice clean side walk with street slush. And so ended Joe's first lesson in basic survival in Minnesota. ■

What's New from page 16

## Why Don't We Put It in the Road?



A "garbage" highway might well be the road to a better environment of the future.

Sections of a road were paved with material containing composted household refuse. It appears to be not only as durable as standard asphalt roadway, but more resistant to cracks.

The paving material contains five percent compost in addition to the usual asphalt, sand and stone. Compost is made commercially by taking metals, glass and other nondegradable materials out of trash, and then grinding it and letting it decompose until mostly cellulose remains. It is a peat-like material that is normally used as a soil conditioner. ■

## BELL NEEDS ENGINEERS



How's that for a straightforward statement? But then, that's the type of company we are. We're straightforward in the answers we'll give to your questions regarding a career in the Bell System, and we're straightforward in our overall outlook as the world's leading supplier of communications service. We hope you'll agree that this makes us a good company to work for.

We offer careers for all types of engineers in all phases of the rapidly expanding communications field, including research, construction, manufacturing, marketing and technical administration . . . with locations throughout Minnesota and throughout the nation.

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#### Power from page 21

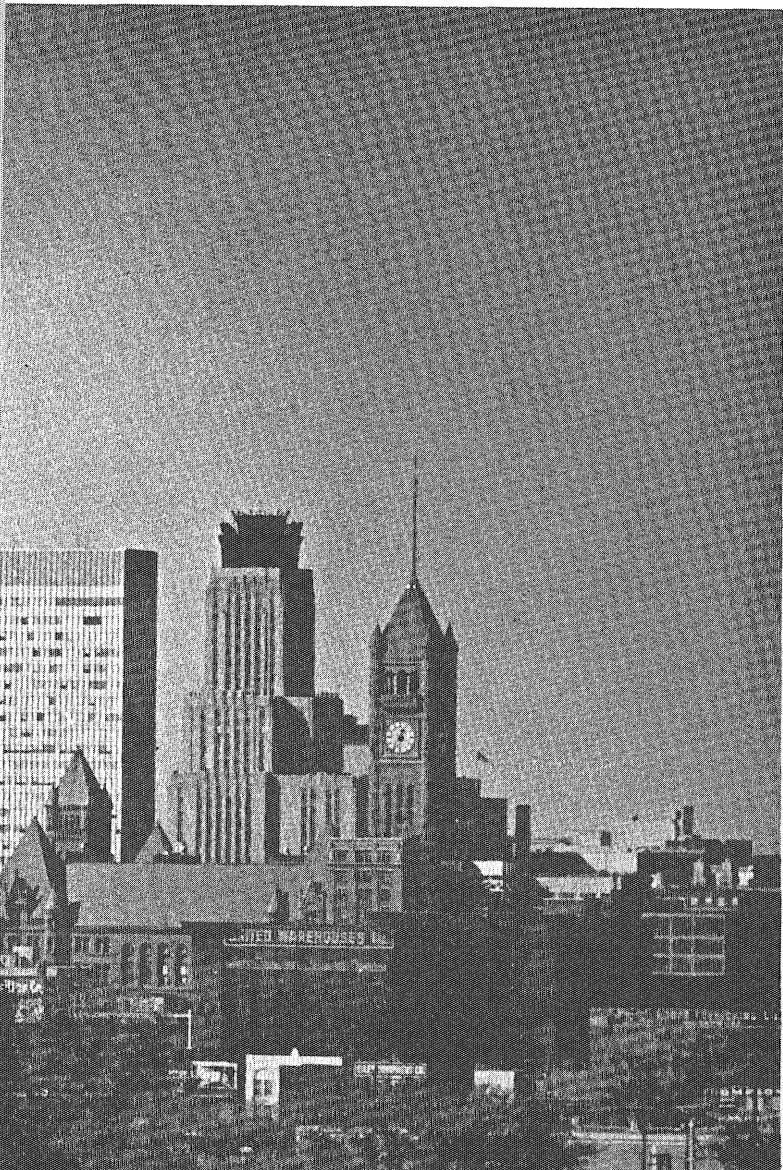
Is there another way of meeting the world energy demand? Part of the answer may lie in the U.S. growth curve for energy use, since we consume about 35 percent of the world's annual energy supply. Why has our consumption been doubling every ten years while the American population is doubling every seventy? Could the rate of growth for energy consumption be slowed without a drastic fall in the GNP? Might not per capita consumption be held constant by a combination of consumer education, taxation of electricity, natural gas, and gasoline, together with government and industrial support of more efficient use of energy and of non-energy intensive industries?

Stabilization of per capita energy consumption in the U.S. would of course not solve the problem of how the U.S. might reduce its 95 percent dependancy on non-renewal coal, oil, and gas for its energy supply; nor the problem of how to persuade other developed countries that they

should also reduce their rate of energy growth. It would, however, minimize the environmental and social impact of the short-term alternatives (nuclear power, oil imports, and strip-mined coal) and help stretch out fossil fuel supplies until new alternatives are developed, whether fusion, geothermal or solar in origin.

A major R. & D. program sponsored by government and industry to expand the use of alternative sources of energy, and more efficient energy technologies, would help reduce the economic impact of a slower growth rate for energy consumption. In addition, if energy industries could be encouraged to diversify into non-energy intensive conglomerates rather than continue their present movement toward concentrated control of fuels (e.g. oil, uranium, and coal), they would be able to withstand the economic effect of public programs designed to moderate energy use. ■





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#### NOTES

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# SPLITTERS

Two E.E.'s were overheard talking about an E.E. acquaintance.  
M.E. #1 "The poor guy doesn't know how to drink or play cards."  
M.E. #2 "Thats great!"  
M.E. #1 "You don't understand. He drinks but he doesn't know how, and he plays cards and he doesn't know how."

\* \* \*

Then there was the overweight Chem. E. who was put on a diet by the Health Service doctor and told he could eat anything he liked. Then the doctor gave him a list of what he liked.

\* \* \*

Note to commuters from the U of M police:  
There are at present two types of parking . . . "illegal" and "No."

\* \* \*

Found on a Fall registration card of a freshmen Physical Education major.  
Name of Parents: Mommy and Daddy.

\* \* \*

A hot young co-ed breezed into a local florist shop approached an elderly gentleman puttsing about the flowers and inquired, "Have you a Passion Poppy?" The old gent stared in amazement at the mini skirted, braless miss and stammered, "Hot damm, miss, you just wait till I finish prunin this here rose!"

\* \* \*

"Mr. Jones!" inquired the stern-faced French professor, "what do you think of French syntax?"  
"Hell!" replied the failing E.E. "I didn't know they had to pay for their fun."

\* \* \*

Hit by a speeding little red sports car while strolling along the road, the little hen got up, smoothed her feathers and clucked indignantly, "Fresh little cuss, but he didn't get anywhere."

Rookie cop to Vet:  
Rookie Cop: "What do we do with the prostitutes we pick up?"  
Veteran Cop: "Send them to the Virgin Islands for recycling."

\* \* \*

M.E.: "Thought you were going to visit that blond in her apartment last night?"

Chem. E.: "I was."

M.E.: "Then how come you were home so early?"

Chem. E.: "Well, we sat a while and chatted. Then suddenly she turned out the light . . . I can take a hint."

\* \* \*

Definition of an Engineer: One who passes us an exacting expert on the strength of being able to turn out, with prolific fortitude, strings of incomprehensible formulae calculated with micromatic precision from extremely vague assumptions which are based on debatable tests and quite incomplete experiments carried out with instruments of problematic accuracy by persons of doubtful reliability and rather dubious mentality.

\* \* \*

Dean of students: "I have a report here that Coke, 7-up and whiskey were found in your dorm room. What do you make of that?"  
E.E. student: "Highballs, sir."

\* \* \*

CHICK: "How about a date big boy?"  
FORESTER: "Can't, I got to go to bed and get some sleep."  
CHICK: "Why?"  
FORESTER: "Tomorrows my rough day. Gotta shave."

\* \* \*

A gorgeous, mini skirted, braless blonde walked into the dress shop and inquired: "May I try on that blue dress in the window?"  
"Go ahead," the owner said, "It may help business!"

by Greg Smetana & Kris Kampf



## Science Fiction

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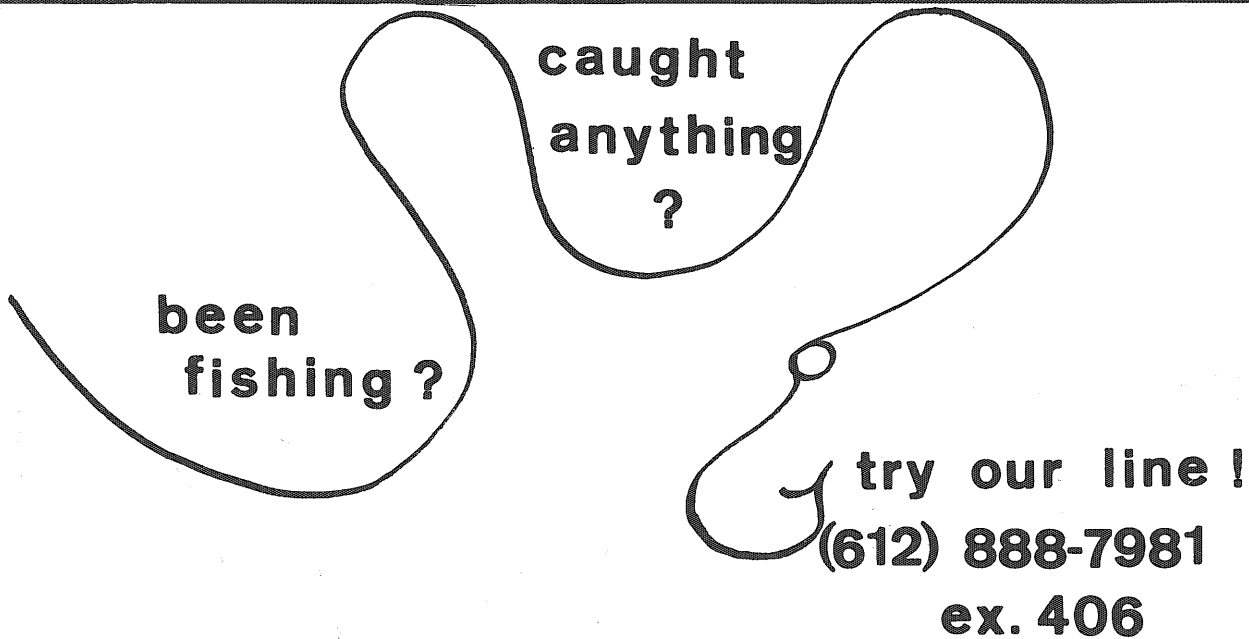
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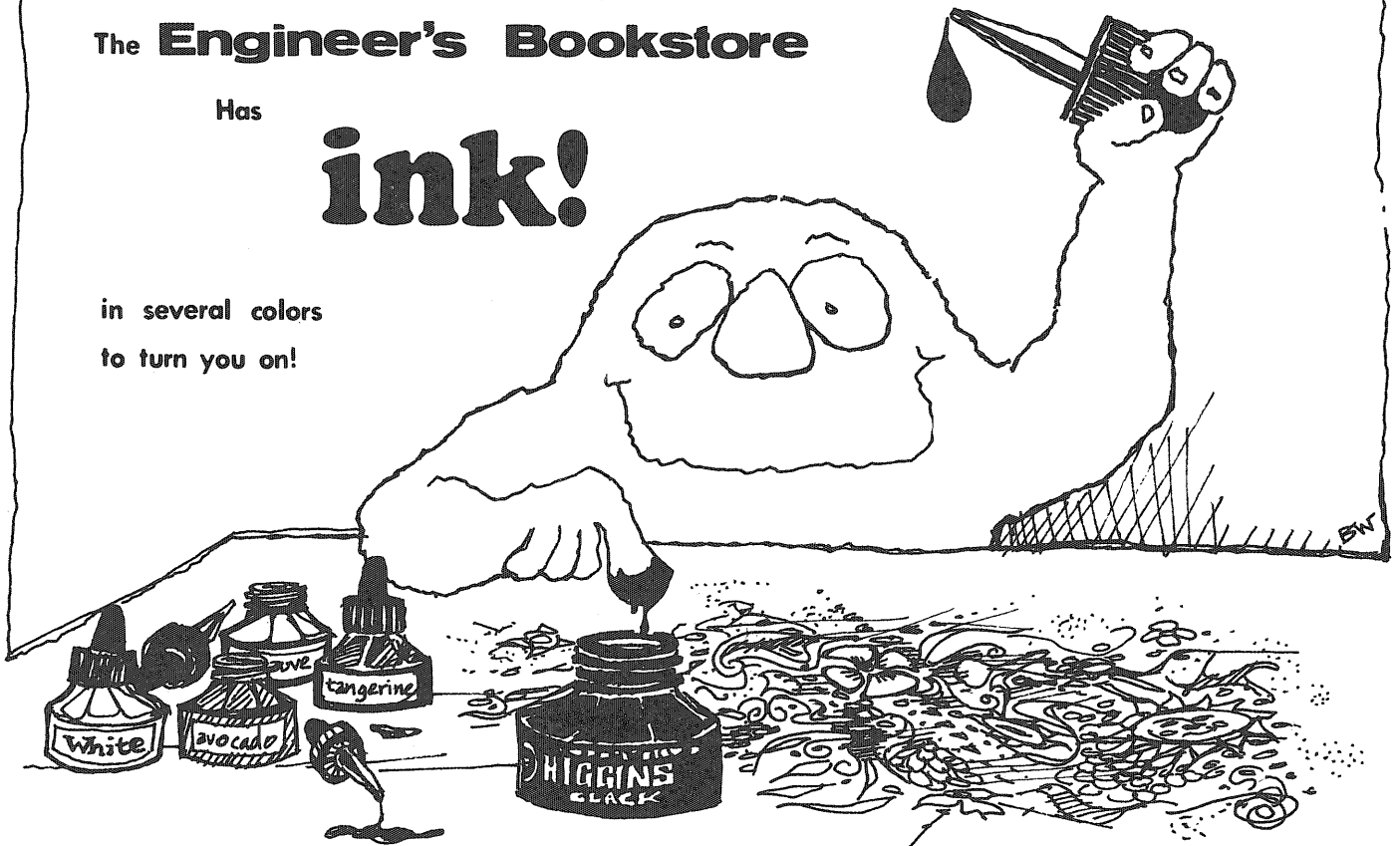
Don Neal investigates the manufacture and use (or misuse) of snowmobiles.

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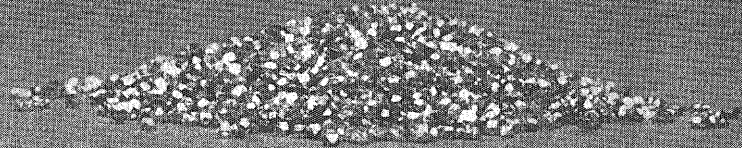
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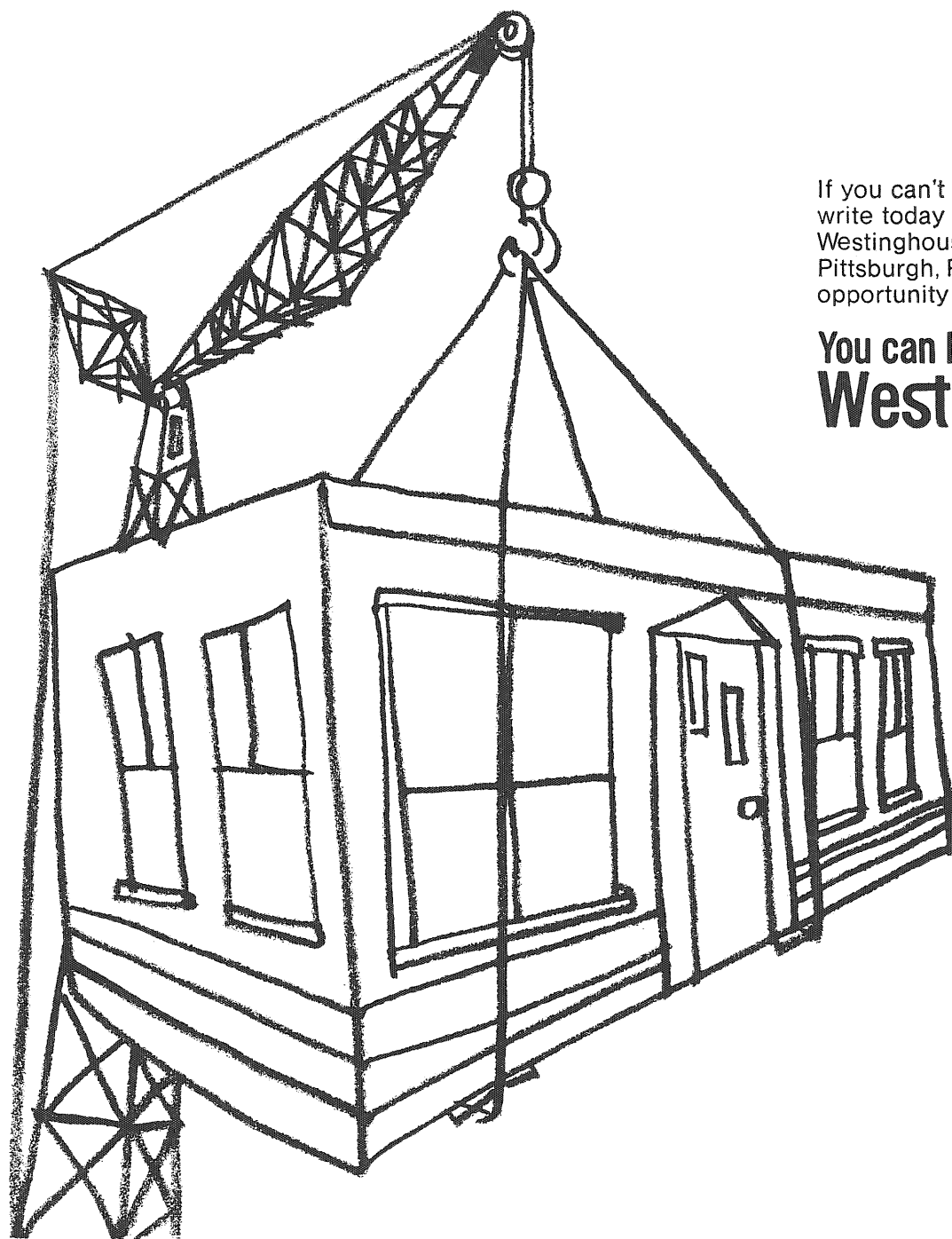
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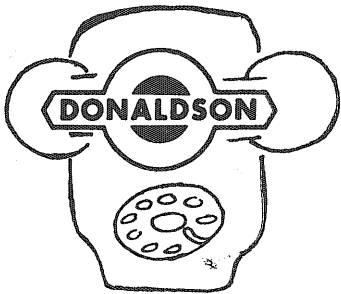
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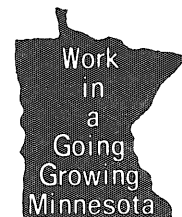


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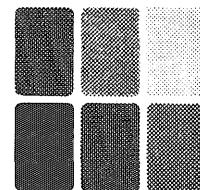
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### CORPS OF ENGINEERS

# TECHNOLOG

VOL. 52; NO. 5

Official Student Publication of the Institute of Technology, University of Minnesota

FEBRUARY, 1972

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Published monthly, October through May. Second class postage paid at Minneapolis, Minnesota. Office: Room 2, Mechanical Engineering Building, University of Minnesota, Minneapolis, Minnesota 55455. Telephone: 373-3298. Printer: Artcraft Press, 425 South Fifth Street, Minneapolis, Minnesota 55415. Publisher's National Representative: Littell-Murray-Barnhill, Inc., 60 East 42nd Street, New York, N. Y. 10017. Publisher's State and Local Representative: University Engineering Magazine Advertising, F. P. McGrath, Manager, Box 14026 University Station, Minneapolis, Minnesota 55455. Telephone: 612-225-0708. Member of the Engineering College Magazines Associated, Chairman: Daniel L. Griffen, Iowa State University. Subscription rate: \$6.00 per year, single copies 50¢. Advertising rates upon request. Any opinions expressed herein are not necessarily those of the Institute of Technology or of the University of Minnesota. Copyright © 1972 by the Minnesota Technology Board. All rights reserved. Reproduction in whole or in part without written permission is prohibited.

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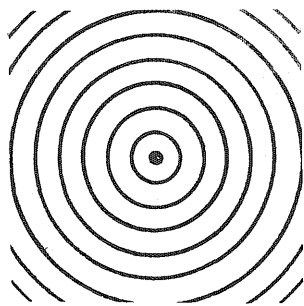
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## TECHNOLOG



"State of the Art" by Kevin Strandberg. The technology of man is like the art he produces. Art was revolutionized so must be technology.



## Adviser, Where Were You?!

The results of the IT survey, taken last spring, have recently been released. We feel that the section concerning the advising system is of particular interest to all IT students.

From the survey, it is obvious that the present system is failing to serve the student. Work is being done to drastically revise the system and, hopefully, changes will be made soon.

The following is, in part, the Tech Commission report on the survey.

Over 45% of the students will see their advisor once a quarter, while 27% will see their advisor once a year, probably to have their one-year plans approved. Only 9% of students will see their advisor more than twice a quarter. These statistics should be looked at in conjunction with the availability of the advisor. Only 14% said that their advisor was always available, while 58% said that he was usually available, 21% said that he was seldom available, but only 3% had advisors that were never around.

When asked if they had only gone to their advisor to have forms signed, 46% said yes. 50% had gone to see their advisor for "advising" purposes. This would seem

to indicate that either the students or the faculty have misinterpreted the purpose of the advising system—to help the student plan his courses in a coherent program, using the advisor's experience in a certain field. This is borne out by the fact that around 43% of the students have not seen their advisor for help in planning their non-technical program, while 66% have not seen their advisor for help in planning their non-technical program, and an amazing 80% have not asked their advisor for career advice, and only 4.6% have gone to their advisor for on personal matters.

Approximately 50% think their advisor is "moderately" interested in his advising role. 26% feel their advisor is "keenly" interested in his role. 20% said their advisor was less than interested or completely disinterested.

The caliber of the advisors seems to be called into the question by the results of the survey. Only 44.9% of those polled think their advisor is competent and well-informed on matters pertaining to technical courses and programs, 39.7% think that their advisor is only moderately well-informed, while 10.8% feel their advisor is poorly informed. The advising system breaks down almost completely when it comes to helping students with liberal education. Only 16% feel their advisor is competent on matters of

liberal education courses. 52% feel he is moderately well-informed, 23% feel he is poorly informed, and 3.4% had advisors that were unwilling to advise on liberal education courses.

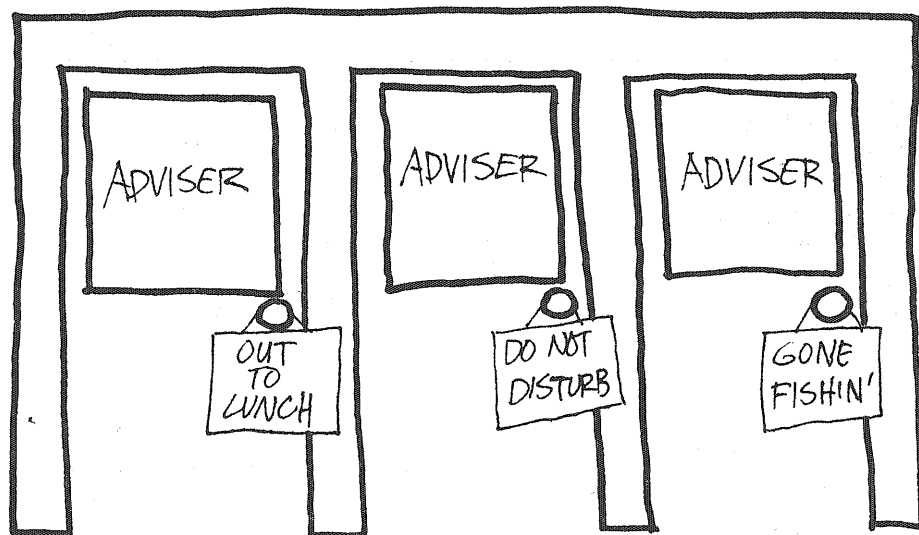
When asked to evaluate their technical program, 44% felt that their program was largely coherent and well-planned, 27% felt that their program was somewhat arbitrary or lacked focus, and an amazing 24.7% had not evaluated their technical program yet. This reflects not only on the advisors, but on the Institute of Technology as well, since IT is one of the most heavily-structured colleges in the University. Perhaps the administration should take a look at their programs, and ask the various departments for their suggestions on how to make the programs appear more coherent to the student. The student also has the responsibility to make his own education coherent and meaningful to himself. 51% feel that their liberal education to be somewhat arbitrary or haphazard. Only 21% feel satisfied with their liberal education, while 23% haven't evaluated their education yet.

Those that saw their advisor once a year felt that their program was somewhat arbitrary or they had not evaluated their program yet.

28% of those that said their technical program was somewhat arbitrary said their advisor was seldom available for advising. This contrasts with 18% that were satisfied with their program that said their advisor was seldom available.

It turns out that of the group that feels their technical program is coherent, 33% said their advisors were keenly interested, compared to 20% in the "arbitrary" group. Those that had keenly interested advisors had the greatest percentage of coherent liberal education programs.

54% of those with coherent programs in technical fields felt their advisors were competent and well-informed, while only 40% of those with somewhat arbitrary programs





# "Crazy Poet"

felt their advisors were competent. Only 7.2% of those with coherent programs felt their advisors poorly informed on technical matters, compared to 15.8% of those with somewhat arbitrary programs.

The lack of advisor expertise in liberal arts education is shown by the fact that only 25.4% of those with coherent liberal arts programs felt their advisors were competent and well-informed about CLA courses. Only 13.8% of those with somewhat arbitrary CLA programs felt their advisor was competent and well-informed about CLA courses.

There is a bright spot in this report, though. The percentage of students who think their technical programs are largely coherent increases dramatically the longer they are in school. Only 35.5% of freshmen think their programs are coherent, versus 52.1% of the seniors and 63.6% of the grad students. However, this increase comes about from those that had not evaluated their technical programs.

This segment of the survey shows that the advising system as constituted now is only doing a half-job. Not even a majority of the students feel their advisor is competent to advise *in his own field*. Only 16% feel their advisor is well-informed on CLA matters.

An advisor is someone the student is supposed to come to with his problems and questions about certain courses and get answers that will help them. Obviously no one ever told all the advisors this. To make this advising system work, there must be a concerted attempt by the faculty, who are our advisors, to become better informed about both IT and CLA courses, and to become more available to the students.

Something must be done to transform our present system of advising into a more viable structure that will benefit both students and faculty. ■

\* \* \*

We appreciate receiving the letter from Mark English concerning December's "Reverb".

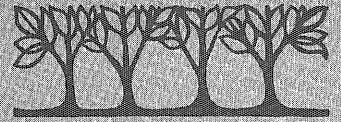
We agree that stating the letter was "printed exactly as received" was misleading. This implied that we were concerned *primarily* with the grammar, spelling and punctuation, which we were not. Correct grammar, spelling, etc., are important since they reflect the image of the writer and are essential to clear, precise expression. Maybe they should be handled in Freshman English.

Our primary concern, though, was with the content of the letter. This freshman was blatantly saying, "I do not want to be educated." The reason for Freshman English is to understand that "crazy poet". As Dean Swalin wrote in November's "Reverb", ". . . it is insufficient to learn only chemistry, physics, and mathematics, for example. The engineering or science student must have a knowledge of areas of intellectual endeavor such as philosophy, psychology and history. The student must be able . . . to place the social system in which he or she lives . . . in perspective". This must be done to "train individuals to control technology". Understanding that "crazy poet" is exactly what Dean Swalin means.

An engineering degree is a professional degree, much like a doctor or lawyer. Webster defines *professional* as "someone who is worthy of the high standards of a professional; someone who is worthy of professional quality and status." We believe that to attain the status of a professional, one must be a *totally* educated person, one with a basic knowledge of literature, the arts, etc.

For these reasons, we certainly disagree with Mark English's opinion that an IT student's needs in English are different from that of the CLA student./BJ,RR

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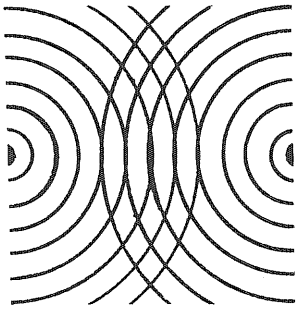
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# REVERB



## Special Grammer for I.T.?

Having talked to the freshman who wrote the letter in the December issue of the *Technolog*, signed "IT freshman", I must take issue with your comments on it.

His argument with freshman English, which you failed to notice, is with the material presented. There is no attempt in the English program to tailor the class to fulfill the needs of engineers, which are manifestly different than those of a history or a sociology major. An example of what the English program could become is found in the teaching of math and physics to non-IT students. Those courses, Natural Science, for example, are less difficult and less detailed than the IT courses in the same fields. This is done for the very excellent reason that those students taking the courses are in non-technical fields. I feel that this same consideration should be extended to IT students. Certainly no one will argue that my specific needs in the English language are the same as the needs of a CIA student.

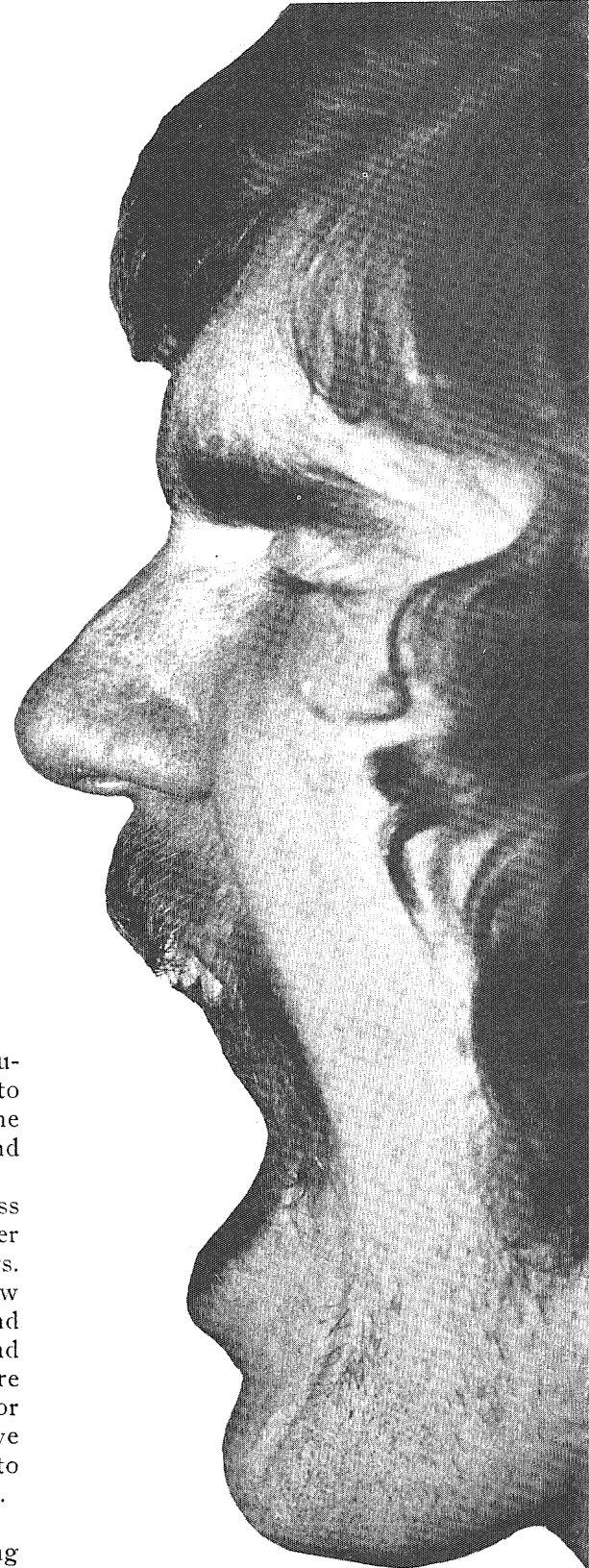
It was extremely misleading to print the freshman's letter exactly as received and charging that freshman English could cure these faults. This is blatantly untrue. Freshman English doesn't teach grammar or punctuation. It is assumed that this knowledge was picked-up in high school. Obviously it is not. All the freshmen I have talked to expressed difficulties in usage of grammar, and also said that freshman English does nothing to correct them. This seems the major failure of the program as presently constructed.

Your amazing assumption that one letter proves that all IT freshmen need to take English courses is completely unsubstantiated. It proves *only* that more time should be taken in the freshman English courses to teach grammar and punctuation to those that show they help. But, then again, your com-

ments tend to support your argument—that IT students need to take freshman English, and in some cases, how to correctly read and understand a piece of prose.

The freshman English class should be changed to suit better the needs and talents of engineers. It should help the student know how to understand writings and how to express himself clearly and precisely. I do believe that there is a need for freshman English for most IT students, but I also believe that it should be reconstructed to better educate the students of IT.

Mark English  
Junior, Electrical Engineering

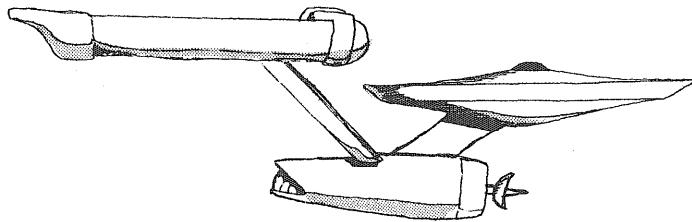


## Focus

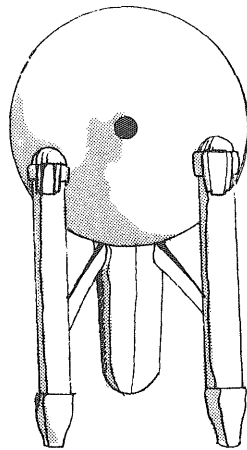
E-Week will deal with social and environmental problems

The Tech Commission (the student governing board of I.T.) is beginning to plan Engineering-Day programs on environmental and social issues related to engineering. The 1972 E-Day may be somewhat of a break from tradition, but it is expected to create more widespread interest with I.T. and the University as a whole.

Programs will include seminars, displays, and a bicycle event. If funds are available and student interest is strong, it may be possible to sponsor nationally famous speakers and a wide variety of display projects, slide showings and films. Interested students or faculty should contact the Tech Commission, Room 230 TNCE, 373-7729.



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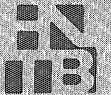
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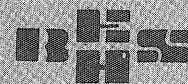
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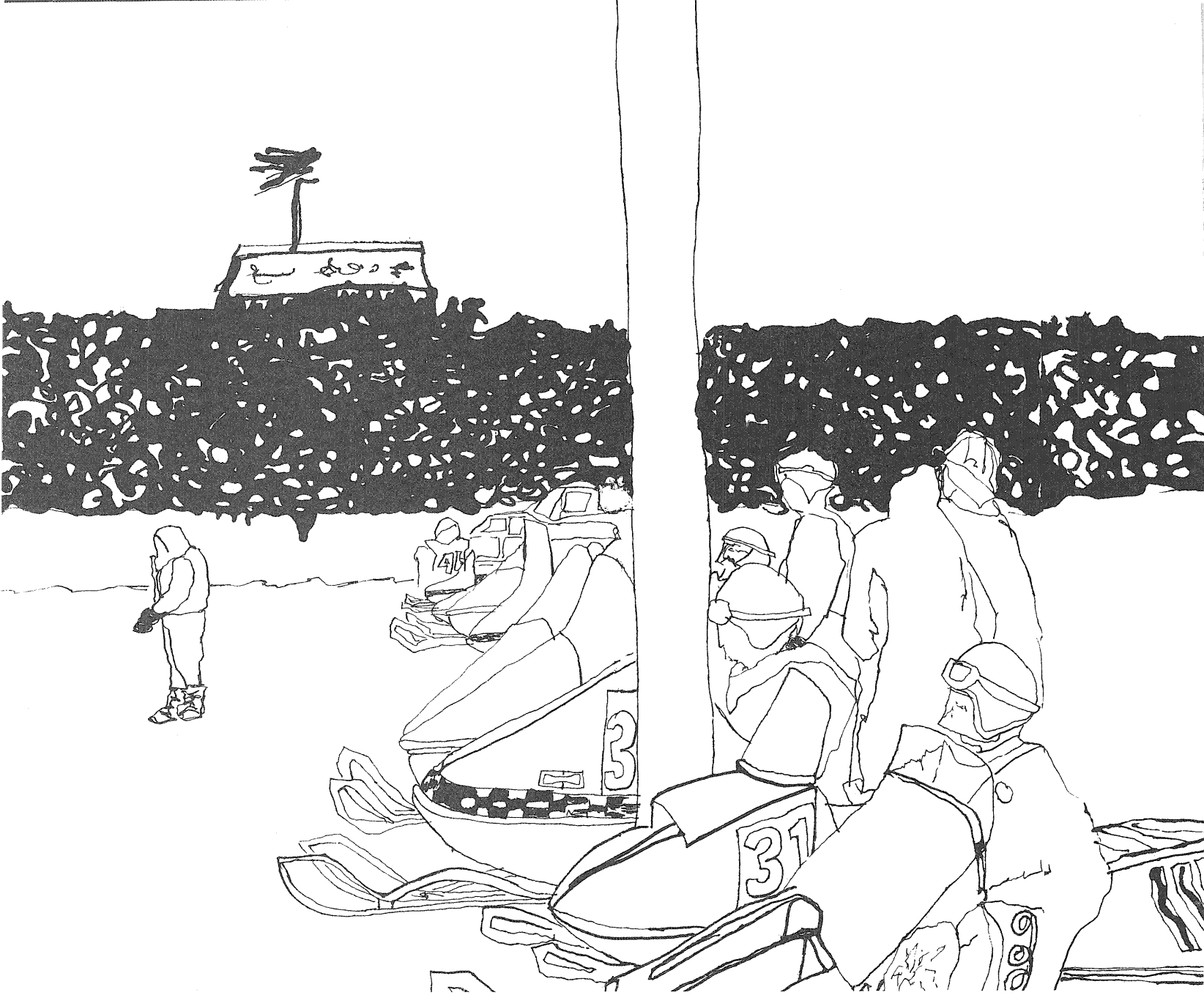


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# Snowblind

**"America has gotten along terribly well without the snowmobile for some centuries. I suggest we can do without it indefinitely."**

by Morten Lund

*Reprinted by special permission from the October, 1971, issue of Ski magazine.*



**T**he good books says 'Love thy neighbor.' But when your winter neighbor is maiming wildlife and filling the air with noise and acrid exhaust, you learn to dislike him. How did snowmobiling get so popular in five short years?

Ten years ago, the phrase "over-the-snow vehicle" had a friendly ring to it. The image was positive: a helpful mountain tractor, a trail-smoother, an ice-chopperupper. Today, "over-the-snow vehicle" brings to mind a Le Mans open-exhaust, gas-powered buzz-saw on metal skis that rides in circles just outside the windows of the lodge as everyone inside gets ready to relax after a pleasantly exhausting day outdoors. And the buzz-saw rides. And it rides. And it rides. And the moon comes up, and other metal-monster buzz-saws join in: The whole screaming tribe gleefully slaughters every last vestige of gemulllichkeit. The peace and evening ambience has been shattered to a final, irrevocable death and the victims are mad as hell.

There are a lot of victims. There are a lot of snowmobiles.

Last year their number topped 1.6 million in the United States and Canada; less than a tenth of these existed five years ago. Since there are three users (average) to a snow vehicle, more people snowmobiled than skied last year. It's been five years of wild lemming-like reproduction. There will be more of the same. One half million more metal monsters will be delivered by the end of this winter; another half million next; and the next; ad infinitum. Where it will all end, God alone knows.

Perhaps He will get angry.

Almost everyone else who is not a snowmobiler but in range of the noise, already has.

"We've lost all peace and quiet in the woods," said a Maine man. "That's about the way it is now. Any place you go, it sounds like a chain saw."

"You've got areas in this state whose snowmobilers are regarded as the next thing to Attila The Hun," said the director of the Michigan State Police.

The prevalence is frightening. The prognostication for Maine is one snowmobile for every three cars in the state. Snowmobiling is now definitely the

Continued on page 23

**Marginal land:  
the same area  
raises 30 chickens  
or 1 ton of catfish**







The farmers at a "Kombinat" (collective farm) in Nasice Breznica, Yugoslavia are really making their acreage pay off.

They flooded it, and are raising good old American channel catfish.

About three years ago, FMC visited the Kombinat as part of a state department-approved agricultural development program. At the time, the Yugoslavians were raising carp in huge man-made ponds covering marginal land—land not best suited for crops. "Why not switch to farming catfish?" we asked. "They yield twice the harvest. And they bring a premium price in the marketplace."

The Yugoslavians said, "Good idea—where do we get the fish?"

That's when our work began. We contracted to ship them 21,000 fingerlings, 110 brood stock, and 120,000 newly hatched "fry," knowing live fish shipment mortality rates often reached 50%.

To do this job, special FMC containers were developed to fit into the baggage compartment of a Pan Am 707. They maintained precise life support levels of oxygen, carbon dioxide, ammonium, and controlled thermal levels, too. During four 50 hour trips from St. Louis to Yugoslavia we lost just six fish. A record.

More importantly, Yugoslavia has more productive "farmland."

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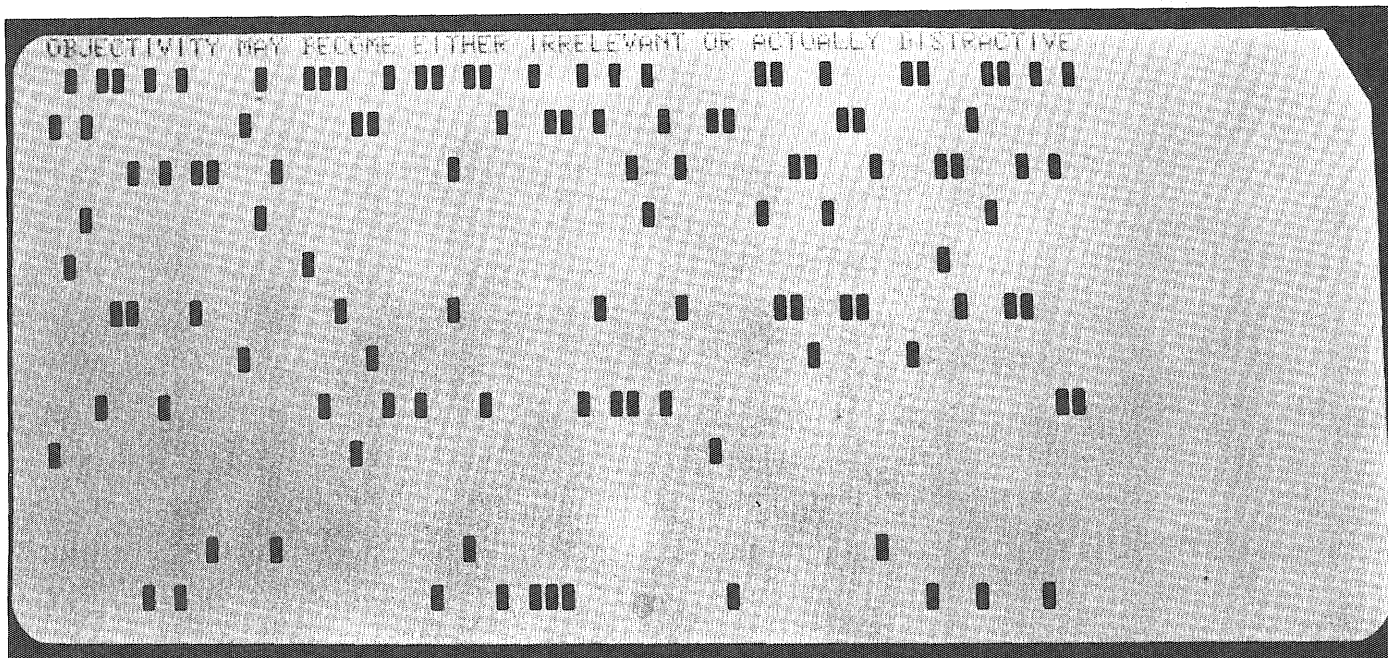
# The Myth of Scientific Objectivity

by Dr. Martin Dworkin

**These are the editorial comments of Dr. Dworkin and not necessarily the views of the Minnesota Technological Institute of Technology. Anyone having opposing views will be given equal space.**

Most laymen are convinced of the myth of scientific objectivity; most scientists insist on it. In a normal world, beset by uncertainty, the notion of objective truths can be a comfort. Misleading—but a comfort nevertheless. In a world, however, where





disaster is within our grasp, the near-religious insistence on objectivity can guarantee that disaster. It can do so by relieving us of the painful and difficult burden of making moral judgments about our work.

The purpose of this article is a polemical one. I wish to argue that science, by its very nature, has important non-objective dimensions. It should follow, I hope, that the shield of objectivity behind which the scientist has often vanished as a shadowy non-person, must itself vanish.

It would be presumptuous for me to try to offer philosophical arguments. The elegant and powerful reasoning of Michael Polanyi (e.g. see "Personal Knowledge") leaves little for a layman to contribute. I wish to talk to you as a working scientist concerned about the social and political implications of "objective" science.

I came to a recognition of the problem via two routes—a political one and an academic one. The former was my involvement in a debate within the microbiological profession. It concerned whether or not the American Society for Microbiology should provide an advisory committee for the biological warfare research activities at Fort Detrick, Maryland.

The latter route travelled through a course given by a colleague of mine in Humanities. The course, called "Science and Humanities" was concerned with the struggle between these two ways of looking at reality, and their attempts to capture ones way of life. We examined the classical science-humanities debate between Matthew Arnold and Thomas Huxley as well as the more recent C. P. Snow — Leavis polemic. During our attempts to recognize the differences between the historian-poet-philosopher and the scientist, as they all struggled to describe reality, it became clear that in the minds of many the issue of objectivity was a central distinction. It also became clear, as we pursued the question in greater depth, that the issue of objectivity was less a **fundamental** distinction than was apparent from a super-

ficial glimpse of the problem.

The biological warfare debate was equally revealing. Time and time again microbiologists would stand up at meetings and insist that biological warfare had no moral dimension for a microbiologist **as a microbiologist**. We were doing what we were trained to do — microbiology. And it could be neither right nor wrong, but only good or bad microbiology. The implication was clear that from nine to five we could be microbiologists working on bacteriological weapons, and from five to nine we could be private citizens outraged at the government's misuse of our work. I was consistently impressed by the observation that the above type of statement was usually made by those of my colleagues who tended toward political conservatism and that the converse relationships also held true. It became clear that whether we supported or denounced the purely objective, impersonal view of our work we were all making political statements about that work.

So much for the background. Let me proceed with my argument that the scientist who is indeed purely objective can be neither a good scientist nor a moral individual.

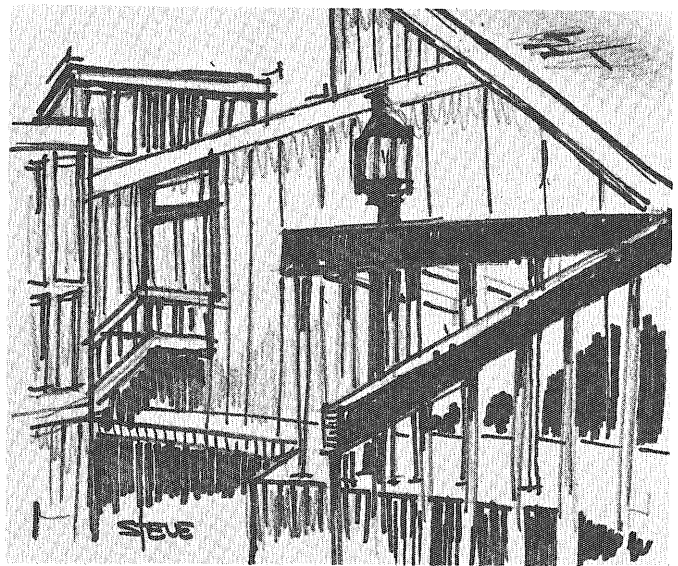
There are at least three major dimensions of science where objectivity becomes either irrelevant or actually distracting. First, there is the matter of premises. One might paraphrase St. Thomas Aquinas on religion by saying about science — "If one accepts the original absurdity, all else is logical." Science itself deals not with the original absurdities but rather with the series of logical connections that one makes, within the bounds of unprovable premises. Is one a Freudian or a Skinnerian? Does one start with wave theory or quantified particles? Is one a mechanist or a vitalist? The choices go on and on. Regardless, one can construct an internally logical system with any of them. What's more, most of them work; i.e. they permit predictability in the areas within which most of us exist. So it is important to recognize two aspects of our premises; 1) they are arbitrary

Continued on page 29

MINNESOTA TECHNOLOG

# Living Room

## New dimensions in city and country housing



by Jennifer Kerr

A 1968 congressional study showed that 2.6 million new or rehabilitated housing units per year were needed in the United States. Last year, housing repair and construction fell one million housing units, or 39 percent, short of that goal. Much of the new housing being constructed to meet these needs is not very encouraging—mobile homes, “cracker box” (two-and-a-half story walk-up) apartments, and rows of suburban houses that look alike. Even when the design is good, the planning and unity of the neighborhood are often poor.

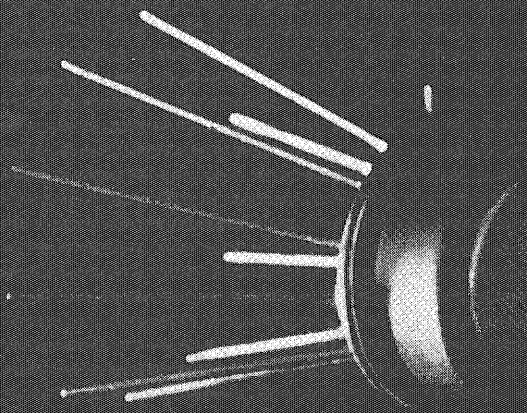
“Traditionally, society has categorized housing,” Duane Thorbeck, a lecturer, said. “Here’s a highrise for the elderly, here are some apartments for young people, and here’s an area for families. And right now, most municipalities require side yards and front yards, which have nothing to do with livability.”

Some alternatives to this type of construction and city planning (or lack of it) are being researched, tested, or built, in the Twin Cities area. The Minnesota Experimental City Project, a plan for a new city with very efficient systems of mass transit, shipment of goods, and solid waste disposal, is being researched at the University. Pentom, Incorporated, a housing corporation, is testing the assembly line production of housing units that can be stacked in very unique spatial arrangements.

Construction has begun for both the Cedar-Riverside and Jonathan projects. Both these projects attempt to bring persons of different socio-economic and age groups together into the same community, and to integrate educational, arts, and shopping facilities into the neighborhood. Planned Unit Development (PUD) ordinances, which make exceptions to zoning laws when it seems appropriate to do

Continued on page 20





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**That cylinder, the size of a pea, is a building block of all space-age electronics gear. Soon millions will put more zip in your mail. And nickel's helping make it happen.**

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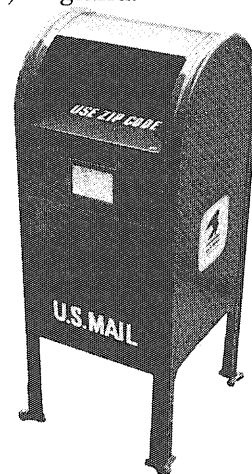
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# WHAT'S NEW

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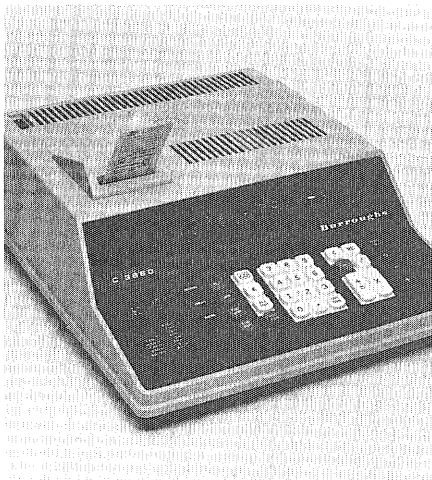
The Novo Biplax 2/83NL is unique, in that it has two pairs of root scales, W1, W1', W2, and W2', on

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The decimal trig log log slide rule is designed for students, engineers, scientists, physicists, mathematicians and others requiring a highly versatile, yet compact rule.



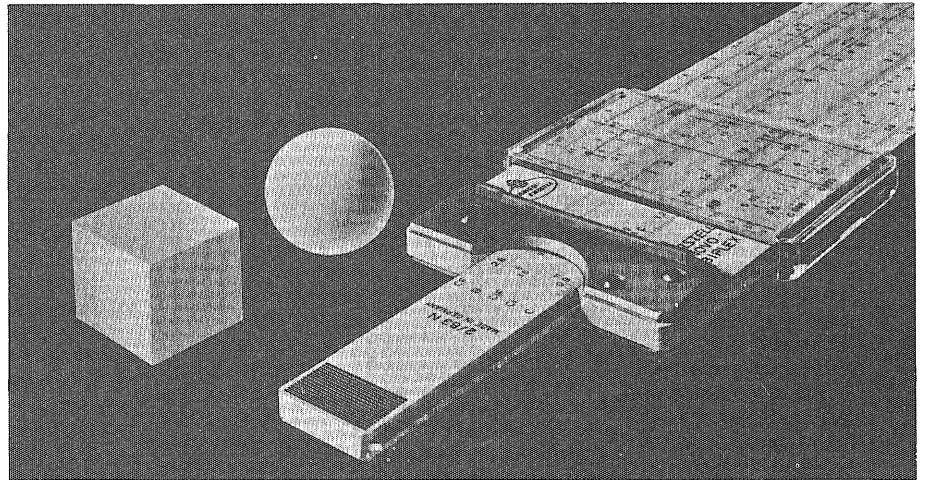
### It All Adds Up

### Small Calculator Memorizes Programs

A powerful new electronic display calculator with automatic program input from magnetic cards has been announced.

The C 3660 Programmable Calculator has the simplicity of operation, compactness and low cost of the desk top electronic calculator, combined with the decision-making ability of a computer, internal memory for storage of programs and data, automatic operations and the reading in of programs from magnetic cards.

Completed programs can be loaded into the C 3660 program memory through keyboard input, then transferred from program memory to a magnetic card, two inches by four inches in size, which can be used repeatedly to provide for a fast and accurate program input.



The new calculator can be programmed to solve complex mathematical formulas applicable to all lines of business. The C 3660 release includes a library of written programs for business, finance, insurance, statistics and engineering for immediate use in customer installations.

The programming power of the C 3660 includes a 14 4-step program memory, 10 storage memories and 15 branch instructions. The computing unit uses 32 digit computing capacity and 16 digit display to perform five arithmetic functions, including square root, with maximum accuracy.

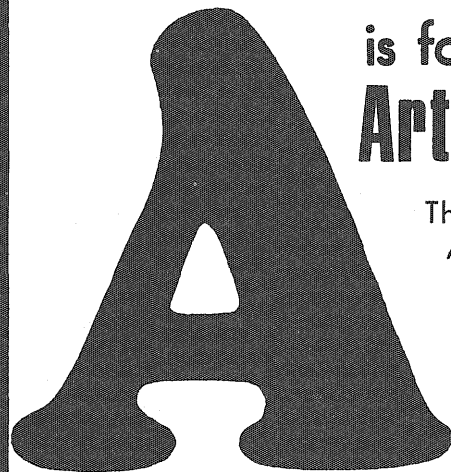
The new calculator is 13.5 inches wide, 4.75 inches high and 16 inches deep. It weighs 17.75 pounds.





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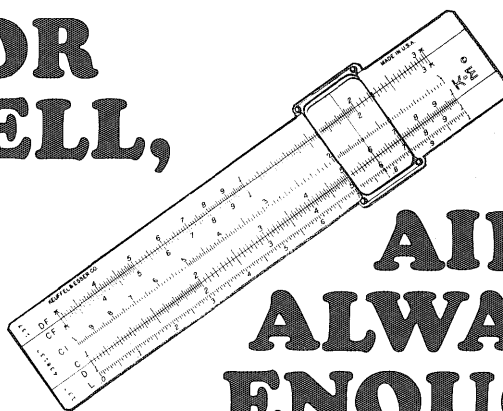


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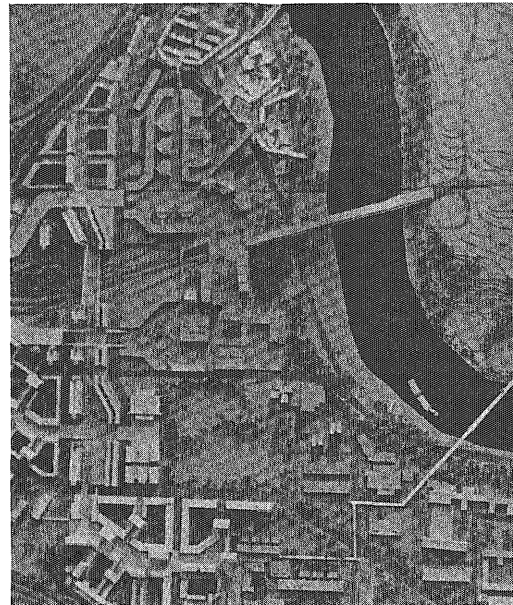
so, has made it possible for Jonathan, Inc. and Cedar-Riverside Associates, Inc. to proceed with plans which would normally be prohibited by zoning laws. Pemton, Inc. will also make use of Planned Unit Development, should it decide to go ahead with its Unimod project (the assembly line built homes).

Zoning laws usually prescribe that dwelling units must be detached and X number of feet apart. "But by reducing the lot size, a developer doesn't have to build on every bit of land," according to Wayne Cox, assistant housing coordinator of the Metropolitan Planning Commission. "More usable open space is protected and left open." Planned Unit Development also allows the developer to have "some town houses, some apartments, some single family detached, and a shopping center within the neighborhood. You can get some variation within a living area. It doesn't have the sprawl effect. You can also have pedestrian walkways. It is an opportunity to create unique living communities."

"About 20 municipalities in the Twin Cities have ordinances providing for Planned Unit Development," Cox said. "It's fairly recent in our area. In the east, it was used before the turn of the century." It was dropped in favor of zoning, but started coming back into use about 10 years ago.

Cedar-Riverside Associates, Inc., which was started 10 years ago by Keith Heller and Gloria Segal, has many innovative plans for the West Bank in Minneapolis. One feature of the Cedar-Riverside project will be integration of various socio-economic groups. There will be some single family town houses, several apartment buildings of different kinds and heights, subsidized and non-subsidized housing units within the same buildings, and probably some condominiums and cooperative apartments. The combination of subsidized and non-subsidized units within the same apartment building is being made possible by the federal 236 program. Barbara Kueppers, assistant to West Bank developer Gloria Segal, said, "Cedar-Riverside Association has also been trying to make it possible for students to benefit from the housing subsidy. Discussions have begun to find a way to make this possible. The law permits only 10 percent, single, unrelated individuals to live in a moderate income subsidy project. Married students qualify with no restriction. What we are doing is finding a way single students can use it, too."

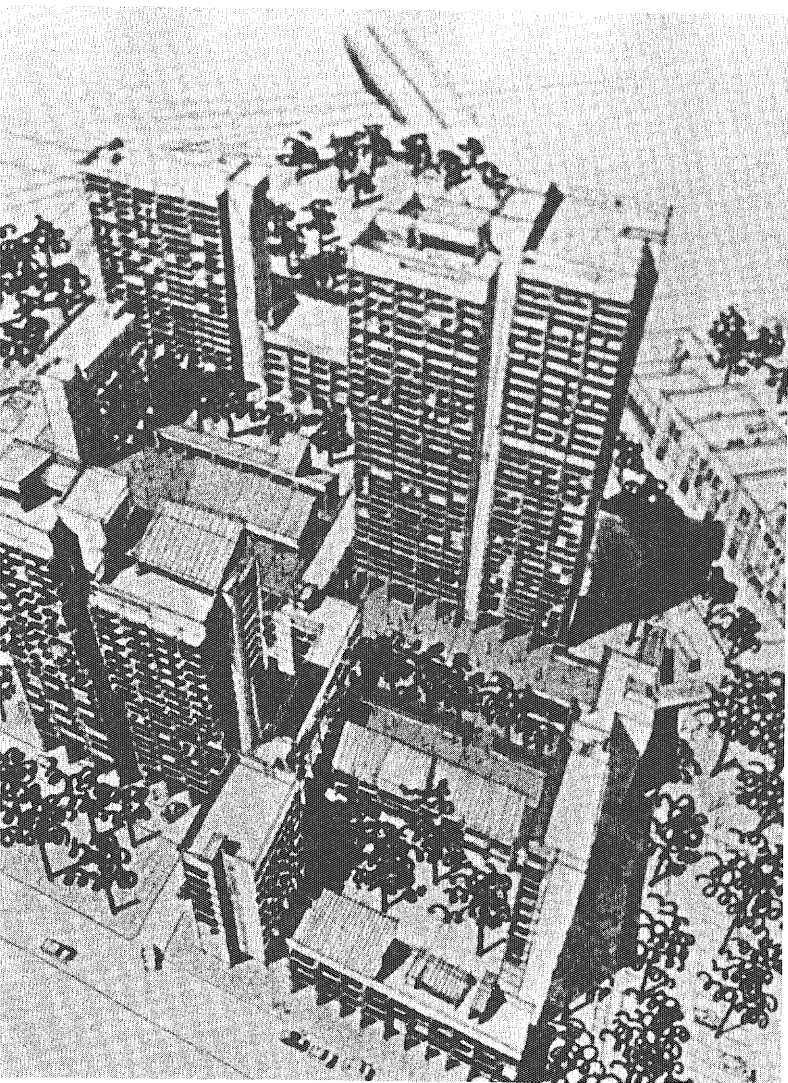
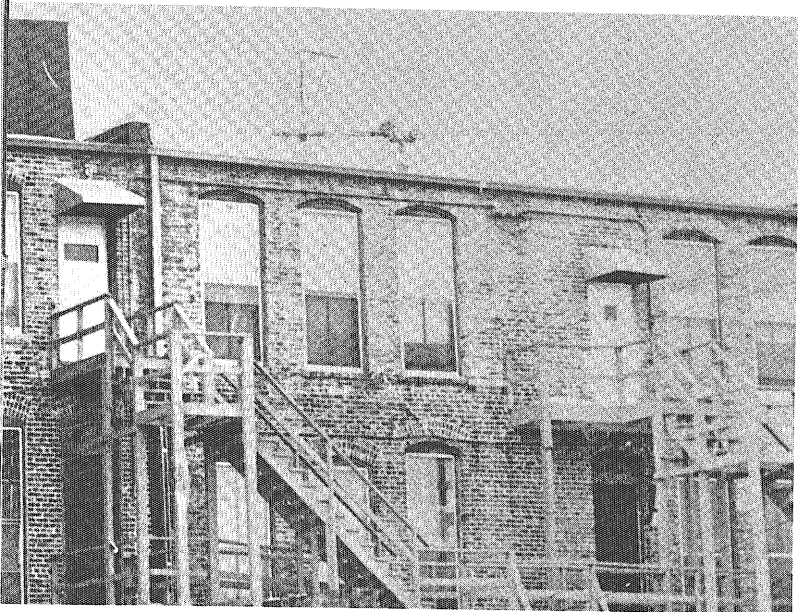
Cedar-Riverside is also using many design innovations. Maximum use of land is being made by having parking ramps covered by decks. Some of the apartments will extend the full width of the building, so they will look out in two directions, and the low and moderate income apartments are two stories. The tenants will have a choice of two sizes of balconies, or no balcony at all, but in any case more living space. It is this system of balconies which will



Top: Will brick three-stories give way to cement highrises as the Heller-Segal project expands?

Above: Overall model of West Bank building plan.

Right: An artists drawing of Cedar-Riverside stage one.



give the external walls their uneven appearance, Kueppers said. And the buildings are all planned to give a good, open view from every window.

Flexibility in planning is important in the Cedar-Riverside project. The project is being planned in ten stages, each stage taking approximately two years. In this way, as new technology or new ideas arise, they can be implemented.

There will be a compactor for solid waste, which may eventually be used for recycling. There will also be a heating plant serving the area west of Cedar. As the Cedar-Riverside project expands, the heating plant will be enlarged to take on this greater area. But the plant is being planned in such a way that it can be reduced when the new area of Cedar-Riverside gets its own heating plant. In this way, there will be no unnecessary expenditure of natural resources.

One new concept being implemented by the Jonathan Housing Corporation is the expandable home. (Jonathan is a new town, near Chaska, about 30 miles outside Minneapolis.) "A young family just starting out could move into a small core unit which, as their savings and family grew, they could enlarge," said Joseph Dennis, General Manager of Jonathan Housing Corporation. "For example, you might add a garage or a bedroom wing. Later, you might add a dining room."

Jonathan has successfully integrated cultural facilities into the neighborhood and provided housing for a variety of income groups. However, some of the people involved in the planning have been a little too enthusiastic in trying to convey to people that Jonathan is innovative and exciting, and that it approaches utopianism. Consequently, there are large posters, and, in some cases, sculptures, all painted in supergraphics (brightly painted letters on brightly painted backgrounds). These signs are reminiscent of the Walker Art Center or Dayton's Out of Sight shop. They announce such names as "Forever Woods", "Tree Loft Apartments", and "Friendship Lane North" (and South). Jonathan would do far better to ride on its own merits.

Jonathan now has an art center, a recreation pavilion, and a village center. There are bus shelters, the designs are very interesting, and a lot of open space and trees are left.

Unimod, Pemtom's system of assembly line-produced housing units, is now being tested. "So far, we've been in a research and development phase, and we have not actually gone out and built housing with new concepts," said Roger E. Conhaim, Manager of Market Development and Research at Pemtom. Unimod is a system of assembling or arranging factory-built housing units, about 40 ft. X 13 ft. 4 in, in interesting ways. One plan is to stack the housing units, not one right on top of another, but staggered.

Continued

Another plan is to cluster detached housing units around a cul-de-sac (courtyard). Garages are added and the roofs are pitched slightly. All of these techniques tend to break up an otherwise tubular effect of the housing units, which are the same size and shape as mobile homes, although made of different materials. The interesting effect achieved by spatial arrangement more than compensates for the fact that the housing units look the same.

"In the design phase, we have tried to take into consideration what we regard to be potential problems with regard to public acceptance. For example, we design interior spaces to be very much like the interiors of a conventional built home," said Conhaim. "And we have chosen, where possible, to use gypsum board, which can be painted, even though wall paneling is a lot more efficient".

Prefabricated housing can provide features not ordinarily obtainable through on site construction. If the units were built on site instead of in a factory, it would be much more costly to stack and stagger them. "It is now feasible to do this while keeping the costs down."

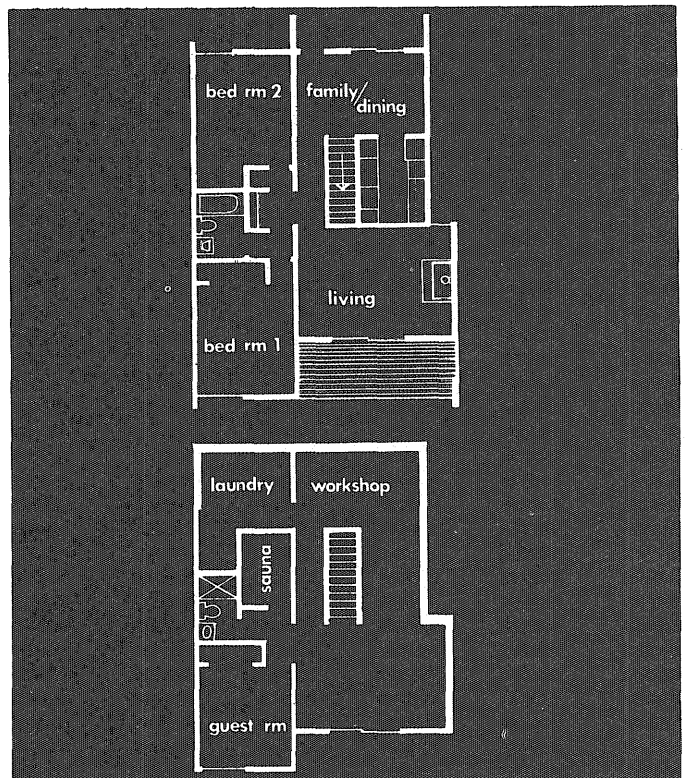
The advantage in prefabricated housing is not that it requires less labor, but that it requires less skilled labor. Whether this is advantageous in a particular area depends on the construction costs in that area. According to Conhaim, "We have not made a definite commitment to an actual Unimod plant. We have a small facility in Indianapolis. We hope to manufacture a small quantity of Unimod housing units in Indiana to test market. Based on the results of this consumer testing program, we will make a decision."

Thorbeck, who designed an earlier version of Unimod, said, "the problem is that the initial tooling up is a very expensive proposition. You have to have a very large assumed market in order to do it." He added that we need more uniform building codes to make the use of prefabricated housing possible over large areas.

The Minnesota Experimental City (MXC) Project is by far the most ambitious of these four ventures, but is still very much in a research stage. Its goal is to build "an experimental new city in the 250,000 population range, in which the human condition would be improved significantly and where, as a national proving ground, technological innovations could be demonstrated and evaluated," according to a May, 1969 progress report.

The project is being studied and planned by a number of University faculty and administrators, as well as by many people from all over the United States, specializing in various fields.

Many new concepts would be incorporated into this new community. A tunnel complex could be used in the coordinated movement of goods and mail, utilities, and solid waste, the report said. The tun-



A "starter" home with flexible expansion possibilities. Upper level is finished with Living Room, Family/Dining Room, 2 Bedrooms, full Bath, Kitchen, Outside Deck. Lower level has space that will accommodate an additional Bedroom, a Family Room, Sauna, Bath, and workshop space. Fully finished, there can be a total of 2,200 sq. ft. of living area.

nel complex might also be used for a mass transit system, another goal of the Minnesota Experimental Cities Project. "My own conclusions were that this tunnel system would be highly desirable, particularly in a Minnesota climate," Walter K. Vivrett said.

Another concept particularly suited to the Minnesota climate is that of a dome covering all or part of the city. The dome would "ease the characteristic seasonal extremes," the report stated. But it would also make the Minnesota Experimental City Project a demonstrating ground for such domes, which could be used in deserts, polar regions, and oceans, according to the report. R. Buchminister Fuller, inventor of the geodesic dome (a dome built with beams forming triangular facets and needing no support other than its own structure) advocates such a project in a paper titled "Patterns of Change and Concepts of the Minnesota Experimental City." "We haven't done any research on domes covering a city," Vivrett said. "We just have information on this or that particular dome and we have drawn some conclusions from that."

The Minnesota Experimental City Project is still very much in the research stage at this time. "Exploratory efforts" are being made to find a site and plan financing. ■



number one winter recreation, everywhere. "Snowmobiling is a bigger sport in New Hampshire than skiing," admitted George Gilman of the state's Department of Resources and Economic Development. In Minnesota, it's a multimillion dollar industry; nationwide it tops a billion dollars.

Most of the snowmobilers are new to winter recreation. Often they bring to it, like the early hot-high-horsepower outboarders, a complete disregard for already existing uses, existing pleasures and the ecological necessities.

Snowmobilers ensemble thus have quickly reached the status of a Big Target. Foresters, doctors, journalists, ecologists and people who don't like noises have joined against The Metal Monster. Every snow state in the union has restrictive legislation, enacted or pending, aimed at stemming the onslaught of the over-the-snow horde.

"On Sunday," writes Jean Mason of Aspen, Colorado, "while on a ski touring trip up Castle Valley, we were rudely awakened at six a.m. by a fantastically noisy array of twelve snowmobiles out to conquer the wilds of Pearl Basin. The next morning it was the same thing . . . revving, spitting, charging and mashing the terrain. On our way down the narrow winding trail it was again our misfortune to encounter the snowmobiles . . . these drivers take special rights and you have to get out of the way."

"Why must we assume," said a letter-writer to The New York Times, "that because somebody has invented a toy suitable for operation by eight-year-olds and is selling it by the tens of thousands, the rest of us must suffer it regardless of its impact on our environment and peace of mind.

"America has gotten along tolerably well without the snowmobile for some centuries. I suggest we can do without it indefinitely."

"The industry as a whole last year was battered from pillar to post," said a public relations man for a big snowmobile maker. "Its image is horrible."

The snowmobile rampage has been instrumental in a wild crime spree in which a considerable percentage of the vacation homes in snow country have been looted, so much so that special posses of snowmobiling vigilantes have had to be sworn in (as around Fargo, North Dakota) in order to keep pillaging within limits. Winter-weakened deer have been chased to exhausted death by snowmobilers trying to snap them with instamatic-type cameras complete with fourway flashbulbs. Dogs running over a "pavement" of snowmobile tracks through the deep snow to the deer yards caused unprecedented dog-deer-kills last winter. Motorists on back highways have been harrassed by packs of snowmobilers. Trespass has become epidemic, a way of life with the snowmobiler, a divine right stemming from ownership. The unseen ecological damage has been potentially so great that several states have set up testing programs to determine the kill-power of snowmobiles on small mammals, young trees and soil bacteria.

So far, the snowmobile has proved a lethal machine—not only lethal to those it meets, but lethal to the owners. Fifteen thousand U.S. snowmobilers had to be treated by doctors last year, some one hun-

dred posthumously, the glorious elite of the injured, so to speak, the people who managed to do themselves completely in, mostly by quite spectacular means—death by drowning under the ice, trisection by barbed wire, being minced under trains, being pulped by cars, head-on collisioning each other in wide open country or getting rolled under the vehicle itself and hamburged within the tracks and cogwheels that grind piercingly on the undersides.

It's violent, it's mechanical, it's American. It's us. We have to face that.

After all, 50 percent of our skiing is mechanical (the uphill).

My father, who was a stout Norwegian, joined and retired from his first American ski club, newly formed, in the same meeting. "They wanted first of all to put up a ski lift," said my father, shaking his head. And he never went back. But he kept on skiing—we call it touring.

Norwegians evidently still feel strongly about mechanical things. Recreational snowmobiles are completely banned in Norway today. Perhaps the fate of the first two snowmobiles imported there have a bearing: Up in the treeless wastes of the northern Norwegian reindeer country, under the midnight sun, the only two snowmobiles in Norwaf collided head-on and totaled each other.

Norway's "final solution" is unavailable here, obviously, and her example is little comfort to the snowmobile-haters who are at least as numerous as the enthusiasts. The state of Maine, possibly the most snowmobile-beleagured state of all, has the highest per capita incidence of the noisy things (a metal monster for every 20 people), and it has John Cole, editor of the statewide newspaper, The Maine Times, as its outstanding spokesman:

"No one can quite believe that a machine which did not even exist ten years ago can now be about to envelope the state in a kind of mechanical epidemic" said Cole. "It's a technological development marketed in the country of super sales, an essentially useless appliance sold by creating a fantastic demand for what turns out to be, when you are all done, a \$1,500 item that gets sold to people who don't have

Continued



that kind of money to spend (you would think) for a thing they only use one season of the year in a very limited way . . . and yet that is just so typically American."

Lewis Bissell, University of Maine forestry expert, told the Third Snowmobile Congress in Portland, Maine, that their machines were "noisy, dangerous, smelly toys which have the capacity to cause harm to growing plants, wildlife and people." Bissell is a snowmobiler.

"The lunge toward the new machine," said Cole, "is merely an extension of the lunges Americans have been making ever since Henry Ford turned out the model T."

There are 100 companies making snowmobiles. Lee Isgur of Anderson and Company, New York, financial consultants, made a study of the six top snowmobile manufacturers. Isgur said, "The unprecedented burgeoning of the snowmobile industry into a billion-dollar phenomenon in five years is not due to any kind of superior management but to an almost insatiable demand for the vehicle."

New companies are riding out onto the booming wave at a rate of 10 to 15 new companies a year and are folding at the same rate. It is a classic study of gadget-economics; cashing in on the great American desire to conquer the world by machine.

The snowmobile stands by itself as an infliction. Even the All-Terrain-Vehicle (ATV), with big squashy tires and an entrancing promotion, so close to the snowmobile in intent (the intent being to pass through the Great Outdoors as with a TV-zoom lens without actually feeling it) is but a pale contender for attention of fascinated sociologists and contemporary anthropologists. The ATV has not caught on; the snowmobile has.

Cole explains, "In Maine, when we have several feet of snow, the fields no longer look as if they belong to someone. The essential property concept is gone. The fences are wiped out. The road markers are wiped out. Signs are wiped out. The whole property divisional thing is wiped out. It's a big inland sea of snow."

"When they put their snowmobiles on top of somebody else's property, they don't have any idea of trespass. It just doesn't get into their minds that they are on someone else's land."

"What the snowmobile dealers are doing when they sell someone a snowmobile is like selling him an outboard with no place to take the boat. Every time he uses it, he is on someone else's property."

"The difference between the snowmobile man and the anti-snowmobile man," said Cole, "is like the difference between the man who owns a gun and a man who does not. In this kind of polarization, the gun lobby and the snowmobile lobby are the same people. The gun lobby is made up of big muscular women who wear patches all over their red wool shirts and these men who are kind of Yankee rednecks and who have very strong biases and identification patches all over themselves, too. They form clubs just by nature. They're the Rotary and the Fin-Fur-Feather-and-Fish club and they're Agnew people. They are the Silent Majority and that's a large part of what's



happened to the snowmobile."

It also explains a large part of the snowmobiler's political clout.

"The legislature," said Cole, "was never so intimidated as it was by the gun lobby when they tried to pass the gun control laws in Maine. About 3,800 of these guys turned up in the legislative hearing in their red shirts with their Fin-Fur-Feather Club patches on. The legislators took one look at that constituency, which they saw as a constituency that could swing any election in the whole state, and they just said 'To hell with this, we're not touching this with a ten-foot pole. And it's the same way with the snowmobile: When they see the same constituency, the legislators get paralyzed; they cannot get around to passing any kind of control.'"

The Maine snowmobile law prevents any community from passing laws with regard to snowmobiling: No matter how much a community might want to regulate or even throw the snowmobile out, they cannot. As the snowmobile people see it, this is only right. Stillwater, Minnesota, passed an ordinance which prohibits night snowmobiling. An irate letter-writer to Snow Sports, one of the national snowmobiling periodicals (there are at least four), found the Stillwater ordinance "outrageous." The editors agreed.

"It has happened before," wrote the editors of Snow Sports, "when a small unit of government such as yours is saddled with a Board of Council dominated by some 'old foggies' (sic) or a couple of 'soreheads.' This is one illustration of how an active and aggressive snowmobile club can perform real service. Your best solution is probably to get yourself a new Town Board—throw the rascals out!"

This is the general editorial line.

The editor of New England World of Snowmobiling News printed the following letter: "Spiro Agnew is not the only one who has a gripe against the press, radio and television. We in the snowmobile industry



a fact that snowmobiling is more dangerous than the so-called "risk sport" of skiing and much, much more lethal.

Compression fractures of the spine accounted for 10 percent of all injuries in a study by an interested party, Richard McLay, an engineer and associate professor at the University of Vermont. McLay's studies (with an eye to designing safer vehicles) showed that the prime cause of broken backs was "snowmobile-jumping," inspired by witless television ads urging people to jump the machine off a cliff, and by shorter inadvertent flights, as off a road into a drain ditch. McLay found that the impact was about 8.5 Gs, or the force that would be generated by having 8.5 people your own weight dumped on your shoulders suddenly. Unless the snowmobiler has the sense (most don't) to "stand in the stirrups" as the vehicle goes airborne to take the landing shock in the legs, the spine gets the full instantaneous brunt of the 8.5 Gs. A compression fracture is a royal road to permanent paralysis (two of the cases studied by McLay were people paralyzed from the waist down).

Driving a snowmobile seems so simple on a demonstration field that an eight year old can do it (an eight year old was concussed driving one in Maine last year) but once you get on uneven terrain, softer snow or ice and with obstacles (trees) in the way, it is not so simple. Dominici found that out of 300 accidents a year in Maine, six were eye injuries. No one wears goggles, even going through the woods—where your face can hit branches at 20-miles-an-hour.) About 15 percent were injuries to the head; hardly anyone wears a helmet.

Snowmobiling is about where motorcycling was a few years ago until the states cracked down with safety regulations.

Writer Cal Trillin, visiting a snowmobile derby (a race meet) in Brainerd, Minnesota, reported in the *New Yorker* that one promoter said "The success of snowmobiling is due partly to the secret yen middle class people in places like upper Minnesota have for the life of motorcycle gangs."

Some of the people whose land is being trespassed are beginning to react as if the snowmobilers were motorcycle gangs. The leader of a group of snowmobilers in Stowe, Vermont was snagged off his vehicle as the troupe trespassed across land belonging to Paul Dumont. A wire line had been hung at the snowmobile driver's neck-height on a traveled trail. The wire hadn't been there before.

"A snowmobile group," wrote Calvin Trillin, "entering a roadhouse carries the mystique of the Western—the Cartwrights riding into town and coming into the bar together, part of a good strong outdoor group." (To Accident-prone Agnew, add Red-blooded John Wayne.)

About 50 percent of all the adults in snowmobile accidents had been drinking before "it" happened. Said a Brainerd, Minnesota resident to Trillin, "I wouldn't have one of those things. They just amount to a way of getting from one bar to the next and I can get to a bar without a snowmobile."

(Put Bibulous W. C. Fields in with Red-blooded Wayne and Accident Agnew and stir well. Set the

Continued on page 28

wish to register a complaint also: Too many writers, editors and newscasters often try their hardest to build 'a mountain out of a molehill' to create doubt and panic over some insignificant item—all for the want of something to print. The snowmobile has become a likely target."

There has been almost no solid opposition to snowmobile escalation other than an occasional journalistic thrust: Industry, state government, local government, and 90 percent of the media have done nothing but praise and accept ads and garner tax revenue. Yet a writer to *New England World of Snowmobiling News* who had read some of Cole's anti-snowmobile articles asks, "How can we, active and interested snowmobilers stop(!) or counter this example?"

How indeed? Nothing seems to stop snowmobilers themselves, even self-decimation.

The man who has studied snowmobile injury most closely is by coincidence from Maine. Dr. Raymond Dominici (now on service with the Navy). He knows a lot of snowmobilers intimately because he has patched so many of them up. While he was manning the emergency ward of a Portland, Maine hospital a few years ago, he began to see the results of the new popularity of what financial columnist Sylvia Porter called "the costliest non-necessity in today's life." People began to arrive at the hospital with limbs ripped open, compression fractures of the spine, faces flayed as with a whip—kinds of injuries new to the ward. Dominici wondered what the accident rate was. He started collecting the most comprehensive set of figures on snowmobile injuries' extent. For starters, he found one out of a hundred snowmobilers ended up at a doctor sometime during the season, and one of six thousand (last year's figure) was killed outright.

The non-lethal injuries are nasty: lots of badly broken legs, and just as many broken backs, skull fractures, concussions, and eye injuries (Are Agnew people, like Agnew, accident-prone in sports?). It's



Now that you've read a book by "M", and another by "J" and have finished the one that tells what happens when "M" & "J" get it all together, it's time you're introduced to the ultimate in the How-to-do it-right books:

I used to be just an ordinary trucker. I spent most of my time just going through the motions, but never really doing any hauling. But one day, just by luck, I really got my ashes hauled. Ever since, my life has been different. I'm not overly endowed, the callouses on my hand are not any larger or firmer than anyone else's. But now I learned that it's not how much you've got, it's how you use it. Since my awakening, I've gone the route with a very nice old milk(ed) truck, got gassed with an oil tanker, wrecked on a tow truck, and plowed on a cultivator. I've "gone the distance" with "'Lil Ervy's Big Truck" (complete with two flogged dolphins) and had many offers from a Roto Rooter service unit which had a beautiful set of stacks.

All of this is not due to any special accessories or options I've had installed. It's all a matter of knowing your speed, watching your acceleration and controlling your torque. I've had to learn the hard way. Along with the success there has been many stripped gears and much burnt rubber. But now, I'll give these tips to you but remember, accidents can happen.

In order to fully realize your potential, you must first prepare your body. Let's start with the basics. The most common position is left hand on the wheel and resting on the cab window, while the other hand holds the shift. (If these words shock you, you must learn that they are common and should not cause any embarrassment). Because of the position of the left arm, all experienced drivers have "the mark of experience" — a sunburn on the left arm. This is mostly

a status symbol and has no real use except to tell others that he "knows where it's at" and "has been there." The neophyte driver may want to use a tanning lotion (or three days under a heat-sun lamp) to give the same effect. But you must realize that when the rubber meets the road, the arm will only serve to mark your inexperience and vanity, if you don't "pass." (For many years, in England, the right arm was the social register.)



The most important piece of your body is the right hand. It controls all the action. Without a firm hand on the stick, there's no forward, just neutral and reverse. But before you can move that magic stick properly, the right hand must be sensitive and strong. To develop the muscles in your hand, I've developed the following exercises.

To run the shift properly, you must know the pattern. Only a foolish "cabbie" looks at the "knob". A true trucker can tell the pattern by feel alone. To develop sensitivity buy a can of new tennis balls. Now, lock all the doors, turn off the T.V. and radio, take the phone off the hook, dim the lights and

prepare for your first experience. Start by removing the key from your can. Listen for the snap, try to feel it deep in your mind. Then place the key on the flange and as you turn it, be ready for the gas to escape. Hold the can firmly and twist till the pressure is released and the top comes off. Next, take one of the balls in your right hand (while holding the can in your left) and while not looking at it, try to find the seams and trace out their path through the fuzz. After you feel that you really understand and know what's happening, alternately squeeze and release the tennis ball ten times to build up the hand muscles. Continue this exercise for at least seven days. (If all the pressure has escaped, use another ball — you've got two left.)

There are two main positions that the sensuous trucker uses. The first is one our secretary calls "the overhand tickle." Start with the shift in the neutral or first gear (definitely not in the "hi" range). Gently place the palm of your hand over the diagram on the knob with thumb extended to the left (as seen from the top). This position allows freedom of movement throughout all the gears and allows a full view of the dash. However, you must be careful not to mess up the pattern, remember you've got the diagram under the palm of your hand. Also, try not to catch your thumb on the upper end of the shaft.

The second position is called "the underdog". The right hand is placed palm up with the index and middle finger on the right and left sides of the shaft, respectively. This leaves the thumb free to trace the pattern on the top of the knob. This position calls for slower and smoother shifts, but allows the beginner the advantage of knowing the pattern. Double-clutching is optional.

But of course, there are many variations of the above. Some oth-

er good positions are: T.V. announcer, motel manager, and insurance salesman.

There are many aids on the market today for smoother shifts. I prefer a chromed knob but a high-gloss, polished one works equally well. However, gloves are a no-no. As for the other available shapes (T-handle, contour grip, etc.)—well, it's hard to improve on the real thing.

Basically, if it feels good, and hurts no one, do it.

Keep on truckin'.

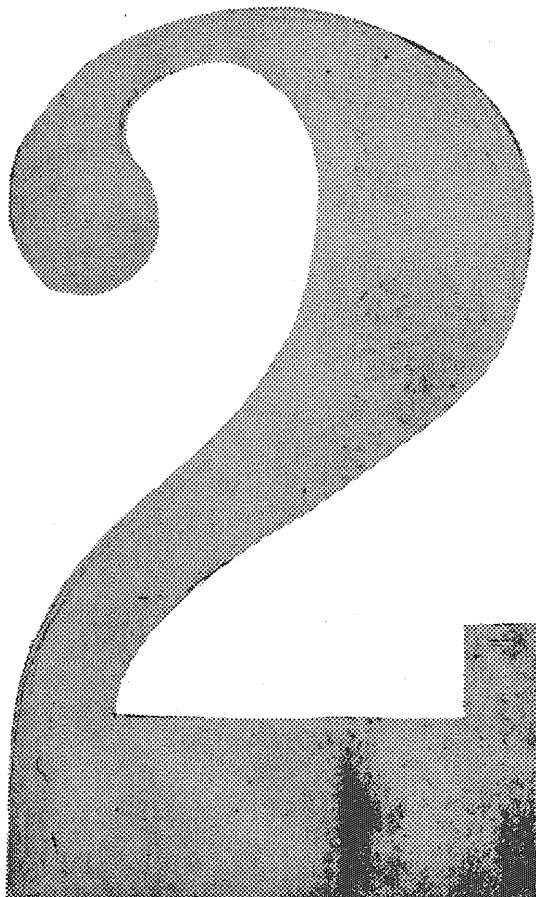
It's about time all you folks get a chance to know the kind of stock Rhube & Co. come from. It seems that in addition to all the adventures Pete & I have, our great-great - great grandbrothers-in-law

(twice removed, once from Poland) also knew each other and had their share of the adventure. ■

It seems that Pete's relation Irv and my rellie Ferd were knights of the end table. Their primary activity was running from tower to tower saving maidens-in-distress. Well, one of these typical days of yore (mine, ours maybe?) Irv and Ferd entered on an enchanted forest and were promptly bagged by an old witch. Well, the guys didn't like this and were very vocal about their discontent. (Unfortunately, the witch was also discontent, and surgically removed one of Ferd's ears sans anesthetic.) After much deliberation (during which Irv lost an ear) the ol' bat said she'd let the boys go if they would

do a few tasks for her. Ferd and Irve agreed and sent for Virgil (also known as Freddie the Rapist) their page, to bring their armor—two tanks, and an anti-aircraft gun.

Task one was to kill off the local dragon, which our boys did with no trouble at all. Task two was to find the golden fleas. Well, between Irv's fleas and Ferd's spray paint, they finished this one in no time flat. The third task was the most disgusting, tasteless, gruesome, uncouth, most sickening thing possible—they must sleep with the witch. Now, you must remember this babe was **super** ugly (not be confused with just regular ugly). But the guys finally agreed. After all, "Promise her anything, but give her our page." ■



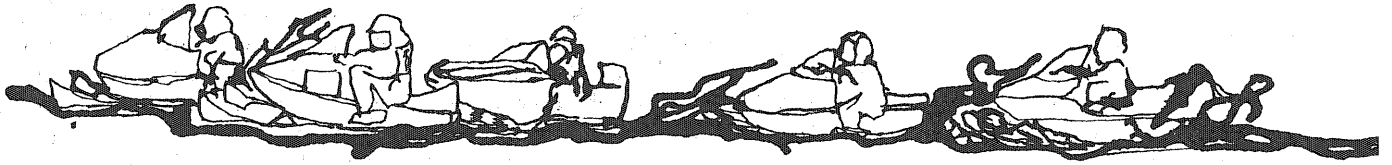
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mixture down on a snowmobile seat and point it down the road; better still, for real family fun, point another one up the road, headed for the first.)

In spite of the awesome accident statistics, the manufacturers have been holding off rising pressure for safer vehicles.

Dr. McLay has designed a better seat. "I have been on a vendetta for two years, trying to get them to do something about a safer seat," he said. But there have been no takers among the manufacturers. McLay also has strongly recommended a track guard to keep people's feet and clothes out of the machinery. No track guard.

Dominici, on his part, has urged that all moving, rotating parts be enclosed in strong metal rather than in the sheet metal and plastic they are in now. "When a wheel blows or a clutch breaks," said Dominici, "the body fiberglass or plastic or thinsheet metal become 'secondary missiles.'" In other words, the body covering itself shatters under impact into a cloud of flying, jagged splinters.

This year, there was a symposium at Michigan State University (the states themselves are beginning to get worried) dedicated to the problems caused by the snowmobile.

A Minnesota researcher, Wallace J. Wanek of Bemidji State College, said his results (from a field test) showed that snowmobiles could cause damage, through compaction of snow (which turns the insulating snow into a cold mass of ice), to the plants and microbes in the soil which are necessary for the growth cycle of plants. "A single traverse with a snowmobile can drastically affect the physical environment as well as damage important plants," he said.

Here and elsewhere it was found that snowmobiles can bruise and permanently cripple young trees, close off the runs of small mammals so that large numbers die (rabbits, field mice). Human beings who have to try to plow roads compacted by snowmobiles have had to bring in bulldozers because of the compacted mass defied plows.

Finally, there is the recycling problem.

An average snowmobile has a lifetime of three to five years, to put it kindly. We therefore will have the potential for a two-million-vehicle junkpile run-

ning around this coming winter. By the 200th anniversary of the founding of this nation five years hence, the current two million snowmobile bodies will largely be rusting away in more or less conspicuous spots.

Well, enough of the sins of the snowmobilers, probably not excessive in view of our way of life, just another dimension. The vast majority of snowmobilers doubtlessly spend most of their time puttering about rather happily at safe speeds and causing no particular problems other than marring other people's enjoyment of winter and obsolescing their own vehicle. This does not alter the fact that the whole snowmobile phenomenon has created phenomenal problems.

When you get right down to it, the waste and mayhem (and, yes, we'd even throw in a few saplings and field mice) could be forgiven if one didn't have the hellish racket. Not only does the excessive noise eradicate the natural quiet of snow country, but it is damaging drivers' eardrums. Dr. Fred Bess, a Central Michigan University audiologist, examined 23 snowmobile race drivers at the International Snowmobile 500 at Sault Sainte Marie and all 23 had permanent hearing impairment. "Present noise intensity levels of pleasure snowmobiles exceed safety standards, and continued exposure without ear protection will cause permanent damage," Bess said.

Ben Hoffman at the Vermont Forest Parks Department is helping prepare state legislation to bar snowmobiles from wild areas in the state such as Mount Mansfield, Camel's Hump, and The Long Trail. Said Hoffman, "This is . . . so we can provide some place as God's green earth for man to spend some time without hearing a damn motor."

There are places where snowmobiles can go without disturbing too many others, particularly if the others are forewarned about the areas to be snowmobiled. The way it stands now, if you don't like skiers, you can stay away from ski resorts, but if you want to stay away from snowmobiles, you have to go south for the winter. ■

By Morten Lund  
(Courtesy of Ski Magazine, Vo. 36, No. 3, October, 1971)



trary and intuitive, reflecting the tales learned at our grandmother's knees and those taught us by our teachers; and 2) they frequently establish a socio-political direction to our work. The psychologist who presumes that I.Q. tests measure intelligence, the anthropologist who insists on the clear cut distinctions between races and the biologist who chooses Darwin over Genesis are committed to a point of view before they have done a single experiment.

The second major non-objective choice one makes concerns the kind of problem one chooses to work on. The image of the scientist aimlessly turning over rocks and collecting the facts underneath until they assemble themselves into a theory is a caricature. But like all caricatures it captures and focuses attention to the essential feature. And that is the notion that it is the facts which, are the movers — not the scientist. But does that stand examination? No mathematician in his right mind chooses to pursue the value of it to a further hundred digits. But what he does choose to do may largely be determined by his peculiar view of the world. If this view includes what Rene Thom has described as "a phantasmic, delirious reconstruction of the universe" he may become a Boolean algebraist. If he cherishes the frequent intuitive insights of Euclid he may become a geometrist. But what do we say about the botanist who choose to develop defoliative herbicides for the government? About the anthropologist who studies the ethnology of Thai tribesmen for the CIA? About the microbiologist at Fort Detrick who pursues better ways to give children encephalitis? What do we say about the distinguished organic chemist Louis Fieser who in 1943 developed napalm for the US government? Or can we simply let Fieser speak for himself? "I have no right to judge the morality of napalm just because I invented it." Nor does he blame the Dow Chemical Company for manufacturing napalm. "If the Government asked them to take a contract, and they're the best ones in a position to do so, then they're obliged to do it." (Time, Jan. 5, 1968). This idea of the scientist drifting along in the current of moral events but strangely unaffected by it, reflects his failure to acknowledge that his choice as to what he works on is a profoundly moral one — and one for which he is responsible. It is a choice determined by his values — not one made for him by the facts.

Thirdly, I wish to comment on the role of objectivity as one actually looks at the data. A young

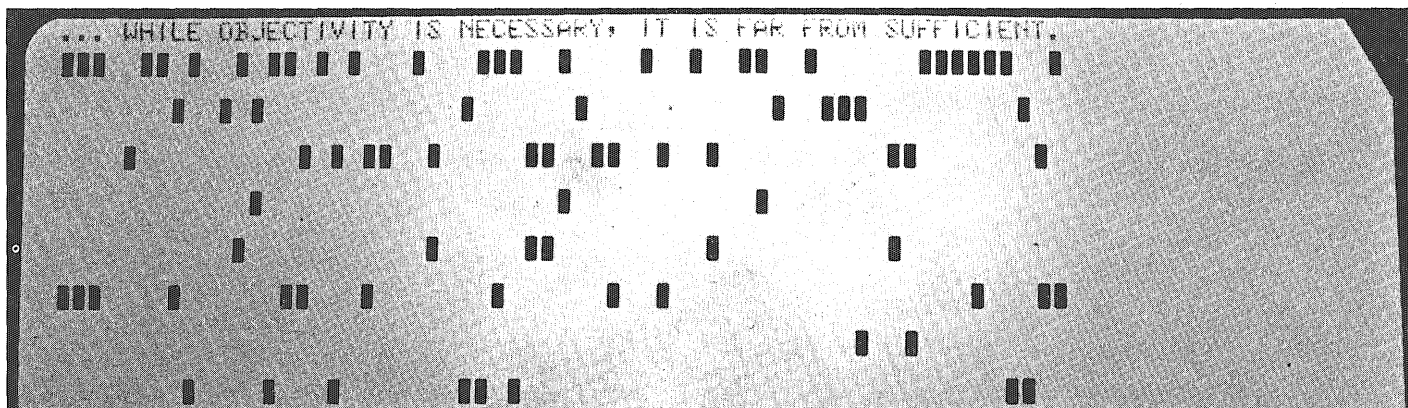
microbiologist, Jonathan Beckwith, who recently won the Eli Lilly award for outstanding young microbiologists commented as follows: ". . . even the science that is relatively free of political context is often done in a less than objective manner. The interpretation of data may be determined by the psychological needs of the researcher. Personal psychological problems or the exigences of a competitive publish-or-perish system may force a scientist to overinterpret his data or push a particular theory as though it were a product for sale. Furthermore, much of the best science done must still be a mixture of intuition and objectivity. Being familiar with the work of Monod and his colleagues, I would say that they operated in a much more intuitive than objective fashion. Experimental results were discarded when they were not easily fit into theory. But because of the brilliant and correct intuitions, this approach worked. The dynamic of science is not that of pure objectivity!" (Science for the People; 9, 1971, p6).

I want to avoid overstating my position. Objectivity, detached analysis and suspended judgment play a critical role in science. They are the features which guarantee those dimensions of verifiability, and and universality which science does have. What must be kept in mind is that while objectivity is necessary, it is far from sufficient.

We live in a world rich with uncertainty. It is a richness because the uncertainty forces us to be more human, less mechanical. A tragedy of our world is that, as a society, we have never learned to cope with uncertainty. We insist on answers even where none exist. We insist on conquering our world rather constantly striving to understand just a bit more of it. Our students are taught and examined in a fashion which places no premium on doubt but only on certainty. Is it any wonder that they emerge into the world, blinking at the sunlight and forever thereafter wondering why the world isn't true-false, a, b, c, d, all-of-the above, none-of-the above?

It is no wonder that many young people enter science with a desperate, subliminal hope that here finally will their puzzlements become irrelevant; here will life indeed be subject to objective analysis. Alas, it is not. ■

1 Francois Jacob and Jacques Monod are French Nobel laureates who were largely responsible for many of the brilliant conceptual insights which characterized the earlier development of molecular biology.



# SPLINTERS

Buyer: "For a new house, these walls sure don't seem to sturdy."

Seller: "Well, maybe, but they haven't been painted yet."

\* \* \*

Since the discovery of elastic, it has been estimated that women take up one-third less space.

\* \* \*

It's quite apparent why the Japanese have such outstanding baseball players. After all, how would you like to hear your manager say: "Go to the showers . . . and take the sword with you!"

\* \* \*

Do you realize what dialing for birth-control information means? It means that twenty years from now, there are gonna be people on the face of this earth who owe their existence to a wrong number!

\* \* \*

COLLEGE FOOTBALL COACH OVERHEARD IN LOCKER ROOM: "Always remember that football develops rugged individualism, initiative, and leadership in all of its participants. Now I want you to get in there and do exactly as I tell you."

\* \* \*

The man was a sight more than annoyed when his neighbor called him at 3:30 in the morning and complained, "Your dog is barking so loudly that I can't sleep." The neighbor hung up before he could protest.

The following morning at 3:30 he called his neighbor and said: "I don't own a dog."

\* \* \*

A customer sat at a table in a fashionable restaurant and tied his napkin around his neck. "Try to tell him as diplomatically as possible," the manager told the head waiter, "that that is not done in this establishment."

The waiter paused thinking thoughtfully, then said to the customer, "Pardon me, sir. Will that be a share or a haircut?"

\* \* \*

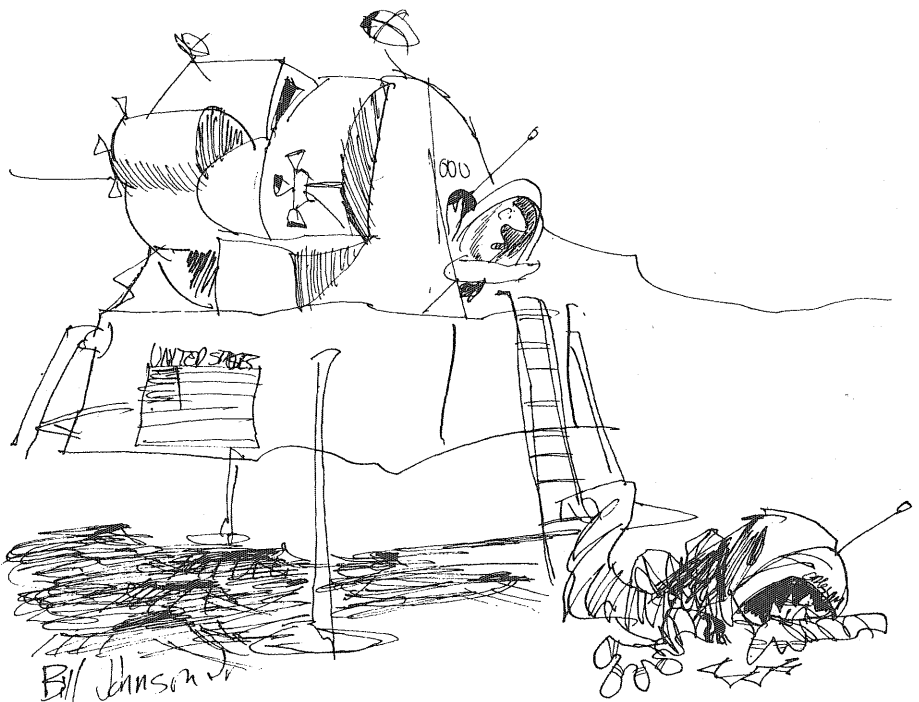
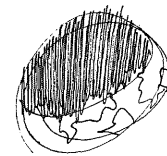
A clerk training to operate one of the new automated office giants, accidentally dropped her mechanical pencil into the delicate machinery.

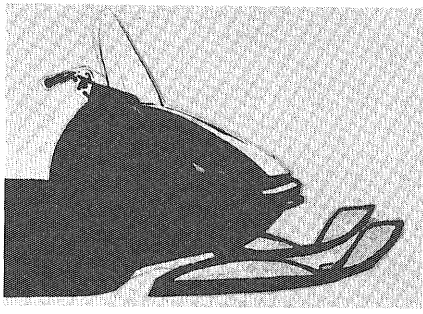
A week later, when, after a cost of some \$35,000, the machine was repaired, her supervisor glared at her and roared, "You're fired."

"Oh, all right," replied the clerk, "in that case I won't be needing this," she said as she dropped her pencil back into the machinery.

\* \* \*

"That's one small slip for a man, one giant slip for . . ."





## As a Matter of Facts?

by Anne Tanner

*Reprinted by special permission from the December, 1971, issue of Sno-Mobile Times.*

Some of what has been written by sincere people for sincere reasons has been contradictory, and shows the need for research which would provide facts, instead of speculation. In 1969, for instance, a news release from the U.S. Forest Service and a speech by a government official at a snowmobile seminar in Minneapolis provided an interesting contrast. First, the news release, which noted in passing that in surveying states and Canadian provinces in the snowbelt not one arrest could be documented for wildlife harassment, "although all mentioned it as a possible problem."

"Perhaps the problem has its source in the fact that the majority of snowmobilers are not old-line outdoorsmen. They are new to the outdoors, particularly in the winter. Most desire to take photographs of wildlife, and the hazing of big game animals may be done mostly through ignorance because of this. The snowmobiler may not realize that his desire to get close enough for photographs may mean the difference of life or death for an animal." (The release went on to explain that the animal might wear out its reserve bucking deep snow in fleeing the photographer.)

Next, the speech, by Dr. Leslie L. Glasgow, Assistant Secretary of the Interior for fish and wildlife: "The Park Service is of the opinion that where over-snow equipment is restricted to unplowed roads, as it is in Yellowstone, there will be little if any disturbance of wildlife. In fact, the operators and passengers have obtained many photos of wildlife apparently oblivious to the presence of man and machine."

So take your choice . . . they're either panicked by cameras or posing for them, or both in different circumstances. The frustrating thing is that no one really knows. There are no facts, just assumptions, such as this one by the publication, "Resource", issued by Canadian Council of Resource Ministers in 1970: "Snowmobiles may cause fish kills in shallow lakes. The Wisconsin Department of Natural Resources suspects that heavy snowmobile traffic on a lake compacts the snow, making it more opaque and thus reducing the amount of sunlight reaching the lake plant growth."

What is being done to provide facts? What research is underway? That's almost as hard to find out as to determine what the truth is by yourself. To be complete you'd have to check conservation departments of every state in the snowbelt and all 10 Canadian provinces, every university, industry as-

sociations and snowmobile club associations. So after an admittedly incomplete search, we found the following:

—A study done at the University of Minnesota on the effects of snowmobile tracks across the habitat of small burrowing creatures such as field mice. Done over a period of two years, its results seemed to be rendered inconclusive when an early spring fire damaged the environment. Significantly, the small animals had left the area when research was done later that spring, but whether they left because the hardening machine tracks cut off their natural trails under the snow, or because of the fire, should be the subject of more research.

—A study of the effects of expressway noise on the annual deer kill, sponsored by Outboard Marine Corp., in an area before and after an expressway was built. Result: No change.

—A proposal for two studies to be undertaken by the Environment Committee of the International Snowmobile Industry Association on two different facets of possible snowmobile effect on the environment.

Bob Miskee of Massey-Ferguson Corp., chairman of the committee, said the first study would concern the effect of the machines on various forms of vegetation, with an impartial third party signed to make the study.

The second would use radio transmitters fastened to 24 deer in an area where snowmobiles are permitted, to trace their activities and effects of snowmobiles near them over a three-year period. As this was written, however, final plans for this study had not materialized.

A speech by Merrill L. Petoskey, assistant regional manager, Michigan Department of Natural Resources, June 27, 1969 at a seminar on snowmobiling in Minneapolis:

"Harassing wildlife, another highly-talked-of sin, seems to come more from opinion than fact. We receive complaints about fox and coyote hunters using their machines to run their prey to exhaustion. Upon investigation, little was offered in the way of proof.

"Several arrests were made in northern Michigan for shining and shooting deer from snowmobiles. Those offending, during other seasons of the year, probably used another, more convenient form of conveyance." ■



# NEXT MONTH

## **Suicide and Technology**

Is an increased suicide rate one effect of technology on American society?

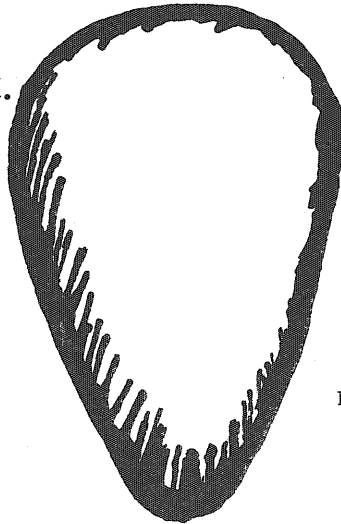
## **Smokeless Smokestacks?**

One of two articles on the local effects of technology will examine the University's planned installation of a device to monitor pollutants emitted from the smokestacks of the University's Minneapolis heating plant. The other will deal with propane-powered engines in motor vehicles.

## **People and Technology**

An interview with sociology professor Ronald Anderson on the ways people react to technology.

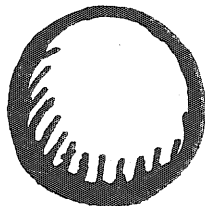
8:30 to 4:30 P.M.



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## Stereotype

Many who use the word wouldn't know one when they see one. Those who recognize it as a metal casting of a newspaper page, curved for the press, may be deriving a livelihood from this and everything else they know about printing. The more people who depend on the printing industry for a living and the more they know, the better for Kodak. The intricate complex of businesses and crafts centered on the art of printing and packaging is more than a principal market for specialized Kodak products. One way or another, it provides a life role for a not inconsiderable segment of mankind. **Finding a role in life does seem to be a common problem.**

So you picture an executive conference. Sweeping generalities uttered, fine details worried over, a strong voice takes command: "Products alone can't sustain the growth we look for. The key is people—people to man our customer industries, to want growth in them as much as we do. Wouldn't we really be accomplishing more with a campaign to attract more kids to printing?"

Not quite.

We can't and shouldn't mount a campaign powerful enough to lure large numbers of kids into printing and the graphic arts, but we have collaborated with new-style academics, the printing and allied industries, and their unions in a measurement just completed of 1) manpower needs in these fields (not just ambitions), 2) how changes in technology promise to affect the needs. Interest in the findings should be made known to W. F. Flack, Dept. 942, Kodak, Rochester, N. Y. 14650.



*Recruiting should run on  
more than enthusiasm*



# HOW CAN A SHEET OF SILICONE RUBBER HELP TURN A TEN-YEAR-OLD INVALID INTO A TEN-YEAR-OLD ATHLETE?

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the clogged arteries of an adult. Or to save the life of an accident victim whose lungs give out.

That extra time may be all it takes to help put thousands of those invalids back on their feet.

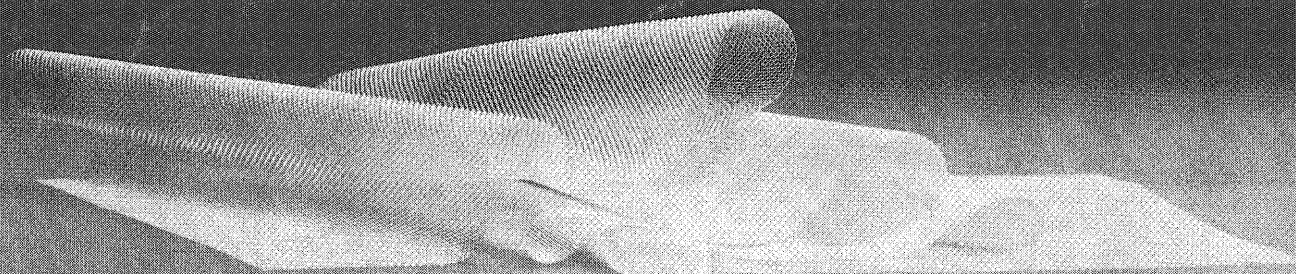
It's a pretty clear example of how a technological innovation can help solve a social problem. A lot of times, the effect of technology on society is rather direct.

That's why at General Electric, we judge innovations more by the impact they'll have on people's lives than by their sheer technical wizardry.

Maybe that's a standard you should apply to the work you'll be doing. Whether or not you ever work at General Electric.

Because, as our engineers will tell you, it's not so much what you do that counts. It's what it means.

GENERAL  ELECTRIC

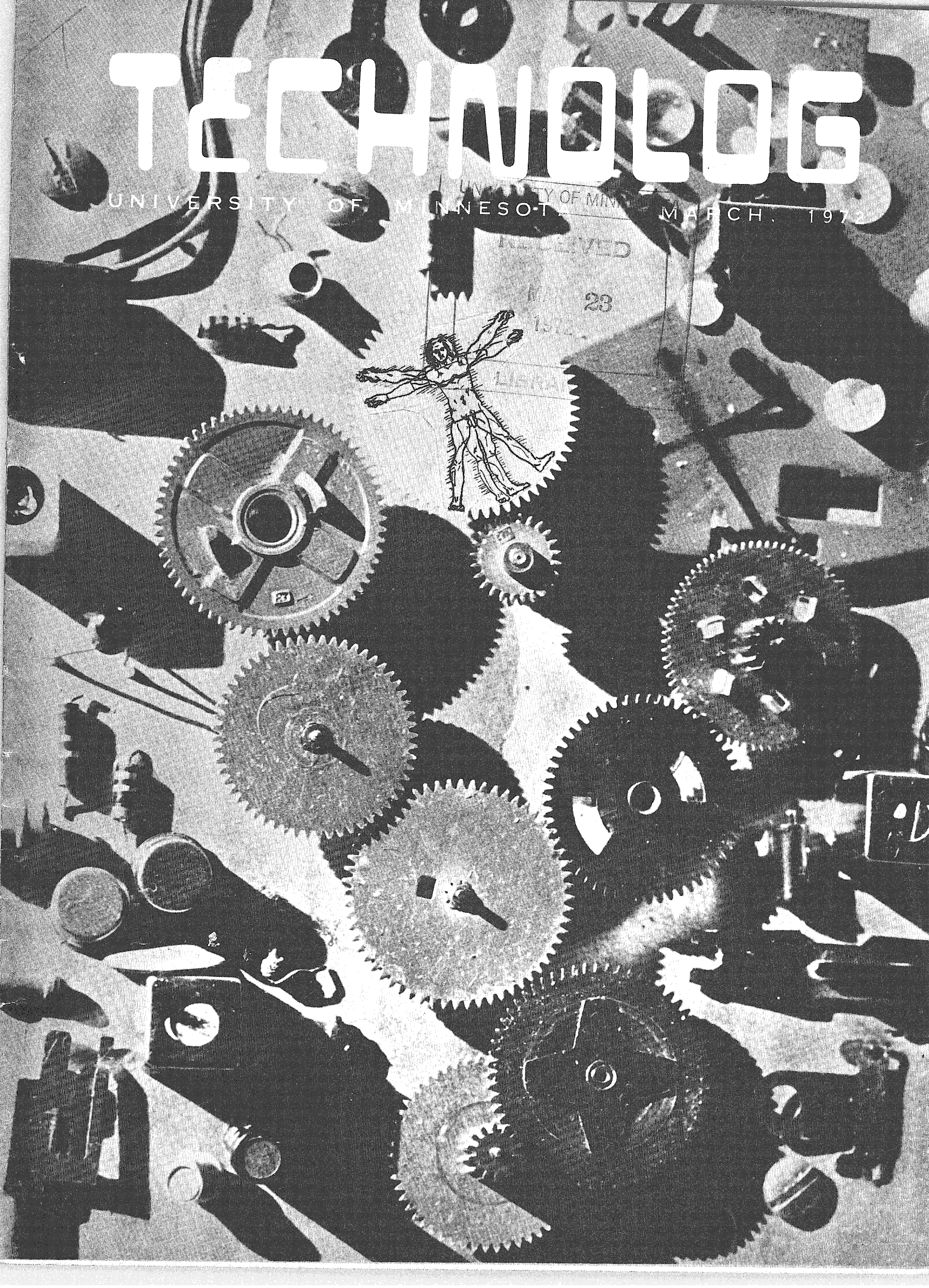


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# TECHNOLOG

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passengers;  
another has its own "el."**

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both systems?**

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el builder, Westinghouse.**

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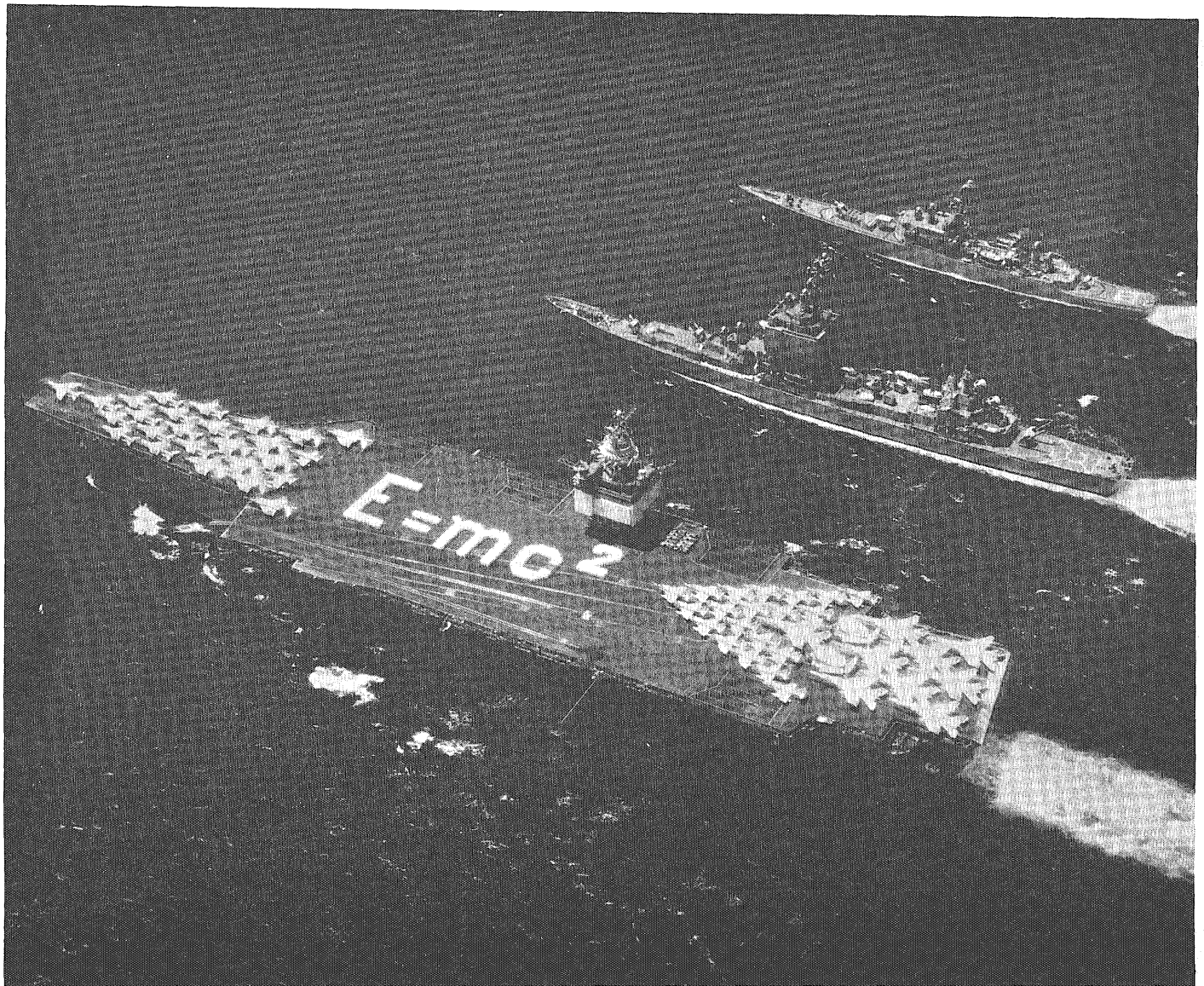


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Take the matched component system, MS210W, over on the right. That turntable is automatic, with cueing and anti-skate controls. It's precisely matched to a Sylvania solid state FM Stereo/ FM / AM receiver.

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But don't believe a word you read. Hearing is believing. Go listen to a Sylvania stereo before you buy.

Then, when you hear our price, you'll believe.

**GTE SYLVANIA**



# TECHNOLOG

VOL. 52; NO. 6

Official Student Publication of the Institute of Technology, University of Minnesota

MARCH, 1972

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Published monthly, October through May. Second class postage paid at Minneapolis, Minnesota. Office: Room 2, Mechanical Engineering Building, University of Minnesota, Minneapolis, Minnesota 55455. Telephone: 373-3298. Printer: Aircraft Press, 425 South Fifth Street, Minneapolis, Minnesota 55415. Publisher's National Representative: Littell-Murray-Barnhill, Inc., 60 East 42nd Street, New York, N. Y. 10017. Publisher's State and Local Representative: University Engineering Magazine Advertising, F. P. McGrath, Manager, Box 14026 University Station, Minneapolis, Minnesota 55455. Telephone: 612-225-0708. Member of the Engineering College Magazines Associated, Chairman: Daniel L. Griffen, Iowa State University. Subscription rate: \$6.00 per year, single copies 50¢. Advertising rates upon request. Any opinions expressed herein are not necessarily those of the Institute of Technology or of the University of Minnesota. Copyright © 1972 by the Minnesota Technology Board. All rights reserved. Reproduction in whole or in part without written permission is prohibited.

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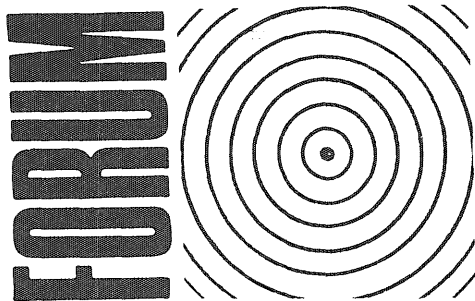
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The Technolog would like to thank these people for their help in putting out this magazine.

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## Five Years?

More and more these days, engineers are being asked not only what is the most economical way of producing a product, but what will be the ecological and social effects of this product. Not only the present but the distant future must be looked at. This involves being able to practically predict the consumer demand of a product fifty or more years hence, and then consider the effects. Will you, under our present system be able to answer these questions? We don't believe so.

Under our increasingly less structured programs, a lot of engineers don't have the social, economic, and artistic backgrounds to be the engineer that is need-

ed in our world.

Our solution to close this void of knowledge is to extend the present curriculums to five years. This fifth year could be filled with the extra liberal arts requirements that could be used to take pressure off the first four years; presently jam-packed with technical classes. Another advantage is that it would give the present engineering student another year to survey the job market, and his own personal goals.

Presently, the Institute of Technology is working on a Master of Engineering degree, which would essentially mean an extra degree to get the training all en-

gineers need. Our belief is that this degree should be reserved for semi-specialization in one's specific field (i.e. in Chemical Engineering, specializations are nuclear, biochemical, biomedical, ecological, metalurgical, etc.)

If we as engineers are going to make this world a better place to live for everyone, we have to be able to cope with the problems our predecessors have failed to recognize or were unable to solve. We don't see how we can reduce the amount of time in college when our jobs require more knowledge than ever. I think it is necessary to put the word "professional" back into engineering./BJ,RR

## Think About It!

In our November REVERB column, Dean Richard Swalin voiced the following desire; "It is my hope that the TECHNOLOG can succeed in focussing on some of the many critical and controversial issues and cause its readers to think and in doing so expand their intellectual horizons". Lets focus for a moment on a critical issue or two.

Does the engineer function the same as the rest of society, or are they because of their occupations, placed in a different category? Does the engineer have any deeper social responsibility than the next man? Is there a difference between occupational morality and private morality? Do engineers practice the theoretically deep social concern that is theirs?

I'll give you some answers to these queries: He is. They do. He should. They don't. Very simple answers to complex problems. Short snappy replys are always easy to give, but because they come out so quickly, they apply so poorly. The fact is that these are all questions which will have to be answered one day by

you—the individual. And the answers will have to be well thought out in your own mind, or else you'll never really be sure of anything, especially yourself. Whether you like it or not, you're a member of the system, the society, the establishment, and your only choice in the matter is either to participate in it, or drop out of it.

If you participate, then one question you will have to answer is when the issue of the almighty dollar is put to you. Are you willing to work for the dollar earned while you supress or ignore your own moral beliefs, or will you save your righteous indignation for when you quit or are laid off the job?

Think about it.

Another thing to think about is this; is there any such thing as a universal morality for engineers, or are ethics a strictly personal and situational (and optional) thing? This is not the place for a philosophical essay on ethics, although E.A. Burtt or A.C. Ewing might disagree with that. But this is the place for a bit of moralizing, or at least to decry the lack of moralizing in most editorial c o m m e n t a r y.

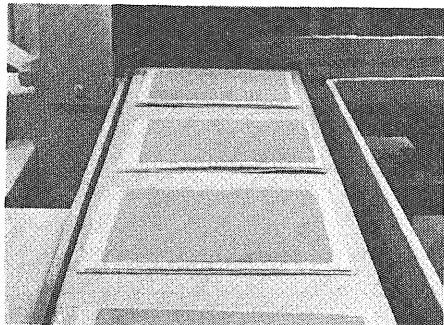
While not pretending to be able to lay down a practical set of universal ethical maxims, I would like to introduce the simple rule of morality. It goes like this; Every individual is personally responsible for any part he plays when the end product is the taking of a human life.

The logic of the worker who "is only doing his job" or the technocrat who cries that "I'm not responsible for what THEY do with my product" is as hollow as the logic of a court which decides that the bank robbers are guilty of theft, but the driver of the get-away car is innocent of the charge. After all, he was only doing his job.

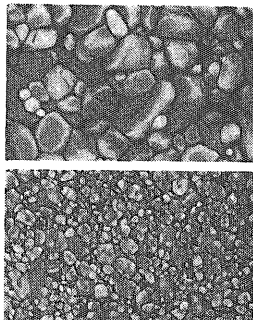
According to the simple rule, todays religious leaders are wrong in lamenting about the moral breakdown of our times. There is no moral breakdown. The immorality was always there, only today we're made more aware of it. And because more of us are aware of it, maybe a few will begin to practice it. Its difficult though. After all, there's an awful lot of immoral people walking around today. Thats something to really think about./Robert Pirro



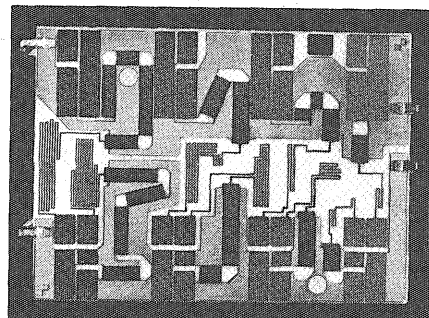
# WESTERN ELECTRIC REPORTS



1500° C furnace was specially designed to fire these new substrates. The relatively low temperature results in smooth substrate surfaces for practically fault-free thin film bonding.



Electron micrographs show the great difference in grain size between new ceramic material (lower) and the previous material (upper).



Thin film integrated circuit shown here is part of a resistor network. It is one of many that benefit from the improved substrate. Metal leads on sides are bonded by thermocompression to tantalum nitride resistor film.

## Smoothing the way for perfect thin film bonding.

Aluminum oxide, or alumina, is considered to have the best combination of properties for thin film circuit substrates. Until recently, however, the bonding of metal elements to gold-coated tantalum nitride resistor film on alumina was somewhat unpredictable.

Now, an advance at Western Electric has made it possible to get practically fault-free bonding of these materials.

This new perfection in bonding came through the development of finer grained alumina substrates.

The process has four basic steps: milling, casting, punching and firing.

During milling, alumina is combined with magnesium oxide, trichlorethylene, ethanol and a unique deflocculant. For 24 hours, this mixture is rotated in a ball mill. In a second 24-hour period, plasticizers and a binder are included.

The deflocculant plays a major role by dissipating the attraction forces that exist between the highly active alumina particles. This prevents thickening, which would ordinarily make an active alumina mixture unworkable.

The 48 hours of milling is followed by casting. When the material comes off the casting line, it is in the form of a flexible polymer/alumina tape, dry enough to be cut into easily handled sections.

After casting, a punch press cuts the material into the desired rectangles or

other shapes. Holes can be punched at the same time.

Finally, because of the use of active alumina, the material is fired at an unusually low temperature which results in smooth substrate surfaces for reliable thin film bonding. The finished substrate is then ready for the various processes of thin film circuit production.

In developing this new process, engineers at Western Electric's Engineering Research Center worked together with engineers at the Allentown plant.

**Conclusion:** This new way to produce substrates is a truly significant contribution for thin film circuit production.

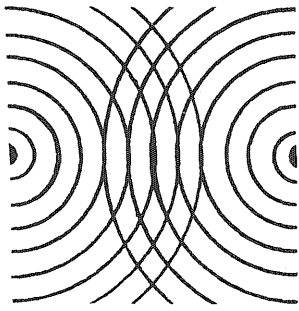
The ultimate gain from this smoother substrate is for communications itself. For through the achievement of nearly perfect bonding of metal leads to tantalum nitride, thin films can be produced with even greater reliability and economy.



## Western Electric

We make things that bring people closer.

# REVERB



## I.T. Trash!

Periodically I have fits of righteous indignation after reading *Technolog* (once a month when it comes out, and once a quarter when I pay my incidental fee). I find it incredible that your staff and editorial practices can consistently produce such an abysmally poor product.

Rather than launch into a tirade on the ills of your previous efforts, let me (very humbly, of course) offer some positive suggestions. I would like to see more articles like the *Daily's* on "Crash" Ryan, articles that highlight the people that make up IT. There are many opportunities however for you to provide unique coverage. For example, EE's might be interested to know that Prof. Otto Schmitt, inventor of the Schmitt trigger (and a rather colorful character), is alive and well in TNCE. Do an interview with Prof. Alfred Nier, Regents Professor in Physics and one of a group first to isolate Uranium 235 during

WWII. Currently he's involved in developing an instrument package for a coming Mars shot. I suspect his perspectives would provide fascinating reading. Do an article on the history of University computer services. Find out how much work in IT is currently funded by the Defense Department. Do an article on registration—put some names on the ladies who patiently give us our tally cards. Give us details on plans for automating registration. There's a myraid of possibilities, and an opportunity to give the *Technolog* a unique role in providing a perspective on the people behind the technology—people connected with IT.

Daniel Burbank

*We agree that the "local aspect" of the Institute of Technology should be stressed more — but in moderation. In this issue, we have tried to add this, and we have more such articles already being written. Ed.*

Fact: In the USA, in 1970, one engineer in a hundred was female.

Question: So what?

## \$50 Reward and possible publication

for the best student answer to the above question

### CONTEST SPECIFICS:

DEADLINE: April 15, 1972

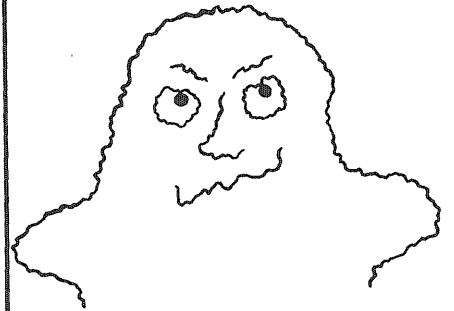
ELIGIBILITY: currently enrolled as student at U of M  
MANUSCRIPT: 2,000-3,000 words, typewritten; pictures and illustrations optional; short biographical sketch of author

TOPIC: What are the implications of the fact?

SELECTION: by committee of students from TECHNOLOG BOARD & TECHNOLOG STAFF.

For further information, contact John Huggins  
EE 34A or 373-4528

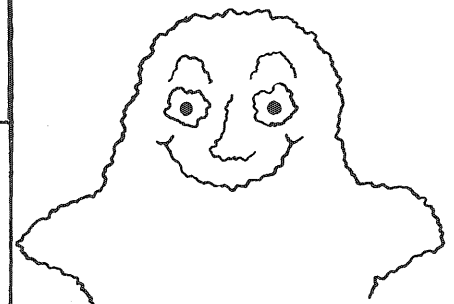
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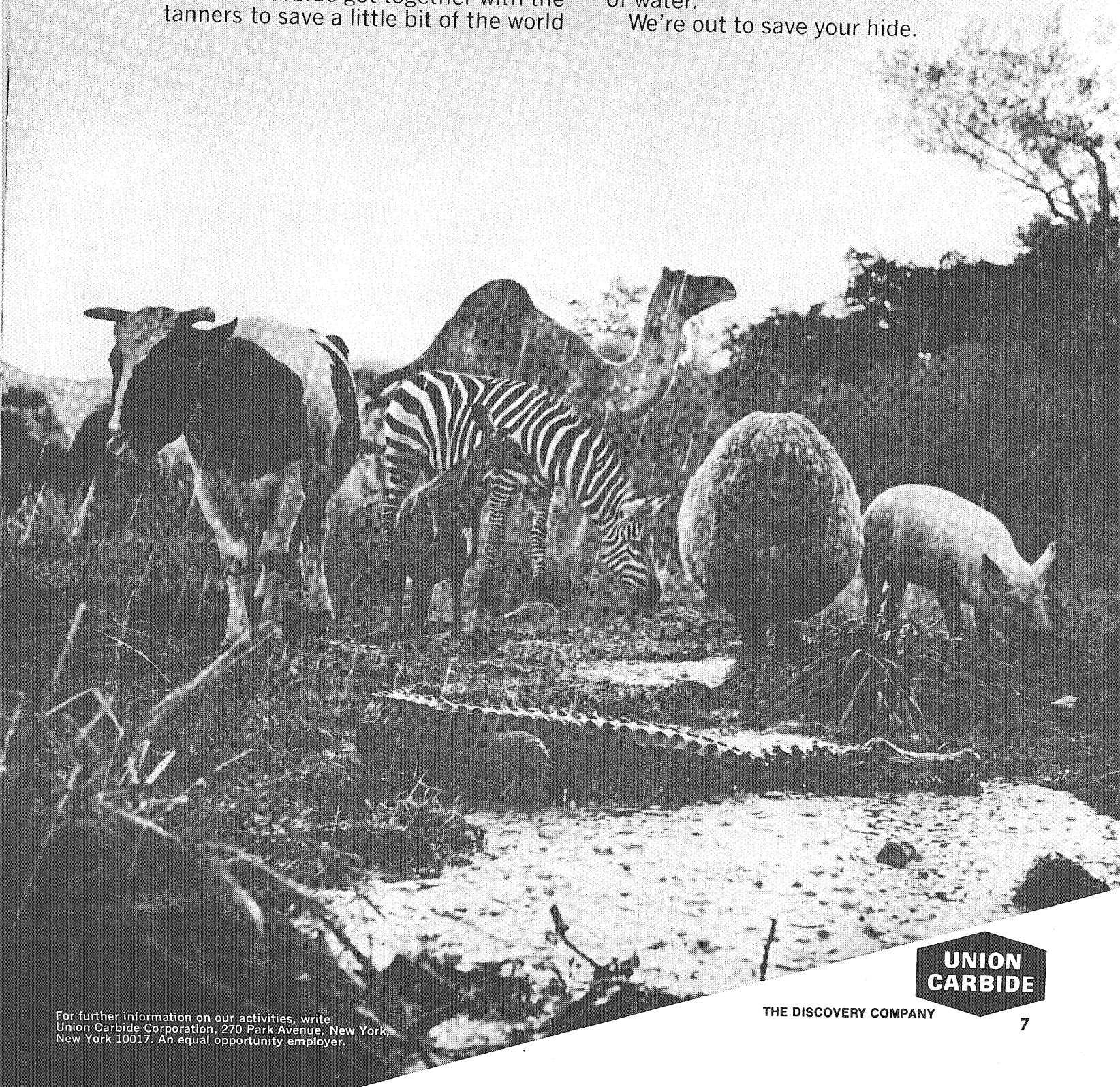
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# How We View Computers

## An Interview with Dr. Ronald Anderson

### by Robert Pirro

*Dr. Ronald Anderson is an Assistant Professor of Sociology at the University of Minnesota. He earned his PhD from Stanford University and taught sociology at the University of Nevada, San Francisco State College, and Stanford University before coming here in 1968. He is the director of the university's Social Science Research Facilities Center and chairman of the ACM's SIGSOC, (Special Interest Group for Social and Behavioral Science Computing). He is presently conducting a sociological analysis of the public's attitudes towards computers and information files. His findings will be presented to the 1972 Spring Joint Computer Conference.*

Q—When and where was your research on computers and public reactions done?

ANDERSON—I have used the findings from the Minnesota Poll survey that was taken early in 1971, and I also reported some of the questionnaire surveys I've done with students from Metropolitan Junior College, as well as 7 or 8 classes here at the university. I also conducted an interview situation survey at the 1970 National Conference of the Association for Computing Machinery. Those are the samples that I collected data on myself.

Q—Is the study still in progress?

ANDERSON—Yes. I'm just be-

ginning to write up some of the data, and I'll probably spend a year just writing and analyzing it. I've gotten reports from the recently announced nation-wide survey on computerization done by the American Federation of Information Processing Society and Time Magazine, and that study pretty much agrees with the Minnesota Poll findings in terms of how people view computers.

Q—What are the important findings of these surveys?

ANDERSON—One thing that's important is that all the studies report substantial amounts of negative reactions and negative attitudes towards computers. I think it's

**Continued**

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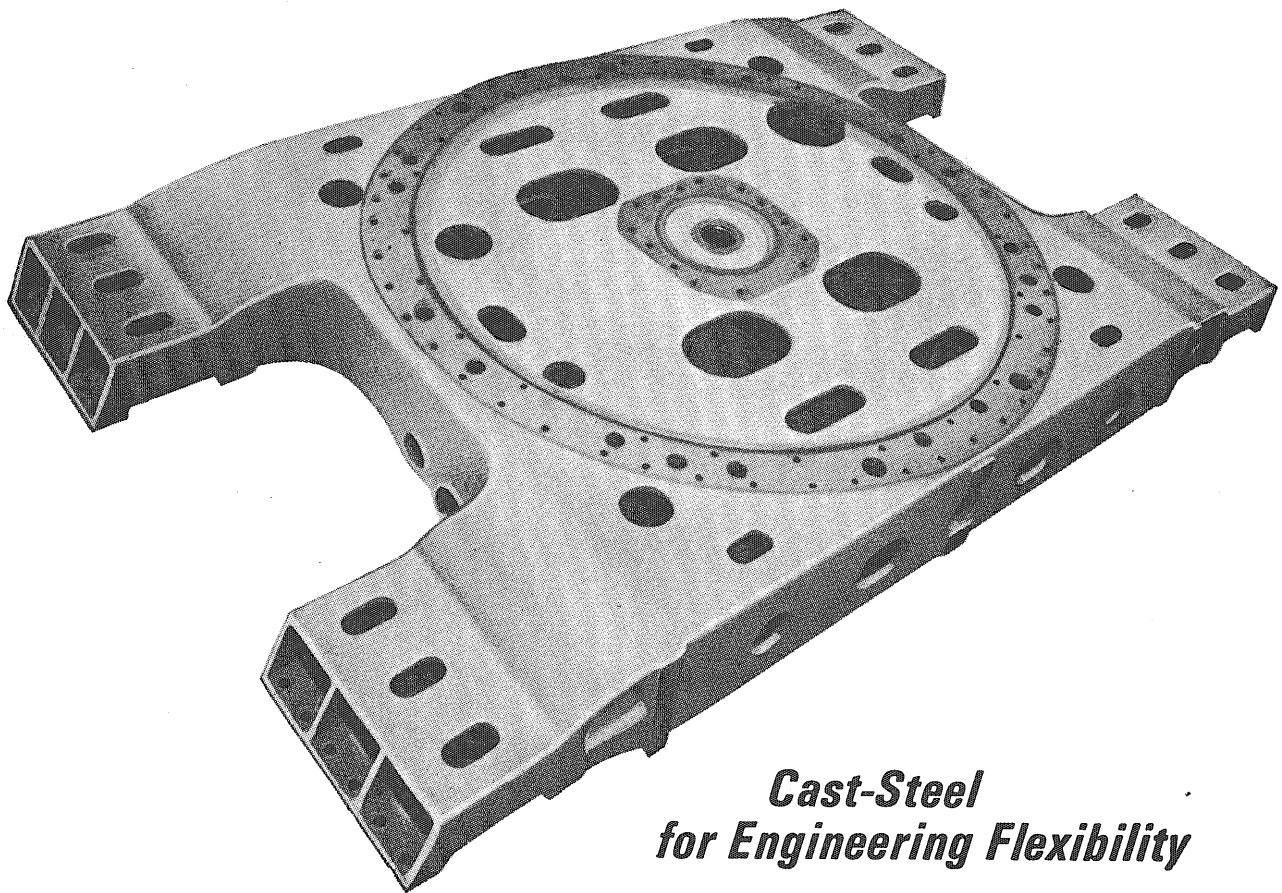
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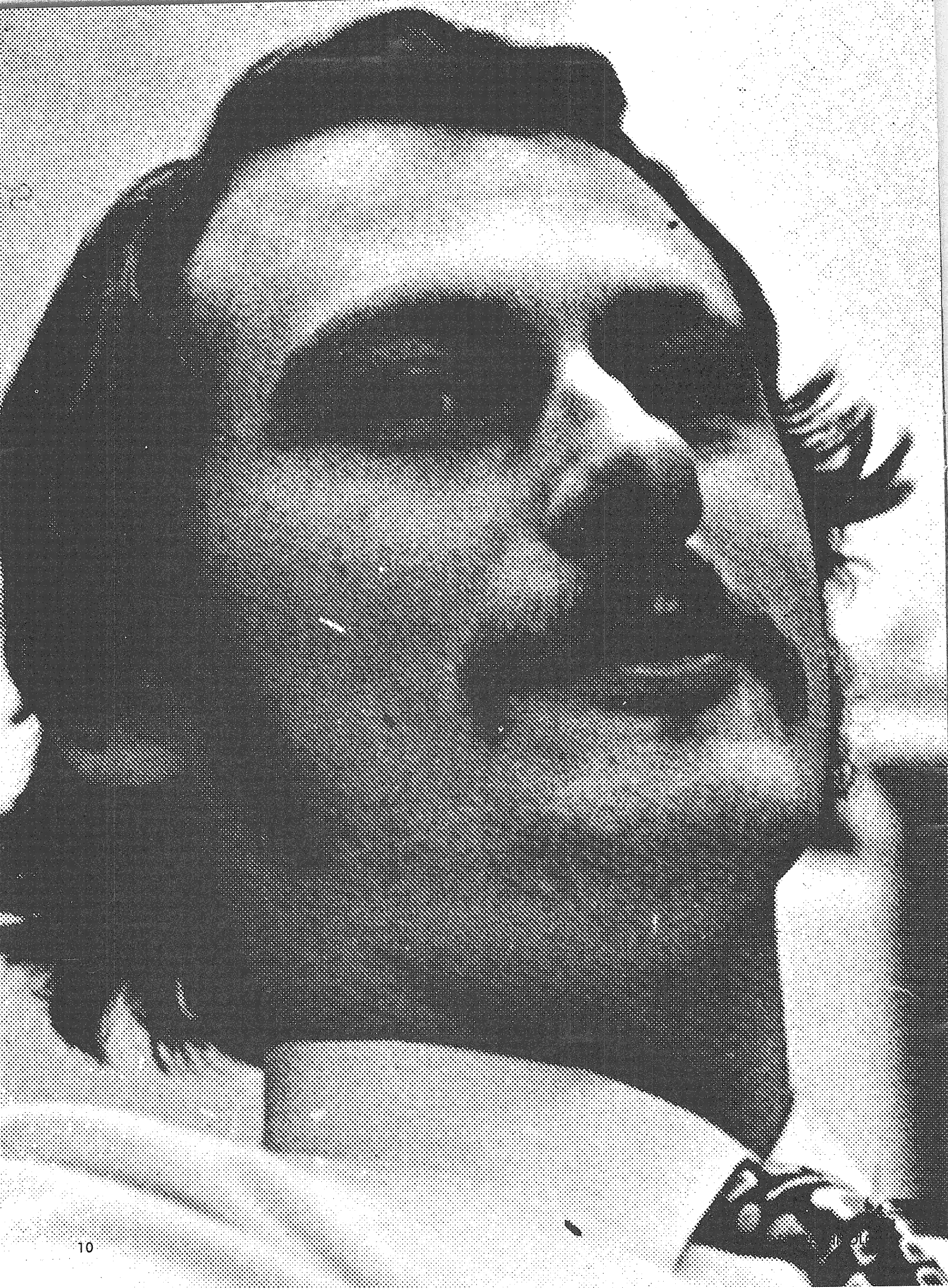
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Anderson from page 8

very important that whoever has control over the situation to any extent, be cognizant of just what the public is thinking because there could very well be a backlash against computerization, an important innovation that could really contribute to society would actually be rejected by it.

Q—Will we ever be using computers in our homes, as an everyday part of life?

ANDERSON—The computer revolution is only just starting and with new possibilities in cable transmission and cable networks, we can essentially bring computers and networks into millions of peoples' homes. Now you can put an entire central processing unit of a computer into a thing about the size of a cough drop. It's reasonable to think of having a computer to carry around in your pocket, and it's not that far off. So the computer will be in the home and in people's personal lives in the not too distant future.

Q—Will there continue to be a growth of government and businesses gathering personal information via increased use of computers?

ANDERSON—There will be huge developments in terms of public social information systems on gigantic computers that will change the whole picture as far as information collection and processing go, and it's this kind of thing in particular that's of concern to the public. There's potential for tremendous invasions of privacy. There also must be some real concern given to possibilities of public control of computer utilities rather than letting the industry control the way services are provided. I think that there needs to be much greater public involvement in controlling the shape of the future computer industry.

Q—Was there great fear of this control expressed and which groups showed the most fear?

ANDERSON—There's a lot of fear of information systems; that is, large data-banks that contain information about people, and ironically people in lower socio-economic classes with less education are less likely to be fearful of these than people who are highly educated. It's ironic because it is the lower

income and educated people who are most likely to be hurt by these systems.

Q—Was there fear of big-brotherism by government through the use of computers?

ANDERSON—Yes, but not just through the use of computers, but through the use of computers to set up large data-banks of personal information that can be accessed by people who don't deserve the right of access. And access is not the only problem. Another is how responsive the system is to change.

Q—Have there been many people who have had difficulty getting erroneous information corrected?

ANDERSON—Yes, many people have had serious difficulty in getting responsiveness to these kinds of demands, like a billing problem, and it's this kind of thing that people are getting worried about. In fact, an important finding which I recorded is that people who have had transaction problems with businesses that involve a computerized bill of some sort are much more likely to express negative feelings towards computers. What this means to me is that a person who has a bad experience dealing with a computerized bill, develops an unfavorable image of computers in general because of the unresponsiveness to his attempts to change the situation. And it's serious because a third of the people in our representative samples say that they have had these kinds of billing problems. If this kind of rigid, unresponsive interplay between people and computers continues, it's likely to be a very unhappy marriage.

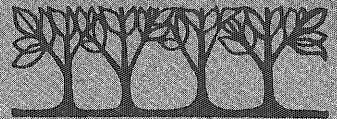
Q—Is the key to most of the negative feeling towards computers centered around personalization?

ANDERSON—I think so. We consistently come up with two independent dimensions along which people think about computers. One is that the computer is beneficial to society is a useful tool, and the other is that the computer as an impersonalizing, dehumanizing device on which we are overdependent. The negative dimension is characterized by feelings about impersonalization. This is what people really dislike about computerization and

Continued on page 13

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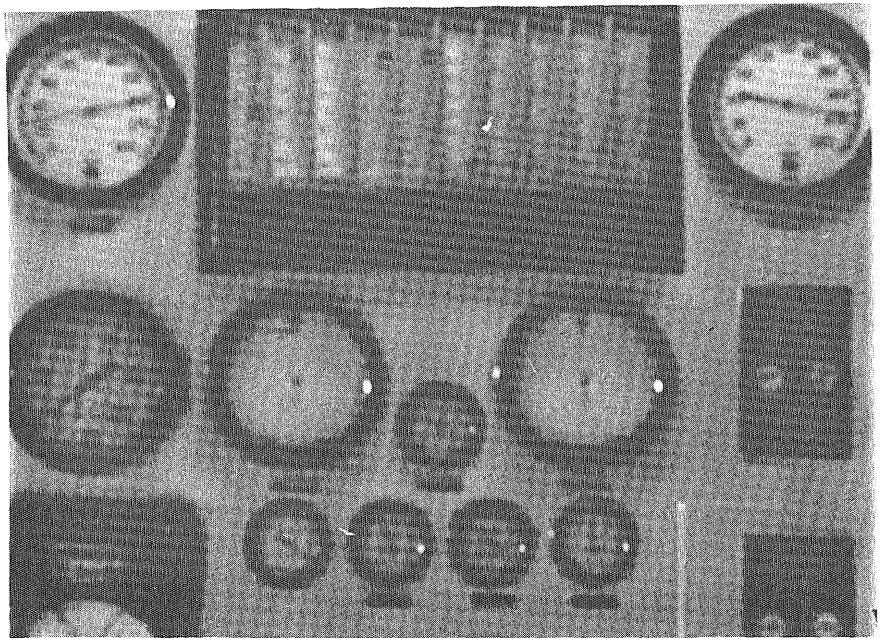
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# Smoke Screen

by Mary Hillstrom

The idea of using technology to solve technologically-caused problems is in operation at the University's Minneapolis campus heating plant. A device installed there may help eliminate an environmental problem that has become a modern cliché—big, black clouds over smokestacks.

The device is an Electric Smoke Recording Instrument and it was put into operation in December on three of the six boilers at the heating plant. The remaining boilers will be fitted within one year. Later, the instruments will be installed in the St. Paul campus heating plant.

The smoke recorder registers the amount of smoke and waste particles escaping into the air and sets off an alarm when these violate ecological limits. Before they were installed, the only way to tell whether the stacks were smoking was to go out and look. Now, the percentage of smoke to air is automatically recorded, and an alarm rings if it goes above 1.5 or 2 percent (by Ringlemann standards). Besides being ecologically successful, the instrument helps the plant operators use their fuel more efficiently. Firing the stacks without smoke is more economical. The units cost \$8900 and have a life of about 20 years, according to Joe Roback, heating plant superintendent. He estimates that over that time they should save \$20,000 in fuel costs. In a plant that uses coal and year-round, the devices would save much more (the University uses gas during summer months).

Although the devices have been on the market for some time, it was not until recently that they were developed enough to be used successfully.

These "drawing board bugs" were straightened out when the demand for the instruments increased due to pressures from the government and ecological groups. The perfected instrument consists of a tube with photo-electric cells on either end, which is installed on the chimney passage. Smoke passes through the light source and is recorded by the photo cells. The tube is connected to a control board where a constant record is kept. If something goes wrong, the alarm rings. When the alarm is acknowledged, a light stays on until the condition is remedied.

"The devices can be very important in keeping the air free from pollutants," according to George Vasilakes, an air pollution engineer with the Minnesota Pollution Control Agency. The University has, over the years, been very conscientious in this area.

But the instrument's effectiveness depends on proper maintenance. Some plants fail to check it often enough. Yearly checks are suggested, although time varies according to the wear and tear the recorder is subjected to, the cleanliness of the plant and other factors. The University has made plans to have the recorder checked yearly.

So some technological problems can be remedied. Destruction caused through technology can be solved if the demand is there. The smoke recorder doesn't solve the problem of smoking stacks or inefficient fuel usage. It only makes the plant operator aware that he has a problem. But knowing you have a problem is the first step to curing it. The smoke recorder is that first step. ■



are most fearful of, and it's a healthy fear. A lot of technology people are feeling very negative about computers for the same reason.

Q—What are some of the statistics you compiled on this point?

ANDERSON—The Nationwide AFIPS Time Survey asked the question; Do you agree or disagree that computers tend to dehumanize people and treat them as numbers? 54% of the people agreed with that. Now I had almost the same question in my surveys in the ACM '70 sample and 30% of the computer people agreed, 45% of the general public agreed, and about 40% of the university students agreed with that statement, so that's almost half of the people agreeing with the proposition that computers tend to dehumanize people. That's quite a substantial negative component. It was surprising to me to find that the students aren't more negative towards computers than the general public. I started analyzing student data before I ever saw public wide samples and I thought the students would be more negative but it's not the case. In fact the younger people tend to be slightly less negative than the middle aged people.

Q—Did you find any reason for this?

ANDERSON—Well it agrees with my theory about events and experiences shaping attitudes towards computers. I think that the younger people today are being more positively exposed to computers via class situations and educational experiences. For instance, a lot of students now have programming classes in high school, so they've had more exposure to computers than middle-aged people have had. They haven't had many bad experiences in the sense of uncorrectable computerized billing problems, so they've had a chance to develop positive feelings.

Q—Has the computer become the symbol of the so-called evils of technology? Is the computer the thing that people can point to as the villain?

ANDERSON—Yes, that's very true. It's a romanticized symbol and that's why it keeps popping up

in cartoons all the time. If a culture has a significant symbol, then there's something important behind it. What you should do is look at the functions that the symbol provides for the culture. Maybe it's a very good symbol to represent the problem that is being expressed. I think that the computer is a very appropriate symbol for advancing technology and impersonal business because clearly it does provide those results better than any other technology we have. It has tremendously wide implications and consequences. It's analogous to the printing press of several hundred years ago when many people were against the printing press, which probably symbolized a lot of the cultural changes that were taking place at that time.

Q—Many people fear becoming tools of the computer rather than masters of it. Is it possible in the future that people will become so dependent, especially economically, upon computers that they can in fact become tools of the computer?

ANDERSON—In the nationwide sample that I referred to earlier, nearly 60% of the people agreed with the statement that we are too dependent on computers at the present time, and this is related to the impersonalization dimension. Over and over again the data suggests that people have a very grave concern about relying too much on computers and I think that it's a healthy concern, and a very important one. But I think that a society which keeps this in mind as it develops new technological innovations will be able to maintain a reasonable balance, and adjust to that whole set of problems that are raised by the new technology. Control, such as that seen in a movie like 2001, is premised on the capability to program computers to higher decision and learning modes, and at the present time we are a long long way from that kind of programming capacity.

Q—How long is a long way off? Is there any possibility of computers controlling us in the 20th century?

ANDERSON—No, I don't see it possible in the 20th century, not the sort of robot control that we were

discussing. But one has to assume that if it ever is possible, that social systems will be able to cope with it. What it really boils down to is our faith in society and our ability as people to run our own lives and I think most of us have this kind of faith. ■



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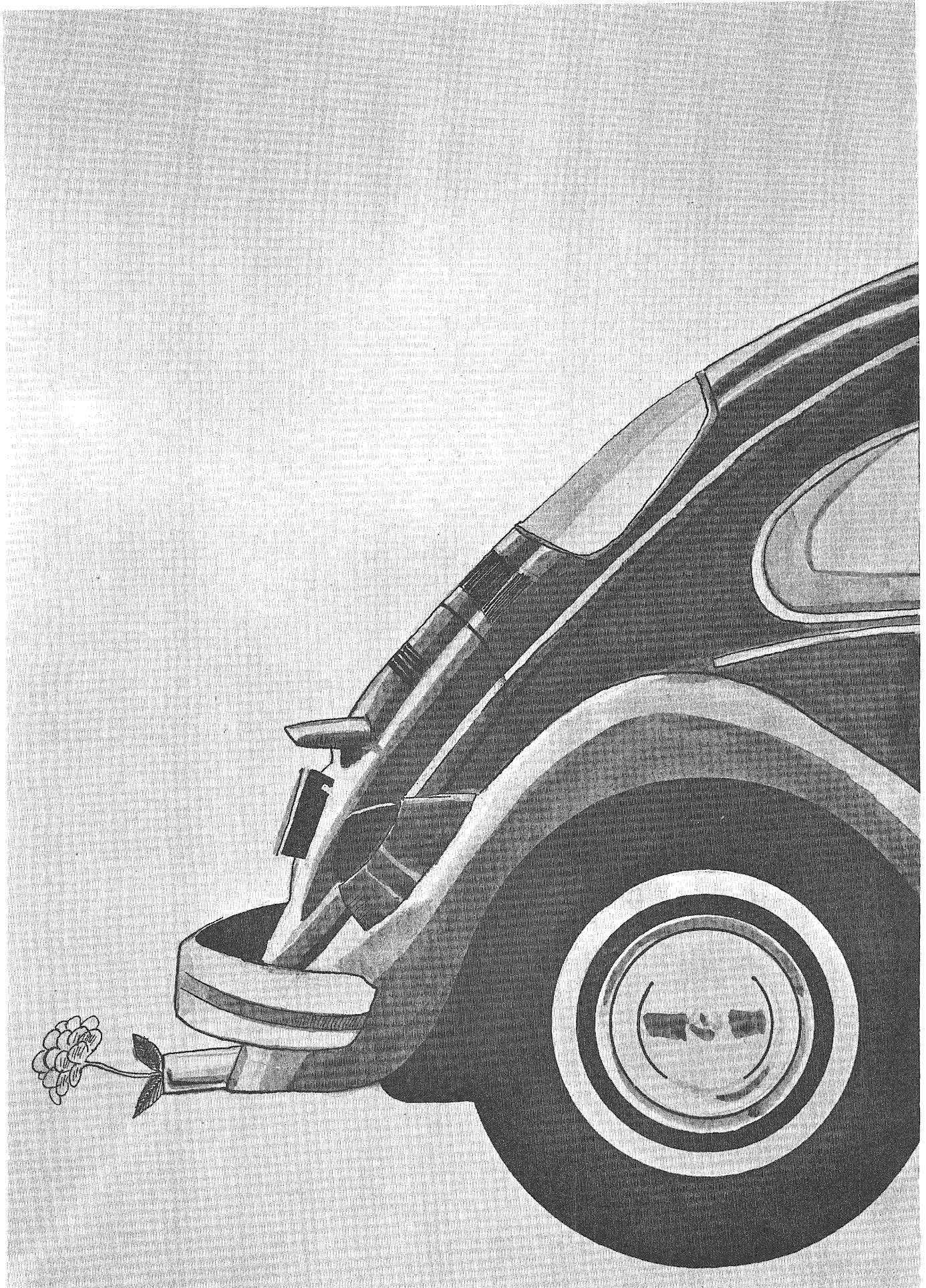
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Assessing the local attempts to reduce air pollution, it appears that such an ad is necessary. Throughout the Twin Cities area, hundreds of buses, trucks and cars contribute very little pollution to the air while the public remains unaware of the vehicles and their potential. The vehicles, powered for the most part by conventional internal combustion engines, use liquefied petroleum gas (LPG) instead of gasoline or diesel fuel. The LP gas burns cleaner and more completely than common fuels, especially at low engine speeds where conventional fuels produce the greatest amounts of hydrocarbons, carbon monoxide and nitrogen oxides.

Tests in California using a car equipped with an exhaust control device and a fuel system that burned either gasoline or LPG, showed that LP gas produced less than eight per cent as much carbon monoxide as gasoline, about 11 per cent as much hydrocarbon and 13 per cent as much nitrogen oxide.

LP gas also reduces pollution from evaporation. Conventional fuel systems require venting to the atmosphere and significant amounts of pollutants escape by evaporation from fuel tanks and carburetors, while LPG systems are highly pressurized and completely sealed, eliminating evaporation.

In addition to reducing pollution, LP gas offers other advantages. Even with an 11-cent Minnesota tax, LP gas cost averages about 27 cents a gallon (though cost varies somewhat with quantity purchased), propane (the most common LP gas) boils at minus 44 degrees Fahrenheit, making it a good cold-weather fuel since it vaporizes readily, its cleanliness and completeness of combustion means spark plugs last longer as there are no unburned deposits to foul them and oil changes are less frequent since there are virtually no residues to contaminate cylinder lubricants.

Yet with all these features, LP gas still needs educators, publicists and advocates.

The University's experience with LP gas highlights this need. In October 1970, the University added an LPG-fueled police car to its fleet in a trial to determine the practicality of such a vehicle. Six weeks later the propane unit was removed from the car as a result of complaints from the drivers—the smell of the gas made them ill and they feared the car would explode if they lit a match. Subsequent tests proved the fear of explosion was unfounded, but the odor (akin to that of rotting cabbage) was unmistakable.

A spokesman for the company that installed the

unit said a small amount of gas unavoidably escapes when refueling—this is what causes the odor. Since then, auxiliary units have been developed which bleed the escaped gas from the vehicle.

Another complaint comes from those who refuel LPG vehicles. LP gas "burns" when it touches the skin. Boiling at minus 44 degrees, the gas really freezes the skin with such intense cold it feels like a burn. The spokesman said proper instruction in refueling techniques and reasonable caution will eliminate such accidents.

Many mechanics will not work on LP gas vehicles because they are unfamiliar with them. An LPG fuel system is a simple one, however, consisting of a heavy-duty fuel tank, a converter to change the liquid to vapor and a mixer to provide the proper fuel-air ratio. Any competent mechanic, with a few hours instruction, can repair the system.

The cost of converting a vehicle to LPG is about \$350, but savings in operating and maintenance costs may pay for the conversion. Edward Falck, president of Natural Gas Vehicles, Inc. (Washington, D. C.) says the fuel savings on a taxi operating 100 miles a day could pay for the cost of conversion in less than a year. Family cars and

other non-commercial vehicles usually driven less than 100 miles a day would require longer to repay the investment, but in the long run a conversion to LP gas should prove economically sound.

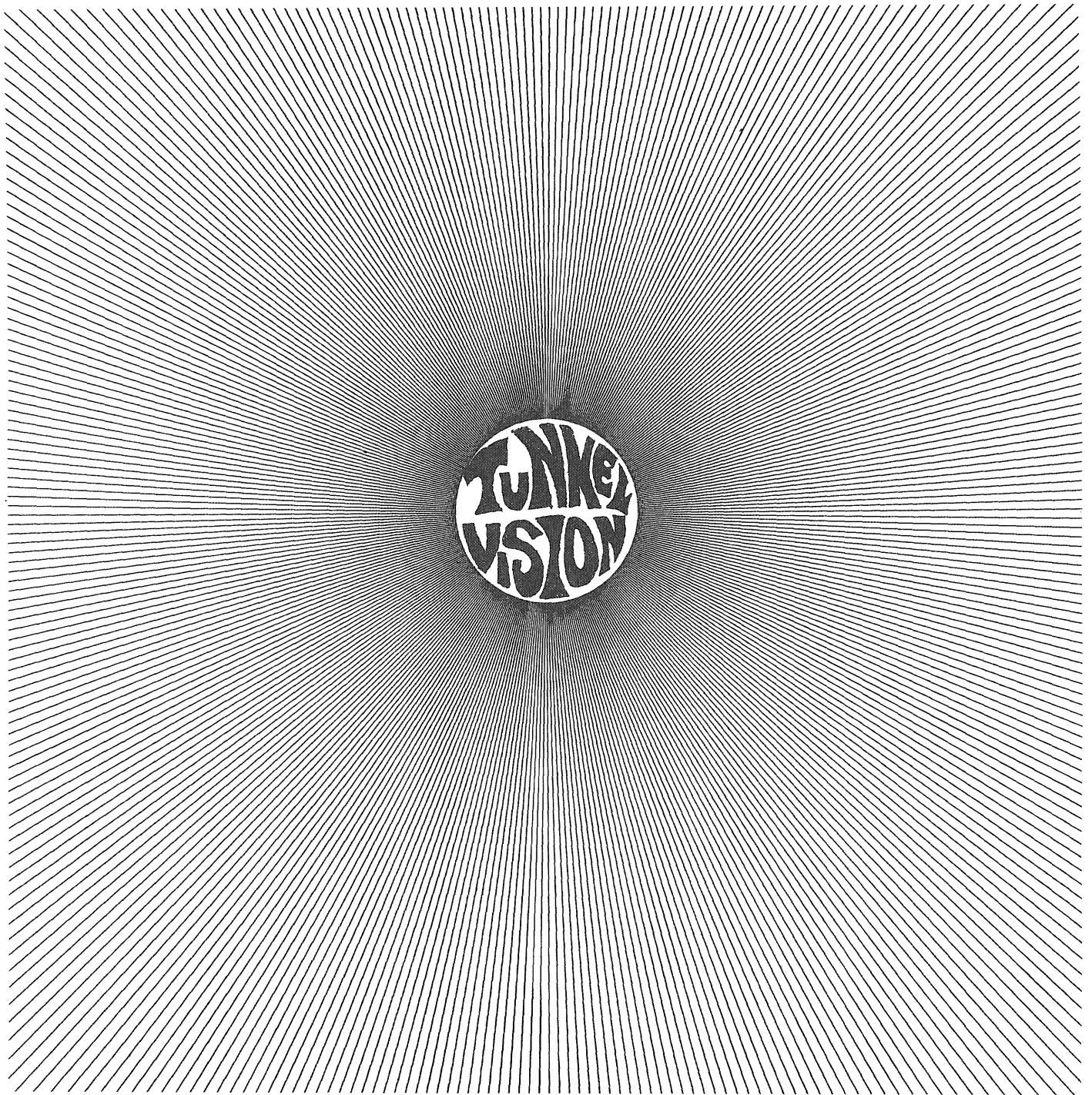
Until LP gas becomes popular, dual-fuel systems are a practical alternative for over-the-road vehicles—gasoline can be used at highway speeds (nearly complete combustion occurs at 40-70 mph) and a choke-like knob on the dashboard enables a switch to LP gas for stop-and-go traffic and extended periods of idling.

It appears that most of LPG's drawbacks (with the possible exception of its odor) can be overcome. California, in its concern about auto pollution, leads the nation in developing an LPG-fueled transportation system: California governor Ronald Reagan has asked for a four-cent tax reduction on LP gas to encourage its use, the state is installing its own refueling stations, 175 state vehicles have been converted to LP gas and lists of refueling stations are available to owners of LPG-fueled vehicles.

Even the odor is not an insurmountable barrier. Propane is odorless, but Federal law requires the addition of the unmistakable odor as a warning device to detect leaks. The smell of rotting cabbage could be replaced by the scent of sauerkraut or T-bone steak. If it comes to that, the ad may read: **WANTED:** Capable chemist to synthesize the "sweet smell of success." ■

# What a Gas!

by R. Vickery



by Mary Steil

The driver of a large semi-trailer truck decided to squeeze his truck through a small tunnel. He didn't succeed. City officials, anxious to free the truck and clear tangled traffic, asked engineers to help. Equipped with tape measures and slide rules, they came to assess the situation. Some suggested the tunnel be torn up, others that the truck be dismantled. As officials pondered, a young boy pedaled by on his bicycle and stopped to observe the truck. "I know what I'd do," he said. "I'd let the air out of the tires and drive the truck away." This simple solution worked and the engineers, defeated, found their tapes, packed their slide rules and quickly left.

For some people, this story is a joke; for others, a parable illustrating the plight of today's engineers.

"This is my favorite story about engineers," said Dr. Charles Carson, director of special services for the Minnesota Pollution Control Agency. "Engineers so often act like this, as if they had blinders on. They look down a narrow tunnel and sometimes they can't see as far as the end of their noses. If something works, they use it, without considering the consequences."

The consequences have sometimes been serious. Engineers have created unsafe cars, polluting factories and killing chemicals, including DDT. An angry



public has accused engineers of lacking social responsibility, of failing to consider the environmental and long-term effects of their work.

Before pollution or ecology, an engineer's life was much simpler. In the Sputnik era, when technology was booming, an engineer was merely asked to create — as quickly and effectively as possible.

"Sputnik was probably the worst thing that ever happened," Carson said. "Americans saw that Russia had a satellite and they said, 'Come on, we've got to get going and catch up with the Russians.' America demanded more engineers, and the race was on."

The number of engineers increased, but Carson and other critics feel an important aspect was omitted from their curriculum — the engineer's responsibility.

"Education is behind this whole darn mess today (the problem of ill-used technology)," he said. "We have created a generation of technocrats and slide-rule kids — the products of universities that have lost their way."

Technocrats, according to Carson, are people who use scientific knowledge to improve existing technology — they are primarily problem-solvers.

"The technologist is told by the politician and businessman to find an answer to a problem and he does so, without reference to anything else, without reference to the environment or to people."

Technology was spawned by science, Carson says, but the two fields are vastly different: "Science is like philosophy — very broad. Technology is like religion — very narrow in scope." A scientist, he said, "creates," while a technologist "deals with a recipe already made up" and finds an answer to the problem.

Often the recipe has few ingredients. Engineers often consider two basic things when answering problems: cost of production and feasibility of production. They aren't accustomed to considering other factors, such as long-term effects on society or the product's ecological effects. It is a continuation of Sputnik-era thought: the product is all-important; if it works and it's new, we'll use it — and then let's invent a newer product.

But the engineer alone is not entirely to blame for this narrow vision syndrome, said John Clausen, assistant professor in the University's Department of Mechanical Engineering. "Technocrats" were created in response to the demands of a product-minded society, he said. Both industries and buyers clamored for "new, improved" products, and engineers responded.

To supply the public's craving for new and better products, companies needed engineers who would provide new designs. But this doesn't mean that today's engineers are ignorant of the greater needs of the world — ecological protection, sociological change and more, Clausen said.

"It isn't always that the engineer doesn't have the know-how to make socially-responsive decisions," he said, "but he hasn't always had the opportunity to make this type of decision. Industry often has in mind the competition and the desire to be first, not the good or bad effects the product would have on

society.

"Often," Clausen said, "industry just didn't want a responsible engineer."

The public is also an impatient entity, demanding a myriad of innovations to make life easier. The automobile industry provides a good example of buyer-desired, engineer-designed, socially-unresponsible technology.

Cars were created to satiate the public's appetite for faster, fancier and more distinctive transportation. But many of these machines were found to be harmful to their owners (Corvair) and others were manufactured so mechanically poor they would only be useful for a few years. The cars had been designed with the market in mind, their cost and feasibility of production had been computed, but not the value of the service they would provide.

For engineers, the key to an awareness of their social responsibility seems to lie in the schools. Carson, who earlier blamed education for the current engineering-social responsibility "mess", has very definite ideas:

"What we should do is insist that all students in institutes of technology pass a very, very stiff program in liberal arts, culture, literature, the philosophy of science. We need to have people who can think — technologists should be made to become broad-minded."

University Institute of Technology students are currently required to complete a minimum of 36 credits in liberal arts — which is only one-fifth of the total required for graduation. Engineering courses take up the bulk of their time.



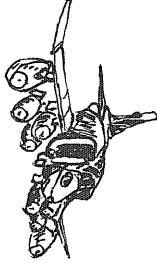

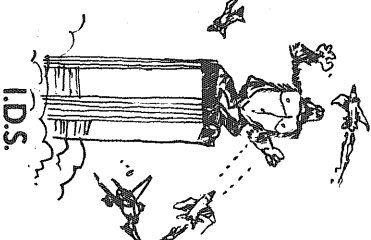




Clausen agreed that more can be done to make engineers aware of their social responsibilities. "I do think that our faculty can do more to help our students become aware of the impact our work has on society," he said. "We have to talk about the criteria an engineer should consider when he is working. He can't just consider the cost and feasibility of production."

Carson strongly feels that engineers should include "impact on society" in their decisions about the worth of a product. Will its long-term effects on the population be good or bad? Is enough known about the invention to guarantee its safety in the mass market? DDT was invented for a seemingly valid purpose, Carson said, "but look what happened." The total influence of the engineer's product must be considered, not just its market value.

A new course offered by the Institute of Technology next fall may help fulfill Clausen's suggestions. A course in environmental awareness will be part of a six-credit course package which will be required.

Perhaps with increased awareness, engineers can begin to fill a role that some engineers feel is desperately needed — awareness of their social responsibility.

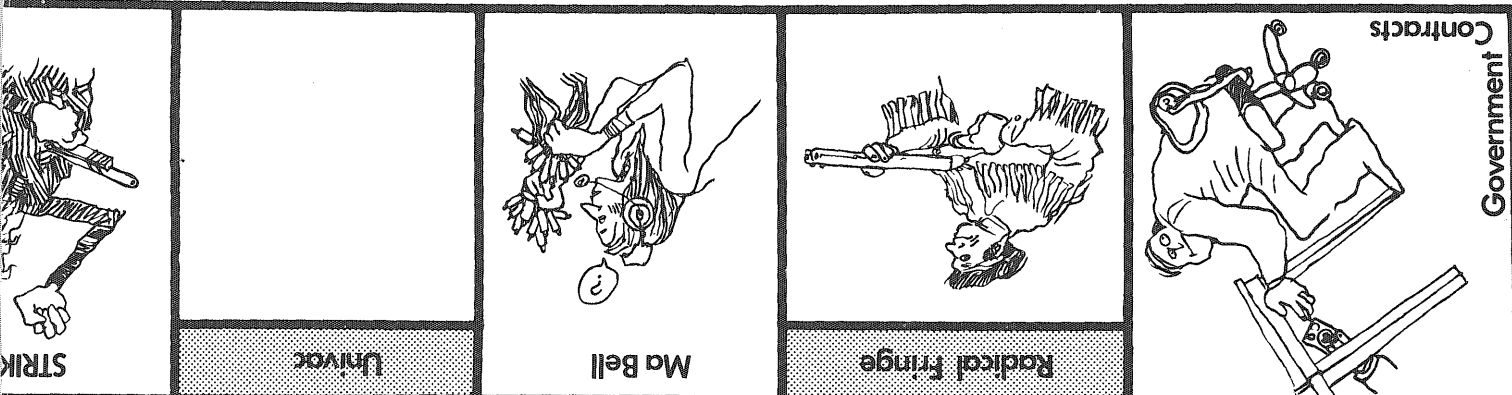
For, after all, responsibility to the public is part of the Canons of Ethics of Engineers: (1.1) "The Engineer will have proper regard for the safety, health and welfare of the public in the performance of his professional duties." ■

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	<p>Noder's Raiders</p>	<h1>AIN'T IT</h1>		
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by Ann

**Ain't It Awful** is a game the whole country can play — and does. It's an easy game. The players simply discuss the awfulness of a weighty social issue. They can choose to talk about the nastiness of snowmobilers who run down puppies, or pigeon droppings on city statues — or, they can discuss the Most Awful Thing: the U.S. involvement in Southeast Asia.

Now, who's responsible? Everybody pleads innocent — the taxpayer who finances it, the soldier who

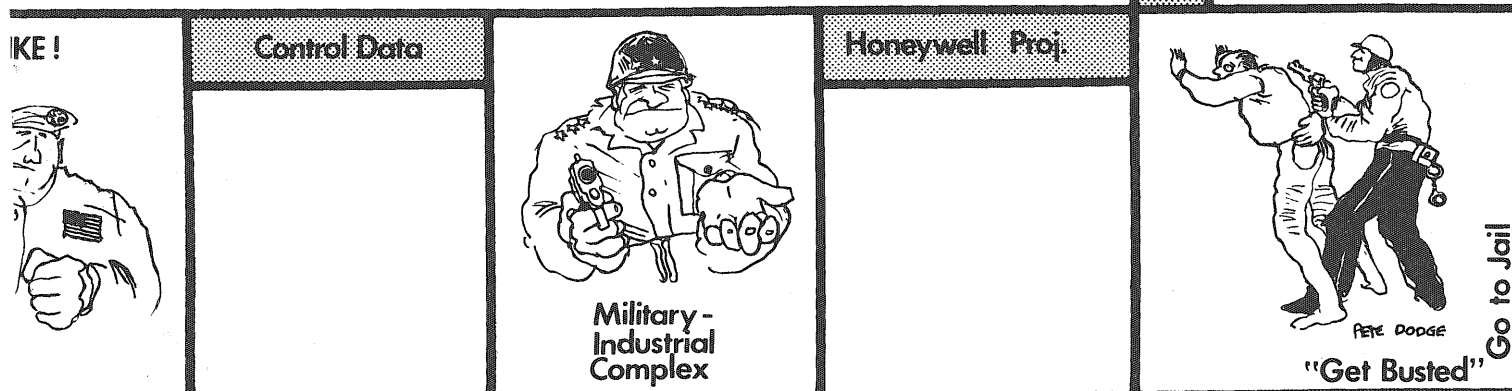
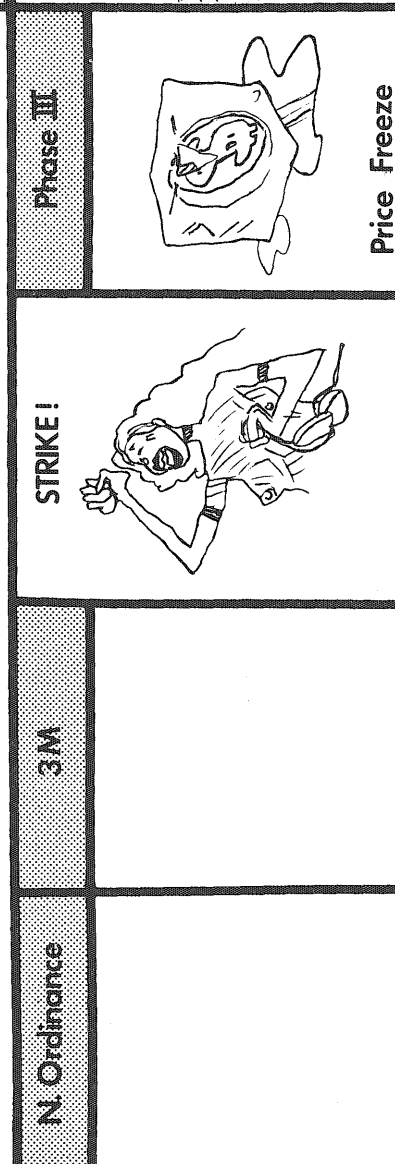


# AWFUL?®

Ludcke

fighters for it, the congressman who appropriates funds for it, and the diplomat who makes the policy. Then, someone invents the catchword, "military-industrial complex," and the players pounce on the scapegoat like a pack of jackals.

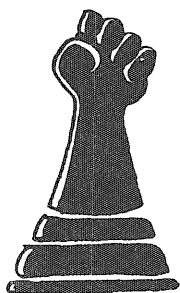
The local version is **Ain't Honeywell's production of Armaments for Vietnam Awful?** War critics in the Twin Cities find a vulnerable scapegoat in Honeywell, Inc., Minnesota's leading defense contractor. Although about 155 other Minnesota companies have





defense contracts and Univac, Northern Ordinance and Control Data are also leading military suppliers, Honeywell gets the brunt of the criticism. The critics usually focus on Honeywell's Aerospace and Defense Group, which produces munitions and equipment for airplanes, spacecraft and ships. This group, one of the six major revenue areas in Honeywell, produces armaments like fragmentation bombs, the MK46 torpedo, an anti-submarine defensive weapon, Poseiden, a submarine-launched ballistic missile and land mines. It also produces non-destructive equipment like airborne digital computers, airplane fuel gauges, and stabilizing systems for airplanes and spacecraft.

The Aerospace and Defense Group, employing between 6,000 and 7,000 people, brought in about 23 percent of Honeywell's revenue in 1970, a Honeywell public relations man said. In the late 1960s, at the peak of aerospace exploration and the Vietnam War, this group contributed a considerably higher percent. The spokesman said this group represents a declining amount of business, but refused to say how much of the decline is attributable to defense cutbacks.



**You'll pay  
for this  
you SOB**

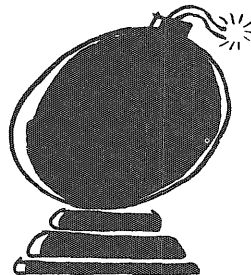
After agreeing that the Vietnam War is terrible and Honeywell is partly responsible for it, the players turn to a more vindictive game: **You'll Pay for This, You S.O.B.** The object of this game is to roundly criticize and demean the scapegoat.

The Honeywell Project is the **White Knight** of Righteous Indigation in the Twin Cities. Started in 1968, this peace group is a student organization at the University and is made up of students, faculty, former Honeywell employees and other "concerned citizens." Its goal is to get Honeywell out of the weapons business. Marv Davidov, co-founder of the Project, said the group focuses on the Honeywell corporation because it is a major weapons producer for the United States. He added that the board of directors of Honeywell have more economic and political influence than any other Minnesota corporation.

Another Honeywell Project spokesman, Richard Garrey, emphasizes, "We're attacking a system — not just Honeywell." He holds corporations responsible for the war: "We think the . . . real responsibility for the continuing war, lie(s) in the immense concentrations of economic activity centered in the giant corporations." Garrey said the Honeywell Project is "an awareness project" which tries to educate Honeywell leaders, employees, and the general public. The group relies on non-violent techniques; demonstrations, distributing leaflets, speak-

ing and writing letters to the corporation.

The Project has submitted three demands to Honeywell: an immediate halt to all weapons production at the corporation; reconversion plans so those in weapons production won't lose their jobs; and transferring corporate control to the union members and representatives of the community. If instituted, these



**Gosh fellas,  
I'm only  
trying to do  
the right  
thing**

demands would abolish corporate capitalism as it now operates — a just punishment for such a greedy lackey of the government, the white knights maintain.

How does Honeywell react to the white knight's allegations that its bombs kill little old ladies in Vietnam? It bows its head, shuffles its feet and mumbles, "Gosh, fellas, I'm only trying to do the right thing." In policy statements, Honeywell gives the impression that it regards defense as its civic duty — a regrettable, but necessary task. In its policy on military contracting, for instance, Honeywell says it hopes international actions can "lead to arms limitations and better understanding among nations." But it adds, "some level of military production is undoubtedly necessary at this time."

Most Honeywell spokesmen view the war as a political decision and think corporations have the obligation to supply weapons. "The government identifies areas of national priorities and national needs. We respond," said one public relations man.

Some Honeywell employees say lucrative defense contracts, not patriotic duty motivates Honeywell to manufacture war materials. A public relations man refers to defense production in the late 1960s as the "diamond stickpin" of Honeywell. Another employee says bombs have been "a good profit item." Donald Kurth, a former Honeywell engineer, says Honeywell makes land mines and anti-personnel bombs because it wants larger volumes of production.

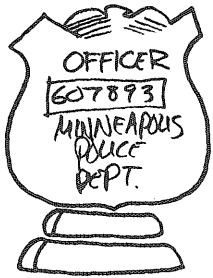


**I'm not  
going to  
play with  
you any  
more**

This game is played by Honeywell engineers who have quit because of indignation about producing defense products. Very few engineers quit because of

moral reservations, said a public relations man. "The theory is when people come to work here, they understand our business and know our policies."

John Edward Anderson, professor of Mechanical Engineering at the University and former Honeywell Engineer, says the main reason why he quit was that Honeywell placed profit above the interests of society. He also says he was "really cooled" when he heard ordinance engineers discussing "people-killing bombs" and saw them experimenting with laser beams designed to destroy the human eye.



**I didn't  
like playing  
with you  
anyway**

A variation of I'm Not Going to Play With Anyone, called I Didn't Like Playing with You Anyway, is played by engineers who were laid off and now view their former activities as immoral. Kurth, laid off a year ago, says engineers often get so caught up in the corporate system that they stop using their consciences. "When things are good, no one ques-

tions what hes doing," Kurth says. "When people start getting laid off, they start to question." At least six former Honeywell engineers, including Kurth, work occasionally with the Honeywell Project.

**Ain't It Awful**, which begins with somewhat rational arguments, soon degenerates into "I am not—you are so." The White Knights of Righteous Indignation are called weirdos, the lunatic fringe, pinkos, effete snobs and the radical chic. The Corporate Dragons are called industrial pigs, government toads, WASP and baby murderers. Fortunately, **Ain't It Awful** is timed to last only as long as the coffee break or cocktail party at which it's played. Then, the white knights, making last jabs at their awful foes, retreat to their ivy-vined castles and the Corporate Dragons, belching final flames of fire, skulk back to their caves. ■



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U. Senate: March 10  
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# LOG

## TRUE CONFESSIONS...

of a physics student

by Rhube & Co.

A KLUTZ! His mind is lightning fast, his rough calculations accurate to six decimal places (but anything before 6 places is worthless), and his manual dexterity equal to Rhonda the retarded chimp. That's my lab partner, a real zero of a klutz. Not that he's dense or anything, he's just an average, everyday moron with an I.Q. of 180 that has to have everything explained in twenty steps and two languages (a real candidate for a T.A.!) . . .

I'll never forget our first lab together. I made the fatal mistake of coming in late and sitting down in the first empty seat I could find. The T.A. began by scribbling something on the board while uttering profuse, unrepeatable (who could remember it!) language that sounded like the rabble of CHUNG KY CHEF and Oddie Ströudlie. I was busy gathering brownie points by listening to instruction (now I know why it's required to know foreign languages for an engineering degree) and, like the rest of the class, deeply lost in utter confusion, my lab partner began arranging apparatus for the coming experiment. Just as the T.A. was making some confusing point about inclined planes and rolling balls an iron ball weighing two pounds kissed my toes and I let out a cry that let the whole physics building know I was in pain. A few minutes later, after the spots in my eyes had gone from red to purple, my lab partner came over and explained, "Gee, I'm sorry! That object was quite massive — your foot absorbed a lot of kinetic energy. Golly, it won't happen again." Later the doctor told me "I" hadn't broken any bones and by next week I would walk again. That gave me sufficient time to cool off and give him another chance.

The next lab was about fluid dynamics and I was going to be polite but safe (or so I thought) and play easy. What could possibly go

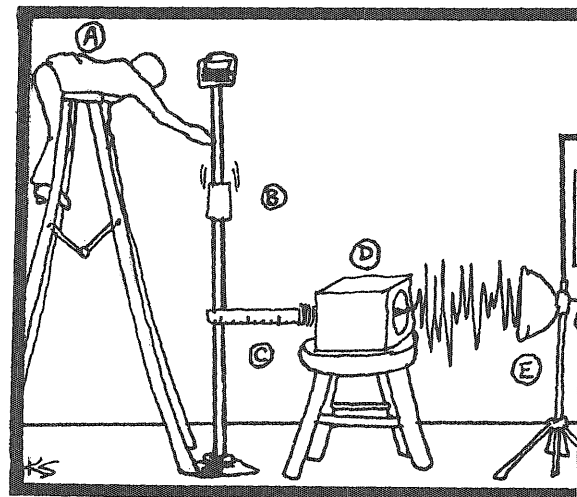
wrong? There just wasn't anything to screw up, so I relaxed and relented to his insistence on helping me. My lab partner, always overflowing with enthusiasm, decided to pull the same stunt again by setting up the lab while the T.A. was shooting the bull. We needed all the brownie points we could get so I made him sit down and listen. I would measure the amount of waterflow by collecting it in a graduated cylinder and he would keep time and regulate the water release valve. I was looking at the different sizes of pipes when I noticed that he was turning knobs, but I thought I'd let him play because the valve mechanism took less than twenty steps to figure out which made it too easy a problem for him to solve. Serves me right. I was recording the sizes of the tubes when I saw a stream of water come gushing out of the tubes to wash my face, my lab book, and nearly flood the room. I was about to build Noah's Ark when he accidentally found out how to shut the valve off.

One, just one saving quality. In six out of eight labs we managed to do about three right. My lab partner, in mystifying stunts of mathematical wizardness defied even the laws of physics to make it six out of eight by taking into account a "smug" factor in our data. Mother Nature didn't mind and the lab T.A. didn't catch us. Everyone lives through a course like that once.

BUT NOT TWICE! Of all the physics labs to choose from . . . why me? He came over, sat down, and said, "It's gonna be another great quarter." I did everything short of jumping out of the window (only three floors down, I figured I had a chance). No way. Somebody up there was after me!

And all this time my lab partner was finding more and more ways

how to screw things up. Remember the arc trailer? I can't forget it. There's some theory in psychology about improving your memory by associating it with something you already know. Well, I was holding the pendulum bob when he was attempting to find the on-off switch on the high voltage generator, and after several frustrating moments, asked my opinion as to



where it could be. So I just leaned over and pushed the black button in the middle of the generator and . . . ZAP! 10,000 volts to immortalize that lab.

By the end of the quarter I was getting concerned with my health. The next lab was on circuits using the 'scope and I decided something had to be done to avoid catastrophe. Brainstorm: skip the next lab, tell the T.A. I've been sick and make it up later. Brilliant? My life was at stake! So when I came to lab and found out that he been sick and was my make-up lab partner I knew I was jinxed.

I wasn't going to take chances so I made him watch as I performed the experiment. He watched the trace on the 'scope like I used to watch Dancing Bear on Captain Kangaroo when I was sixteen. After I was done I decided to let him

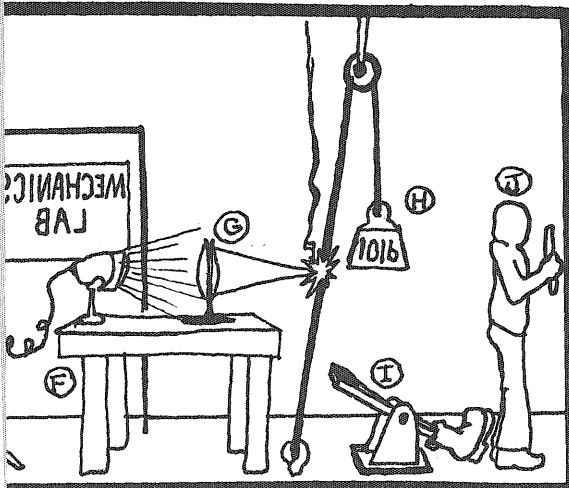


## Ac(e)tion Insert . . .

# All in Vein

by Mike Chase

kill himself and so moved to another table to write up my lab while he would attempt to imitate what I had done. A few minutes later he trotted over and asked if I could help him figure out what he hadn't done (right), and forgetting that he was an honor Rhonda Chimp, I said sure. One look at the circuit board and I could see he had the resistors in wrong, so I removed



one and . . . began to sing the Star Spangled Banner as sparks came shooting out of the board and the whole table went up in red, white, and blue. He had reversed a capacitor. End of quarter two.

I'm alive, not too well, and presently suffering from a bad case of nerves. The psychiatrist said that I was slightly schizo—a little on the paranoid side—and that I have this delusion that someone was trying to kill me. I thought about CLA but somehow couldn't give up the idea of I.T., so I dropped the idea of taking labs for awhile and decided to do three things: wait until next year to try it again; take several language courses in Far and Middle Eastern tongues; and to become religious. Laugh? You might . . . but what about that zero YOU have for a new lab partner that keeps screwing things up . . . ?

Paint. Slip. Crash. Pain. Blood. Curse. There I stood, looking at my forearm muscles. Only now there was no skin there to obstruct my view. Upon closer inspection, I noticed a veritable Draculan feast—severed veins, lots of blood, dead nerves, and several varieties of assorted maggots and worms. (Yum. Yum. A nice slice of meat eight by four inches.) This was to be the start of another fatal (or nearly so) adventure for yours truly, Ace. My arrival at the emergency room of University Hospital was my first mistake. I should have reported directly to Mortuary Science—it would have saved me much time and pain. (Who knows, they might have been able to do a better job.) As soon as I had climbed onto the slab, alias surgical cart, I asked for a hypo to kill my pain. (They must have misunderstood me, because what they did to me almost killed me, not the pain.) What did I get? Try about two jabs in each finger with sharp needles (covered with rust, yet). Then they told me to count my fingers with my thumb—must not have known I already had five quarters of calculus.

After laying there for over half an hour biting my lips to shreds and turning blue from lack of blood, I got my first of three shots of Demarol (a synthetic form of morphine, for all you drug freaks). Next, they proceeded to wash my arm in a saline solution. For all I knew, it could have been hydrofluoric acid, for as it turns out Demarol takes fifteen minutes to work. Neat. (Salt water feels just wonderful in an open wound.) I inquired why they didn't freeze my wounded wing with Xylocaine, a local anesthetic (sort of like Benzocaine). One nurse replied that the doctor hadn't ordered it, so therefore, I couldn't have it. I then asked the nurse if it was permissible for me to breathe, considering that the good doctor hadn't ordered me

to do so. It didn't seem to matter to her that my arm felt like it was laying in a bed of hot coals. Four specialists then entered and made some of the most brilliant diagnoses ever recorded in medical history: "I'll bet that hurts!" (No, it feels so good I plan to do it again.); "How did you ever do that?" (I was attacked by fifty rabid Amazons.); "Are you ever going to have a nice scar there?" (No shit!); "Nurse, soak his arm in Phisohex for fifteen minutes." (Phisohex, containing hexachlorophene, was recently found to cause brain damage. HMMMMMM!)

The next series of events which took place really had me believing that I was in M\*A\*S\*H. These same four doctors were arguing how to suture my arm. When they couldn't decide amongst themselves, they called for the poor guy who was later to get (stuck with) the job of sewing the wound closed, Dr. Leavenman. These doctors questioned his diagnosis, also. Dr. Leavenman pointed to the wound and said, "Suture here to here, there to there, this to that, and that to this." I raised myself and exclaimed, "What the hell are you doing, a dot-to-dot puzzle? Quit playing games and just sew up my damn arm!" Upon hearing this, the doctor asked the nurse, "How many shots of Demarol has he had? Two! Give him another and make it a large dose this time." (Shunk, shunk. Should kept my mouth shut.)

Finally the mob left Dr. Leavenman to the impossible task of attempting to sew up this wounded bear. (By this time, my disposition was as one.) While he was suturing (and mumbling "knit one, purl two"), he asked me about IT and engineering courses in general. I replied that everything was fairly straight-forward. Then I made a

Continued

**Vein from 23**

fatal error. I threw in the comment, "If only they didn't let those foreign students teach. Those doofs . . . ." Five minutes later Dr. Leavenman informed that he was born in Borneo. (Way to go, Ace!)

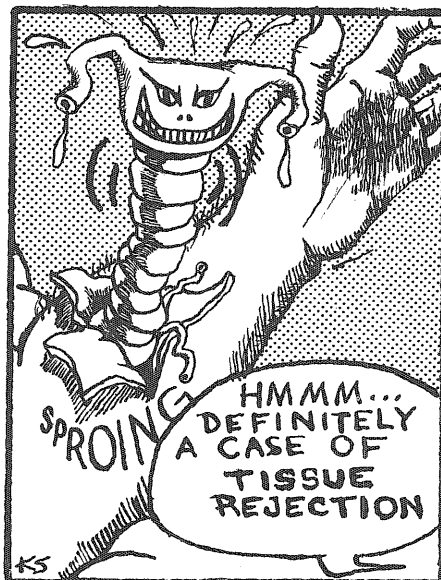
If I wasn't worried now, I surely was to be after talking to the good doctor a little while longer. He told me, "You don't want to be admitted to this hospital. Why you're even taking a big risk just lying here on this cart. If you only knew half of the things which go on around here! This wound might eventually heal by itself without stitches if you cared for it properly. I might take over a year, but . . ." About this time I had thoughts of leaping off the cart and making a run for it. After having ruined four sutures, sewing for close to an hour, and using a foot of suture material, Dr. Leavenman finally finished stitching. (He was still mumbling "knit one, purl two").

The good doctor then wrote out several prescriptions. As he was doing this, I received a shot of ampicillin, a tetanus shot, another shot of Demarol, and almost every other shot conceivable—except the kind of "shot" I really needed. A nurse arrived and I grumpily (and groggily) ordered her to get my coat so I could drive home. Overhearing this, Dr. Leavenman interjected that I surely could not drive. When I argued to the contrary, he invited me to first sit up and then stand up. I sat up, stood up, then promptly fell on the floor. After they peeled me off the floor, I was placed in a wheel chair where I wouldn't do any further damage to myself.

When the prescriptions arrived, I was really shocked. I had antibiotic pills, pain pills, and all sorts of goodies. If I had been stopped on the way home I would have been booked for every drug offense in the book. (After busting me, the

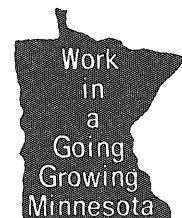
narc could have retired with a fat pension.) The ordeal was not to end that day, however. On Christmas day I had to return in order to have my dressing changed. Sure enough, some "Zero" was assigned to work on me. I didn't really know what to expect, but from past experiences I had a pretty good idea. The following thought raced through my mind: Would he use acupuncture instead of Demarol?

For a starter, he ripped the old dressing off in almost one grab. He also took off half the scabs doing it. Doc Doof then proceeded to scrub the wound with a saline solution and cotton swabs. "Scrub" is a mild word for what he did. A more appropriate term would be "belt-sand" or "wire-brush". To add insult to injury (pun), the little f-----r yelled at me for jumping around. "Why you move arm?" he screamed. I bellowed back, "Oh, it feels just fine, you little . . ." My folks then admonished me not to get mad at the doctor. I exclaimed, "He's a doctor? Hmph! More like an executioner!" Once again, old Ace had come down with a severe case of hoof-in-mouth disease. The rest of the examination was to



Continued on page 35

# "The Upper Midwest grows on us"



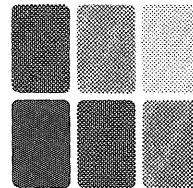
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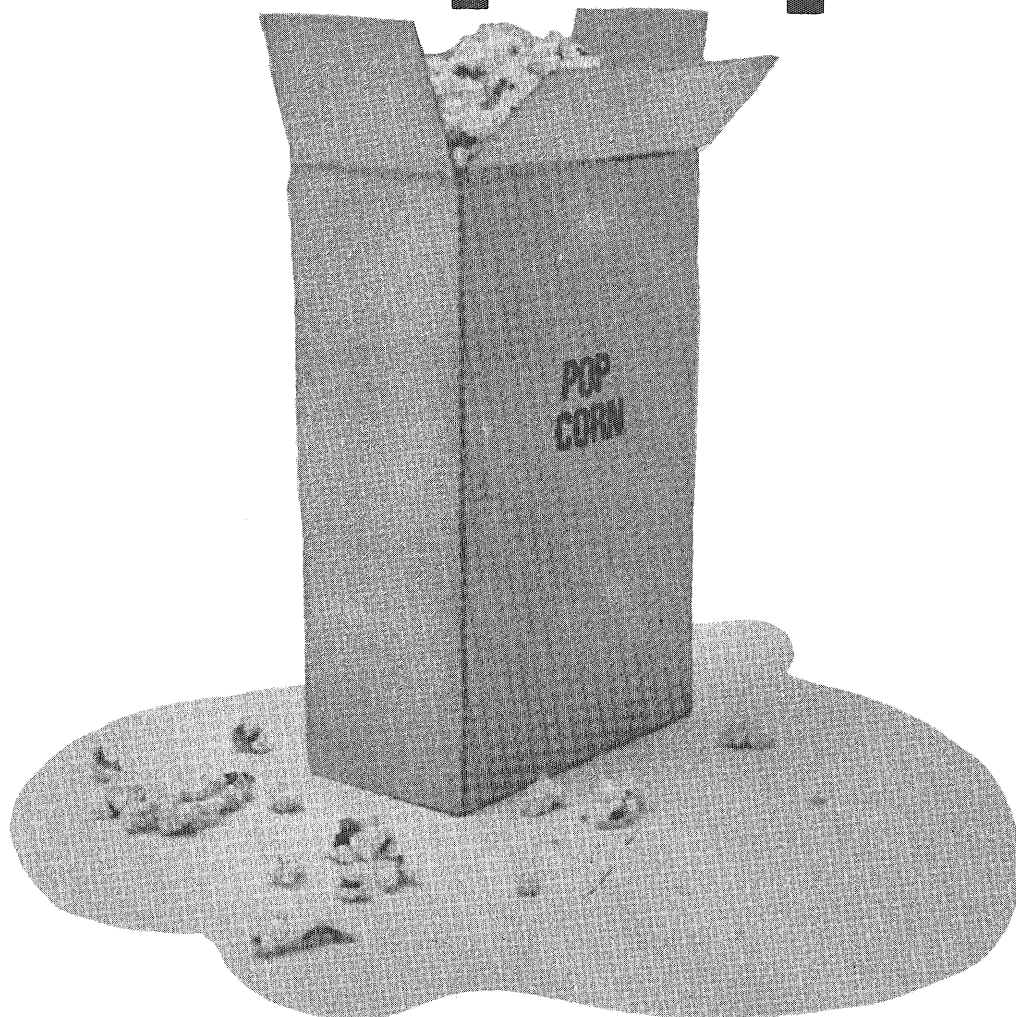
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# Wrap It Up



by Joseph M. Campbell

Opening a bag of potato chips that are soggy or a package of dried milk, soup or instant potatoes that have caked like a sugar lump is a thing of the past. New developments in food packaging end the need to tolerate such food problems.

New food products have brought about a need for increased packaging efficiency. Dried fruits, vegetables, milk, eggs and a complete line of dried camping foods required the development of new and better packaging materials for this type of food.

Dr. Theodore Lubuza, associate professor of food technology at the University of Minnesota and formerly with the Massachusetts Institute of Technology, has developed mathematical models for predicting moisture and oxygen gains in packaged foods under any given external conditions.

Dehydrated foods packaged in semi-permeable packaging materials have a shelf-life dependent on the transfer rate of gases through the package.

Two basic types of processes occur: (1) Transfer of water into the package causes caking, enzyme reactions, mold growth and non-enzymatic browning which is a process where protein and sugar interact to decompose the product. (2) Transfer of oxygen causes oxidative rancidity. The objective of packaging is to reduce or eliminate the transport rate of oxygen or water or both through the package barrier.

High quality storage for the desired shelf-life of a food is every food processor's goal. Traditional methods for choosing proper packaging are based on experience and good guessing," said Labuza.

These methods involve selecting several packaging films (materials) which have given good results in previous tests. Food packaged in these films are placed in storage for 6-12 months and the best film is selected. This method has led to overprotection in many cases and is very costly in time and man-



power. The consumer invariably pays the extra packaging costs and therefore, would benefit from a systematic method of determining shelf-life of various films.

Labuza also has used a computer to predict storage life based on deterioration due to browning. His findings have been within 10-15% of actual shelf-life as determined by product tests.

A semi-permeable package transports water vapor across its thickness by virtue of the vapor pressure difference across the package. By use of an equation in which all factors are known or constant except for internal package vapor pressure, rate of transport of water vapor can be determined. The unknown internal vapor pressure is a function of the food inside the package, since as water enters the package it is absorbed by the food. Food has an absorption rate which can be calculated under any given circumstance.

Many dehydrated foods deteriorate by means other than caking, such as by non-enzymatic browning. Solving this problem essentially involves the measurement of some browning index, such as increase in color or loss of solubility under constant environmental conditions. To simplify matters, rate of browning is assumed to be at a constant moisture level. The point of chemical change is pinpointed where the product just barely becomes unacceptable.

This can be done for dried milk by presenting it to a panel for visual observation at different stages of deterioration.

Another problem is to determine the rate of chemical change as a function of the product moisture content.

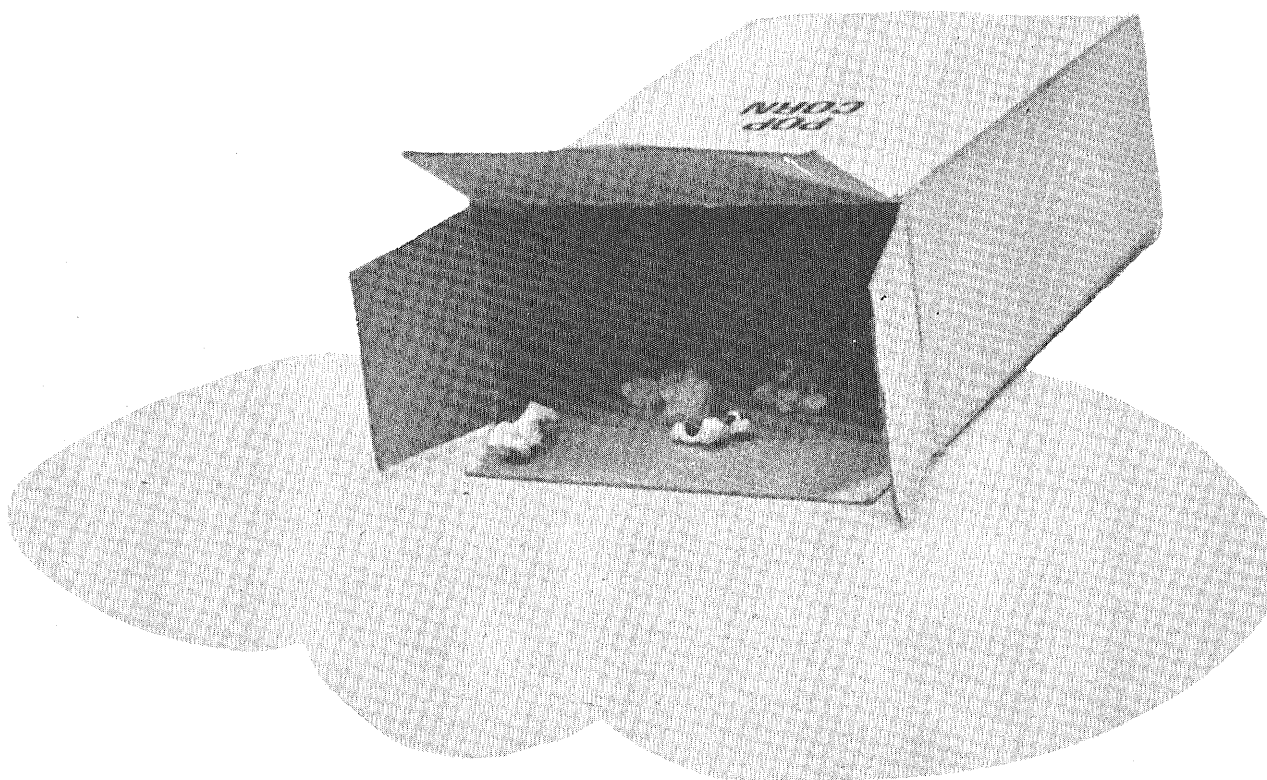
Data must be collected for which equations can be set up to predict packaging conditions. The method

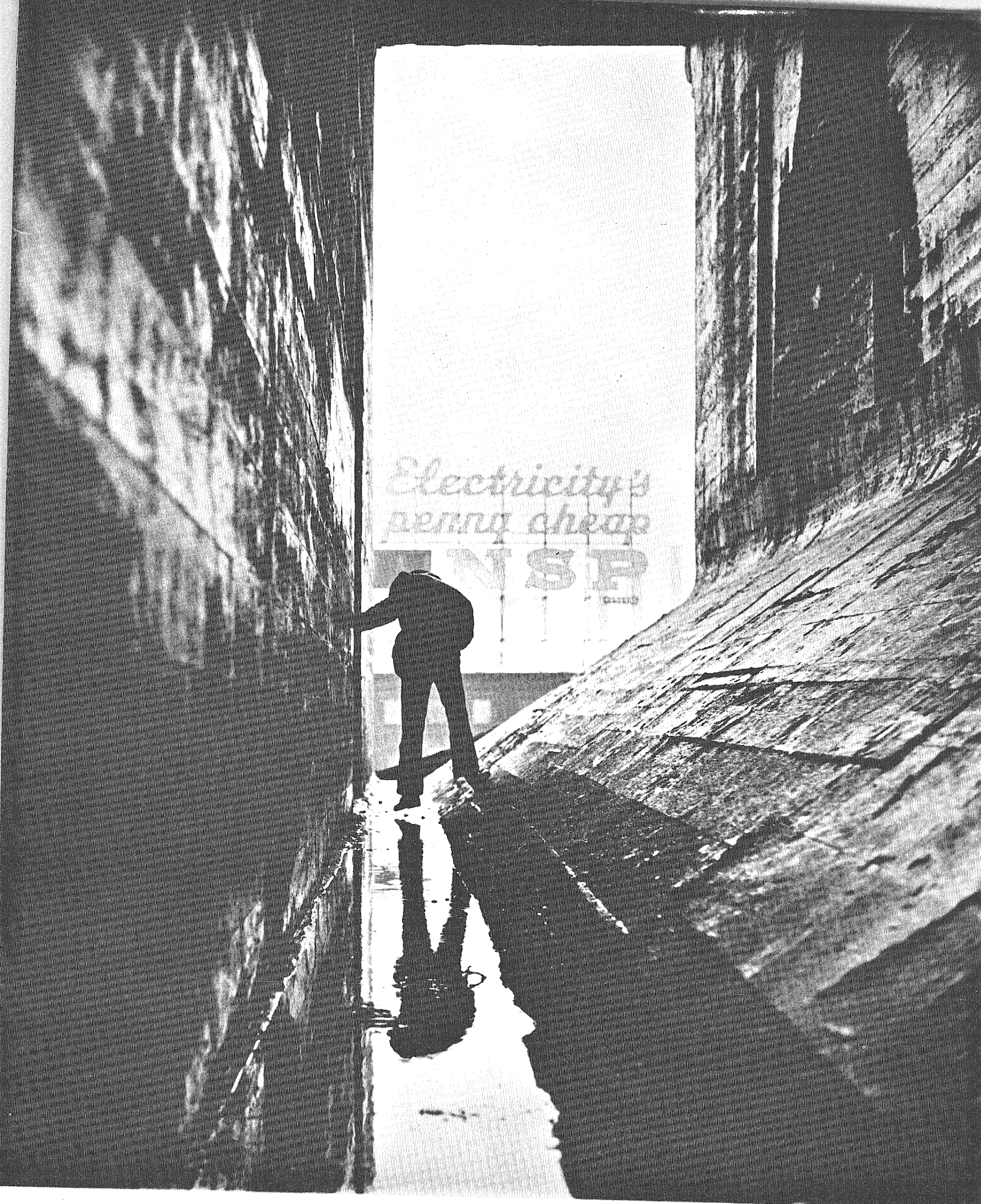
used previously to calculate rate of water gain is applied. At each time moisture is increased content is utilized to calculate the instantaneous increase in the amount of chemical reaction. Labuza says this procedure can be applied — in addition to browning — to any reaction system which depends on moisture content.

Many foods deteriorate because of reaction with oxygen, especially through oxidation of unsaturated fatty acids. This situation is more complex than moisture gain since rate of oxidation depends on oxygen, partial pressure and moisture content. No effective procedure has been developed for obtaining equations to describe this. Labuza says present efforts are being concentrated in this area.

Mathematical methods are available to give adequate prediction of packaging variables. Use of these methods combined with accelerated storage of foods to determine deterioration factors should allow the food processor to find the best package for each product. In addition, the economics of packaging can be improved if one can find films of similar permeability but with different weights. Use of this methodology for food systems of the Apollo Space Flight program have shown many foods to be overprotected by factors of 10-100 times. They've also demonstrated extreme excesses in packaging weights. In that application weight savings are critical to the overall flight system. Labuza says that finds in the Apollo program apply to consumer products as well.

With scientific methods used in food packaging the consumer will benefit from increased food safety and reduced costs. So the next time you open a bag of potato chips, instant breakfast drink or dry baby formula, be confident that food technology has made the product safer and cheaper to buy. ■





Photography by John Bortnem



# WHAT'S NEW

## Chips off the Old Block

by Kiki Koras

Some samples of lunar rocks and partially solidified soils taken from the Apollo 15 landing site have been determined to be less than a million years old. Prior to these measurements, the youngest observed ejecta from lunar cratering had been 20 to 30 million years. Using radioactive dating techniques, these, "young" samples were shown to have been ejected during lunar crater formation within the past million years. These observations provide the first measurements of the actual times of recent lunar cratering events.

A boulder, from which samples were taken, had the appearance of being an ejected fragment from a

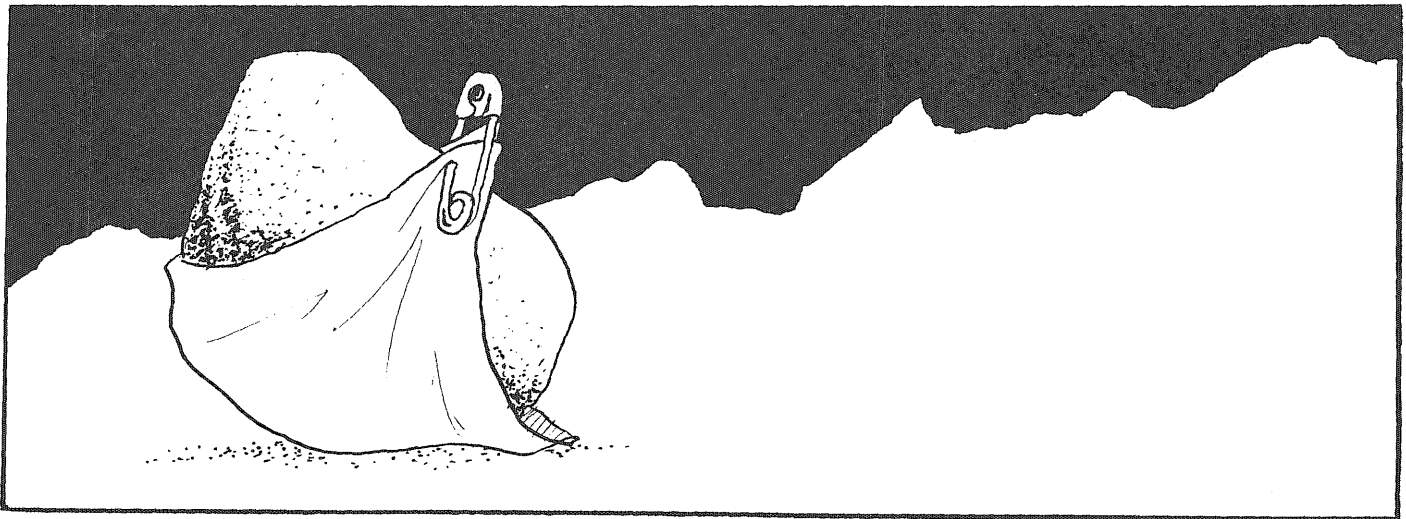
relatively recent impact at some other site. The boulder surface was relatively free from dust and had a fresh appearance. Much of the surface was covered with bubbly glass which had not been significantly eroded.

Analysis of the boulder chips and the cosmic-ray produced radioactive aluminum-26, showed about half of the possible saturation value. To produce the concentration of aluminum-26 would have required the boulder to have been ejected by a meteorite impact about three-quarters of a million years ago.

Further verification of its lunar surface age was provided from the analysis of underlying soil which

the astronauts collected after rolling the boulder over. The aluminum-26 activity of the underlying soil was what would have been present after shielding for three-quarters of a million years.

Other young lunar material, which was collected a few hundred feet from Hadley Rille, showed a lunar surface age from aluminum-26 dating of between one-half and three-quarters of a million years. The material consisted of cloddy fragments of compacted lunar soil which had been ejected from a 10 foot deep by 50 foot diameter crater. The crater had not penetrated bedrock, and therefore the sample consisted only of compacted regolith components.



## Let There be LOC

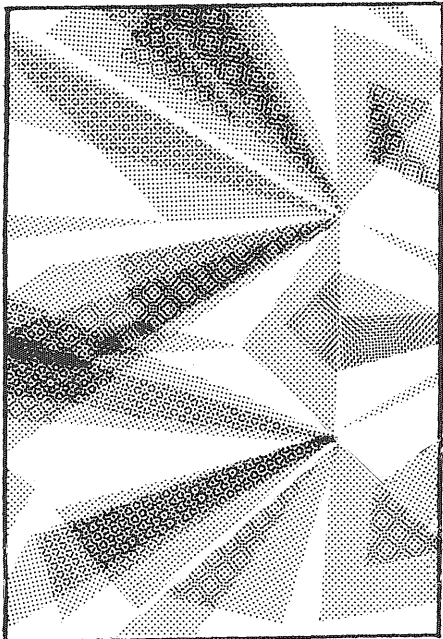
A group of scientists have developed a universal design that can provide laser light at power levels suitable for virtually any application of semiconductor lasers. The design, which involves placing an optical cavity within a semiconductor laser, doubles the output efficiency at high peak powers. It represents an important step toward the practical use of lasers in closed-circuit TV and in commercial and military communications systems.

Essentially, the Large Optical

Cavity (LOC) is a passageway through which the light can travel. The laser light is propagated away from the area where it is generated in the semiconductor and emitted from the device with very little power loss. The power level of the emitted light can be adjusted to specific applications by simply changing the size of the optical cavity. Before the development of the LOC, light was generated and emitted from the same area of the laser, resulting in a loss of light through absorption.



# Crystal Clear Memory



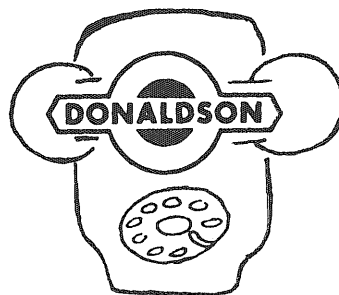
A crystal that can store holograms in the form of atomic patterns has been developed. A new document-storage system in which graphic material could be permanently stored in crystals about the size of a sugar cube may be the ultimate result. The crystals are made of lithium niobate or barium sodium niobate.

An advantage of this system is its large storage capacity. Theoretically, a cubic centimeter of crystal could store a trillion bits of information. The holograms also can be read out fairly easily, since a small change in the angle at which the readout laser strikes the crystal makes it possible to select a different hologram. Also the display from a crystal hologram is about 15 times brighter than that of a conventional photographic film hologram.

Holograms have been recorded in crystals before, but the process required a powerful laser and long exposure time which made it impractical. The new crystals are made about 500 times more sensitive by adding metallic impurities thus allowing the use of low-power gas lasers. ■

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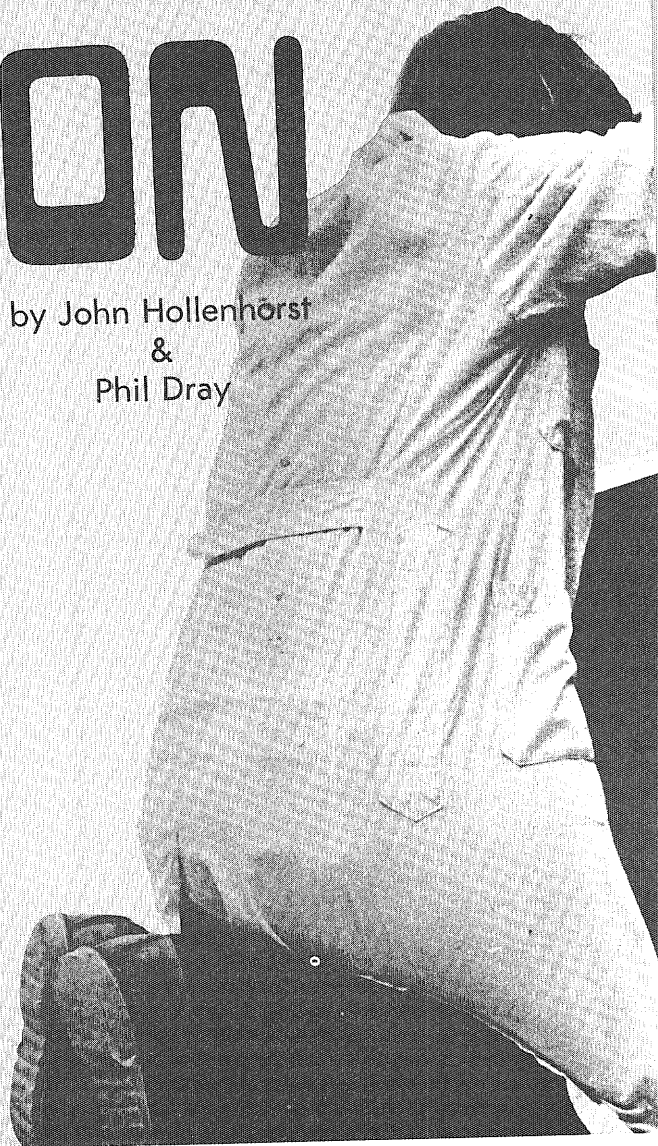
**"I exploited the phenomenon of the technician's often blind devotion to his task. Because of what seems to me to be the moral neutrality of technology, those people were without scruples about their activities."**

**Albert Speer  
Nazi Minister of Armaments  
Inside the Third Reich**

As concern rises for the direction and consequence of modern technology, many people have pounced on statements like Speer's as evidence of the scientist's lack of concern for his society. In an informal opinion survey of fifteen students and faculty men in various technological fields, a surprising level of qualified agreement with Speer was discovered. Most, however, felt that recent trends showed some cause for optimism.

# BLIND DEVOTION

by John Hollenhorst  
&  
Phil Dray



"Speer's argument may have been correct in his day, said Al Johnson, Electrical Engineering teaching assistant, "but it is becoming less so all the time. Many professional organizations have begun to explore the possibility of political involvement for scientists. Many scientists today are seriously questioning the applications of their work."

"In years past, people tended to follow the government no matter what it asked," according to Ed

Peterson, assistant professor of Aerospace Engineering. "Scientists are very rapidly losing their blind devotion, just like the rest of society."

Many who felt Speer was essentially correct said they didn't believe scientists were especially different from anyone else in their ammorality. "Is the truck driver who delivers an atomic bomb from point A to point B any different from the physicist who helps invent

it?" Peterson asked. "Both might give no thought to the end result of what they are doing." Joh H. Parks, Jr., professor of Electrical Engineering agreed that scientists are not uniquely callous to the moral consequences of their work. "They are morally neutral in the sense that their decisions are based on their desire to get their paycheck at the end of the month," he said. But, the same can be said of the secretary or glassblower who are employed by a company involved in defense work."

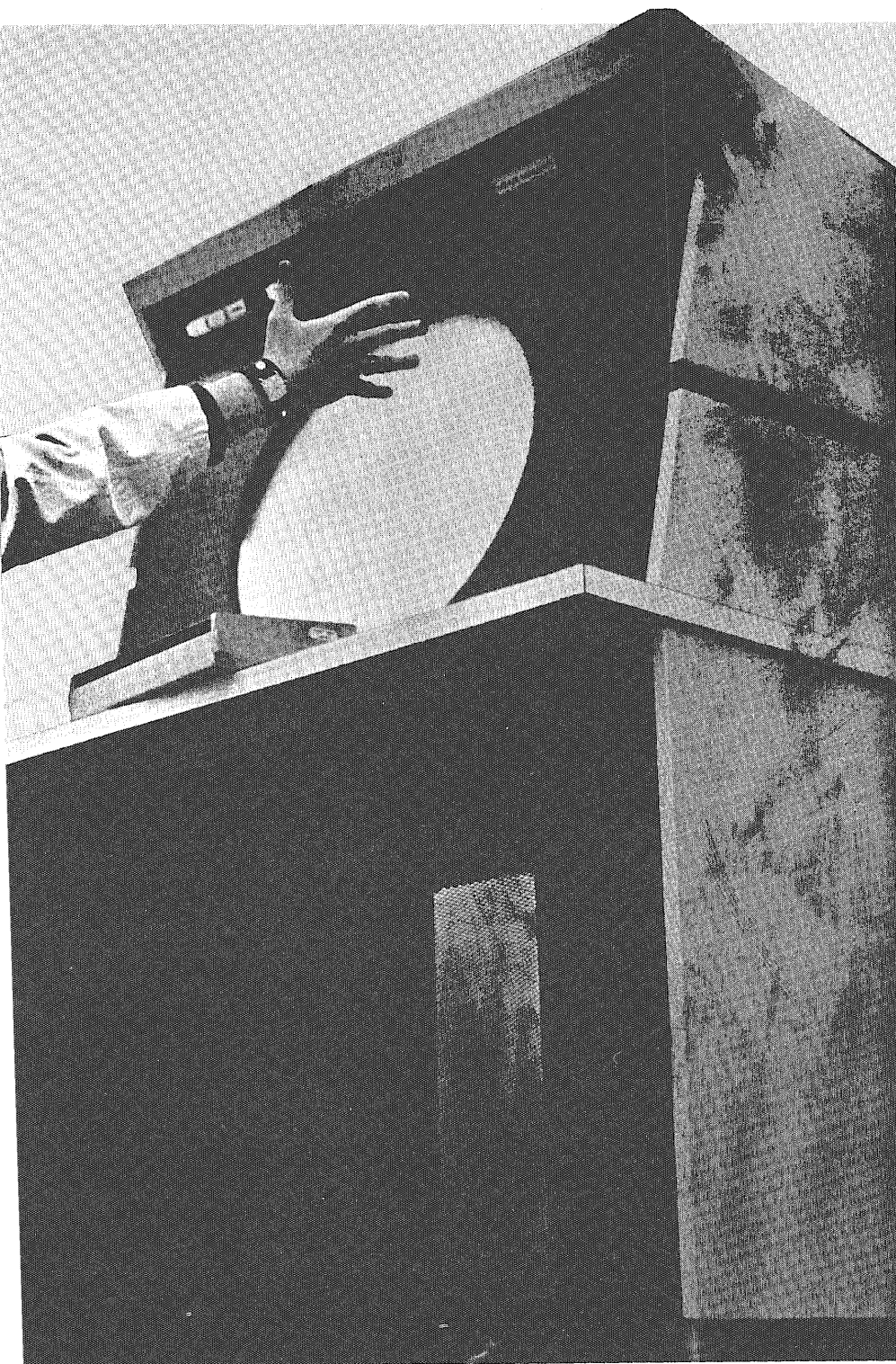
Park's statement reflects a belief shared by many of those who were interviewed: the principle factor preventing the scientist from considering the moral consequences of his work is his desire for financial security. Park observed that while some may give up a job "to satisfy their own moral code," scientists "are human and in many cases they will overlook moral issues just to keep bread on the table."

John Glover, architecture senior backed up Park's claim, and pointed out a growing economic dilemma employed engineers. "They don't make moral decisions about whether to work on a certain project simply because there is no place else for them to go." Glover said "They either work on the projects assigned to them or they find themselves out on the street."

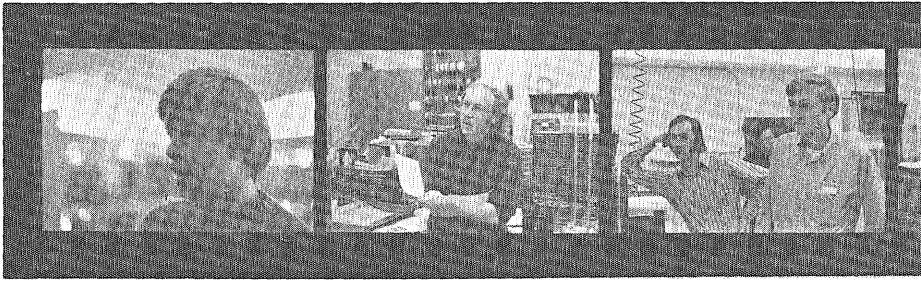
"I think the scientist is in a position where he's being exploited," said Paul Kintner, a physics research assistant. "What he's really interested in is getting enough food to eat and shelter over his head."

Another factor which may tend to divorce the scientist from the consequences of his work is the ego involvement between the scientist and his work. This was a recurrent theme in the remarks of those interviewed, but by no means one which they all agreed upon. The concept is central to the point Speer was making and many of the IT men rejected it.

The idea was stated most forcefully by Terry Shelton, a senior in the College of Biological Sciences. "I don't think it makes a goddamned bit of difference to scientists one way or the other, if there are unpleasant political consequences. They are so egocentric about their







work, they're just interested in solving a problem and they go pell-mell to the solution."

Gary Jones, a graduate student in Chemical Engineering said "Scientists are more concerned with the fact that something can be done and is intellectually satisfying. Often times, a scientist's satisfying work experiences precludes his being concerned with the destructiveness of his work.

"Scientists are victims of their devotion," said M. Riad, an Electrical Engineering teaching assistant. "They are after new discoveries and inventions without looking carefully to their consequences."

Skelton sees great potential for human misery in this alleged callousness of scientists. "The written correspondence between the principles involved in the decision to drop the A-bomb on Japan," Skelton said, "shows that they did it more for a test than for its military value. They wanted to know exactly what the effects on humans would be. They were treating people like insects just out of a clinical interest in the effects."

Some of the students and faculty who were questioned defended the objectivity of scientists. The usual view was that bureaucrats, politicians and lower level technicians were more to blame than research scientists for the development of destructive technology.

"I think there's more danger from the technocrat — the guy who builds railroads, the civil engineer — than from the research scientist," Parady said. "What the scientist does is uncontrolled. Anyone can take it and do what he wants with it. There's no direction to it until after it's completed."

Jones went further in saying that scientists . . . should not be allowed high-level decision-making powers. He said that our society should have more concerned and morally

aware, elected officials.

Harald Eriksen, ME junior, explained that although the scientist develops new technology, "it is his society which accepts or rejects this development. Proliferation of an "immoral" development is the result of society's acceptance and hence, it's tacit approval."

"It is asking too much to ask scientists to give political direction to their projects," said Kintner. "They can certainly give advice, but to think they should have any special political aptitude because of their specialization is a very poor concept."

Kinter's response was echoed by Jaak Daemen, a teaching assistant in Civil and Mineral Engineering. Daemen agreed with Speer's characterization, but said that it is the responsibility of the society at large to decide what to do with technology. "An engineer shouldn't decide what kind of technology to develop," he said, "The people ought to decide on broad programs."

"People in higher positions have misused developments that have been made for sound technological advancements," according to Kyle Jones, a CE senior. "An example is the atomic research that was begun with completely peaceful intentions but was misused and misconstrued by others and can now be used for a lot of destruction."

Glover was adamantly opposed to scientists maintaining an absolutely objective view of their work. "I don't think scientists should be neutral," he said, "and allow outside forces to make moral decisions for them. Every man has to take a position."

The solution to the problem, in Glover's view, is a broader, liberal arts education for all IT students. Glover himself spent two years in CLA before deciding on a career in Architecture. "I think people who start out in CLA tend to have a lit-

tle different outlook on what their impact on society will be," Glover said.

"I'd like to see the whole university system begun as a two year CLA program. Only after that would the student be allowed to go into a specific discipline," he said.

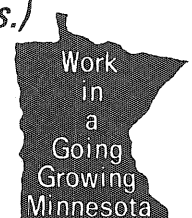
The dangers of specialization were also pointed to by Jean-Claude Roegiers, a research fellow in Civil and Mineral Engineering. "Especially in the U.S.," he said, "the scientist is forced to specialize more and more. The Nazis used the specialization to keep people from knowing the consequences of what they were doing."

Roegiers did not call for a broader liberal arts education for scientists. Instead, he said that a more widely-based technical training was essential. "The curriculum we have in Europe, he said, "forces a person in a specialized field to have a good basic knowledge in other technical fields. You see all the facets and all the consequences of any particular project you are working on."



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# SPLINTERS

Experts tell us that money can't buy love. But it sure can put you in a helluva bargaining position.

\* \* \*

The lumber mill foreman put a newly hired forestry student to work for the summer feeding logs into a circular saw. As the foreman started to walk away, he heard an "ouch" and turned to see the student looking dumbfoundedly at the stump of a finger. Rushing back, he asked what happened. "I dunno," said the boy, "I stuck my hand out like this and . . . well, I'll be damned, there goes another one."

\* \* \*

"I was shot in the leg in the war."  
 "Have a scar?"  
 "No thanks, I don't smoke."

\* \* \*

A governor of Ohio went looking for a call girl in a local bar. He happened upon three girls; a red-head, a blonde, and a brunette. To the red-head he said, "I'm the governor of Ohio. How much would it cost me to go to bed with you?" The red-head replied, "twenty-five dollars." The same question was asked of the blonde to which she replied, "one-hundred dollars." The governor told both these girls that their prices were way too high and went over to the brunette. When he asked the brunette how much she charged she replied, "If you can raise my blouse as high as the taxes, get my pants as low as the wages, and shaft me like you do the public, it won't cost you a damn cent."

\* \* \*

A man went into a department store and asked the sales lady for a size 8 1/2 bra for his wife. The sales lady was amazed and asked the man what he used to measure his wife, to which the gentleman replied, "My hat."

\* \* \*

PROUD FATHER TO BYSTANDER: "My son doesn't smoke, drink, swear, or go around with fast women."

BYSTANDER: "And does he also sew his own dresses?"

\* \* \*



Is it true that two of the prerequisites for Math 1-230 are five credits of Japanese and ten credits of Indian?

\* \* \*

A pretty young girl's definition of "like" and "love": "If I likes 'em I lets 'em but if I loves 'em I helps 'em."

\* \* \*

TEACHER: "David, what does F-E-E-T spell?"

DAVID: "I don't know."

TEACHER: "Well, what does a cow have four of, and I have only two?"

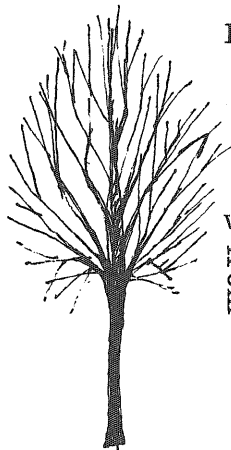
The class was dismissed.

\* \* \*

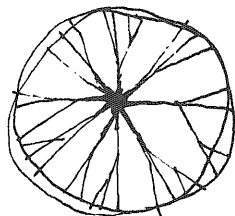
Linda refuses to let her old man hold her new baby until the kid's ears are strong enough.

\* \* \*





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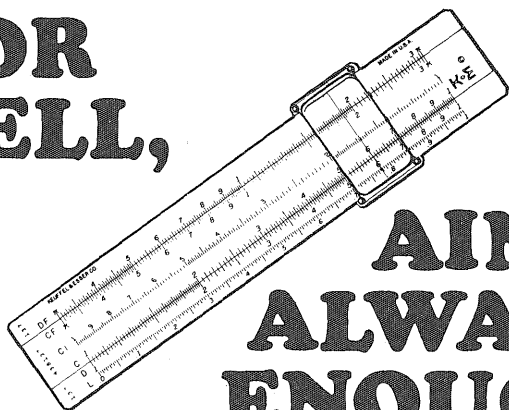


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**Vein from 24**

be worse than the first. Doc Doof wrapped the wound very carefully—with the sensitivity of an abrasive toilet seat. I had to restrain myself from clubbing the little dude. Next, he wanted to check my lymph glands under the arm for infection. All I can say about this is that I'm glad he wasn't planning to check some other type of gland which is much more valuable and even more sensitive! After he was done wrenching away at my glands I had to check to make sure they were still there. (Another form of Chinese water torture, I presume.)

My misfortunes were still not over, though. The dressing which Doc Doof had put on predictably fell off the next day. When I returned three days later to refill my prescriptions, I was hassled for over an hour. The Health Service Pharmacy wanted me to pay for the prescriptions—over \$35.00 worth of drugs. No way!

Several days later when I came back to have my stitches removed, I was told that I was due in surgery that afternoon. Again, it took a long argument to set the receptionist straight. It seems that I was supposed to see a surgeon that afternoon. (Doof! Doof!) No way were they going to get me near that slab again!

After two weeks of pill-popping, wearing an arm sling, putting up with the doofs and donges in Health Service, and seven bandage changes, the sixty-five stitches were removed. My arm is healing very nicely now, thank you. After my ordeal, there is one thing which I have come to firmly believe in. No, not the medical ability of the University Health Service—Dr. Leavenman's statement, "You don't want to be admitted to this hospital. . ."

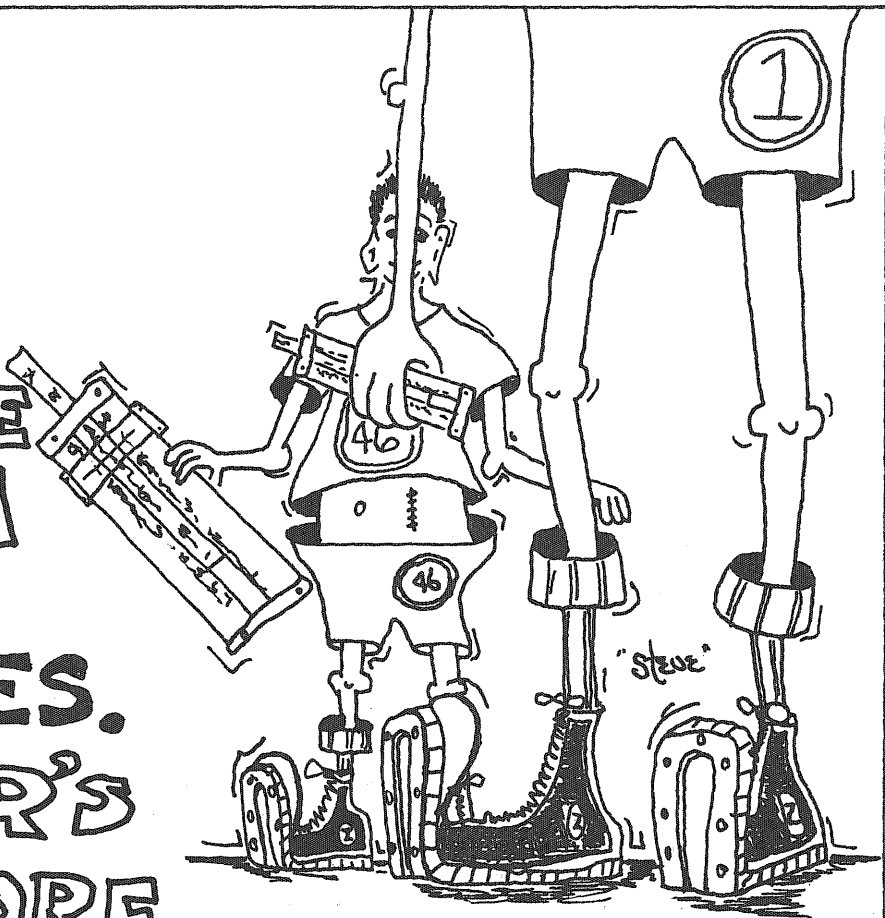
You'd better believe in it, too—for your own health! ■

# NEXT MONTH

April issue will be devoted to the options facing a student after graduation. Among them will be:

- Job opportunities for the 1972 IT graduate.
- Graduate school
- Summer Travel—a "how-to" section.

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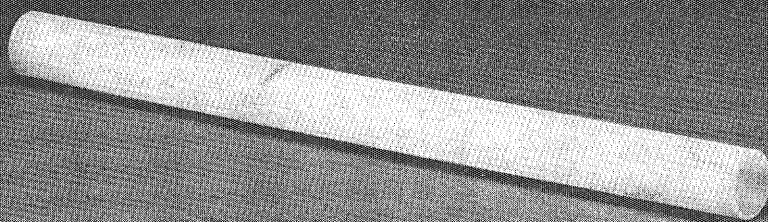
It's a clear example of how a technological innovation can help solve a social problem. A lot of times, the effect of technology on society is rather direct.

That's why, at General Electric, we judge innovations more by the impact they'll have on people's lives than by their sheer technical wizardry.

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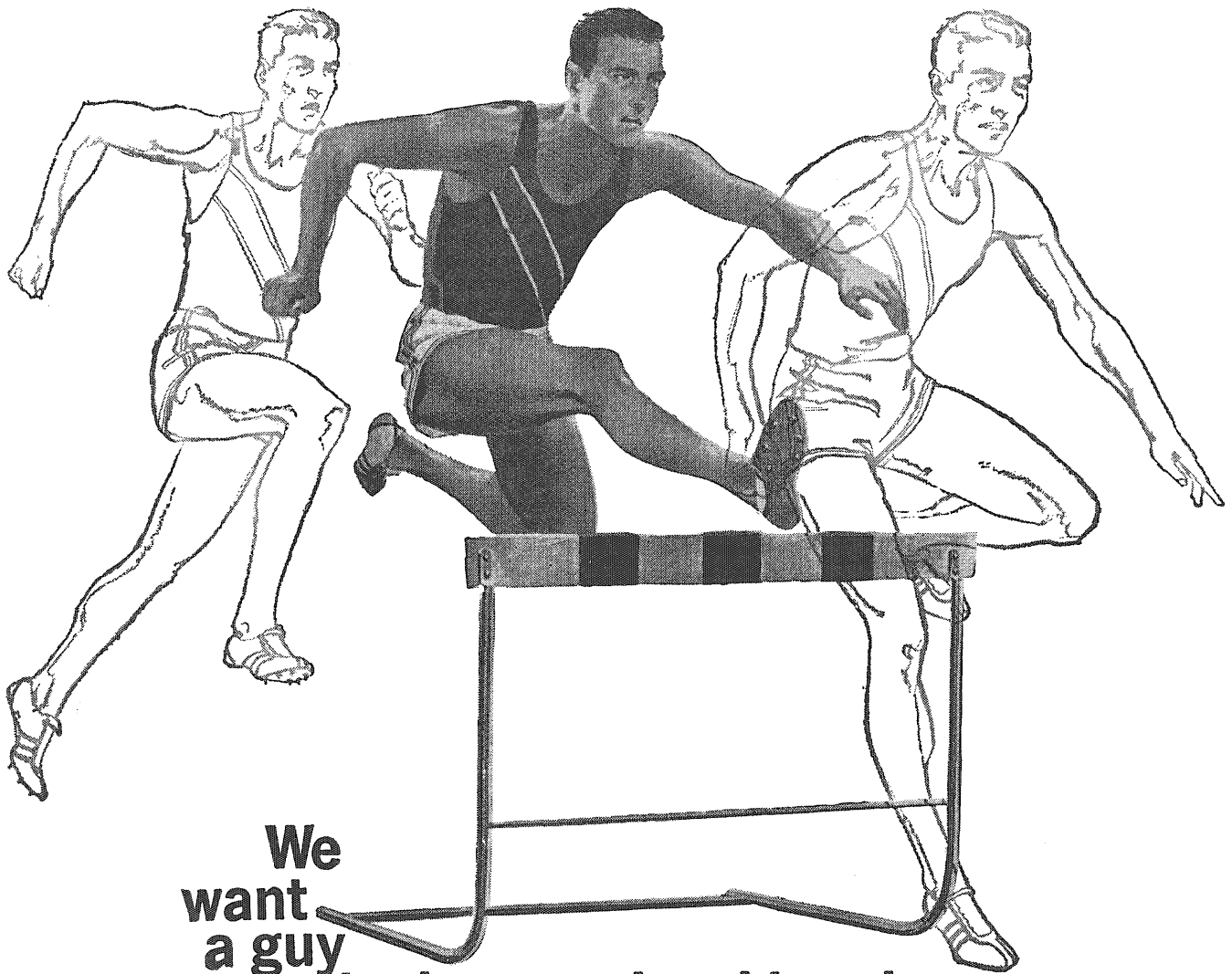


# THE WHOLE EARTH... TECHNOLOG

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APRIL, 1972





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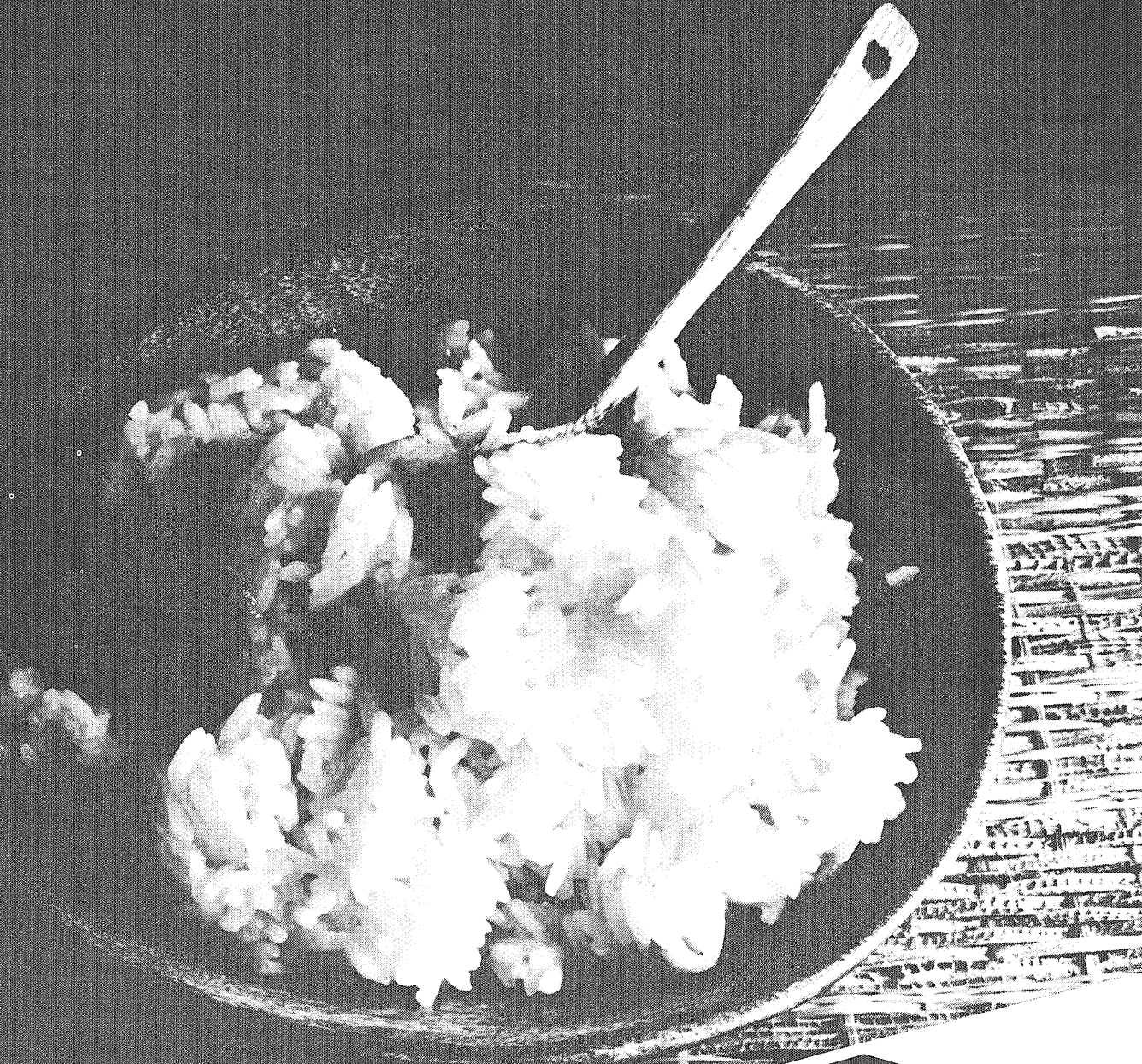
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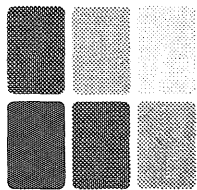
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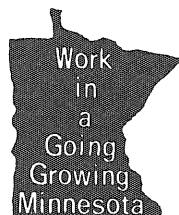
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# TECHNOLOG

VOL 52; NO. 7

Official Student Publication of the Institute of Technology, University of Minnesota

APRIL, 1972

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Published monthly, October through May. Second class postage paid at Minneapolis, Minnesota. Office: Room 2, Mechanical Engineering Building, University of Minnesota, Minneapolis, Minnesota 55455. Telephone: 373-3298. Printer: Aircraft Press, 425 South Fifth Street, Minneapolis, Minnesota 55415. Publisher's National Representative: Littell-Murray-Barnhill, Inc., 60 East 42nd Street, New York, N. Y. 10017. Publisher's State and Local Representative: University Engineering Magazine Advertising, F. P. McGrath, Manager, Box 14026 University Station, Minneapolis, Minnesota 55455. Telephone: 612-225-0708. Member of the Engineering College Magazines Associated, Chairman: Daniel L. Griffen, Iowa State University. Subscription rate: \$6.00 per year, single copies 50¢. Advertising rates upon request. Any opinions expressed herein are not necessarily those of the Institute of Technology or of the University of Minnesota. Copyright © 1972 by the Minnesota Technology Board. All rights reserved. Reproduction in whole or in part without written permission is prohibited.

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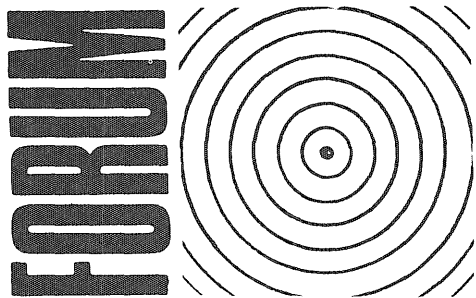
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The Technolog would like to thank these people for their help in putting out this magazine.

John Hollenhorst, Bill Johnson, Philip Dray, Nan Schlauderaff, Gayle Dorfman, Gail Tischler, Betsy Barry, Leslie Carlson, Ruth T'Kach, Darryll Olson, Ray Vickery, Cathy Madison, Bill Morlock, Joe Campbell, Mary Vitcenda, Martha Mertz, Alfreda Gabiou, Mary Hillstrom, Anne Ludcke, Mary Steil, Marsha Storck, Karen Kurth and Pat Johnson.

**COVER:** The "Whole Earth Technolog" is a collection of the present and near future options for Engineering students.





# RACISM

A number of people have charged racism in connection with last month's article "ALL IN VEIN." We saw that word splashed across The Daily's headlines, heard it echoed in IT halls and read that word in letters we have received. Many people felt that the sole racial problem in America was the integration of the black man into white society. In truth, racism involves much more than one or two minorities.

The oppressed minorities appear everywhere, all actively working for their group's betterment. There's blacks. There's women. There's Jews. There's Indians, Puerto Ricans, and Chicanos. There's the "questionable" minorities, (questionable to bigots and WASPS) such as Poles, Italians, and Asians. There's communists, fascists, socialists, and criminals. There's college students, SDS'ers, hippies, and the drug culture. There's gays, foresters, and interior decorators. The fact is that about 80 percent of all Americans are members of an oppressed minority group, and its becoming impossible to open your mouth without saying something that will be taken offensively.

This is not meant to lightly brush aside or explain away anyone's hurt feelings. The charge of racism is a serious one which is damaging to both the publication and its readers. But we can state that there was not a shred of racism intended in the Chase article. The objective was to present a satirical description of the author's health service treatment, not to attack or slander a race. If some readers were sensitive to the Chinese element of the story, then we apologize to them. It's a shame that when you print satire you always seem to hurt someone's feelings. Satire, by its

very nature, is a critical and personal humorous assault on someone or something. You enjoy this type of humor until you become the victim of a satirical piece. Then your outlook changes. You may feel hurt and angry. You might complain and moan instead of taking the verbal jibe in the spirit in which it was offered.

After all, if you can't laugh at yourself, then who can you laugh at?

## To \_\_\_\_\_ With Censorship

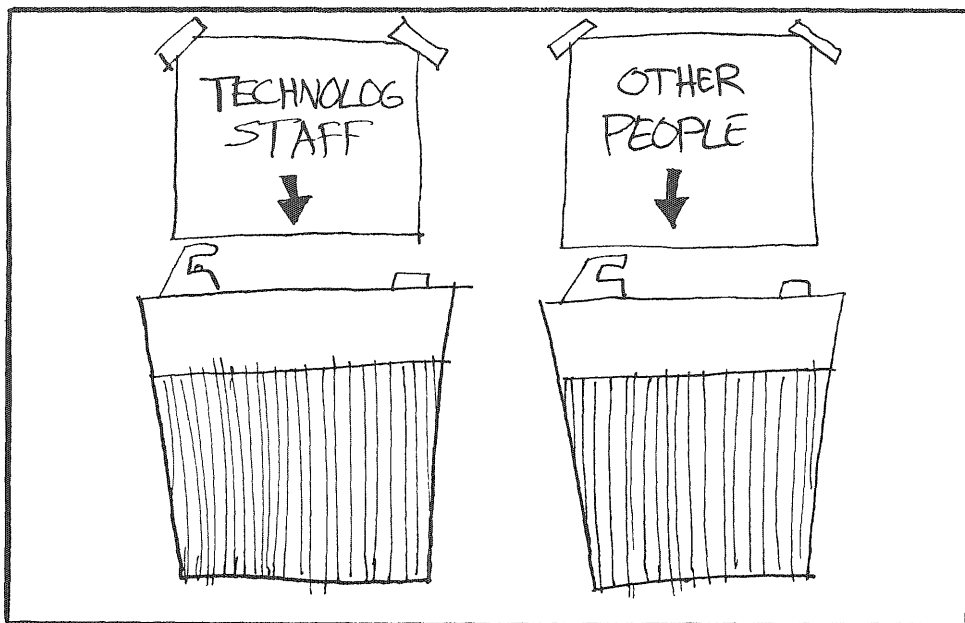
In discussing censorship, any humor ends with the above title. Censorship is defined as the arbitrary deletion of an article prior to publication, which is dictated by an outside source (an outside source is anyone who is not a direct member of the staff or editorial board).

While appeasing the censor is a way of life in many countries, Americans have been particularly blessed by having the rights of the press Constitutionally guar-

anteed. The Constitution, however, has been constantly reinterpreted in the face of controversy. From the Peter Zenger trial in 1734, to the repeal of the Alien-Sedition Acts in 1800, to the Roosevelt-Pulitzer suit of 1908, to the Pentagon Papers of 1971, the issue of freedom of the press has been attacked by outside pressures. In return, journalists are expected to provide a responsible forum for all views on all subjects.

The **Technolog** is not immune to these obligations, nor is it immune to the normal guarantees of freedom of the press. This is the issue at hand concerning last month's controversial issue "ALL IN VEIN." Other issues have been raised concerning this article, but the truly vital question is whether an outside agency can order the deletion of any article prior to publication. In a word, censorship.

Our stand on the issue can be stated simply: We will never accept censorship. We hope it will never be accepted by you, the readers. If it ever is, then we all will lose. R. Pirro/B.J.

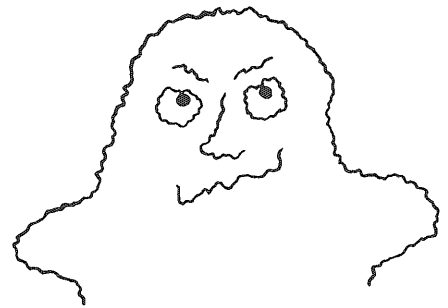


# National Gray Matter

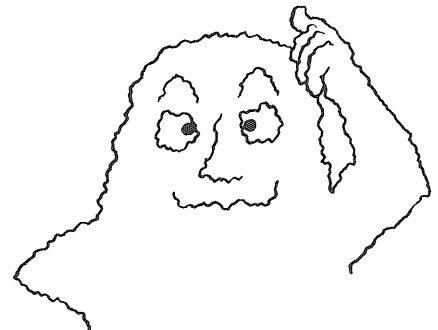
By Anne Ludcke

About 45 percent of all Minnesota Institute of Technology graduates in the last two years have accepted employment outside of Minnesota. Therefore, the national employment picture must be considered in discussing the employment problems of IT graduates. The national employment picture for engineers is gray, highlighted by darker and lighter tones in certain specialties and geographic locations. Richard Jordan, head of the mech-

Continued on page 27

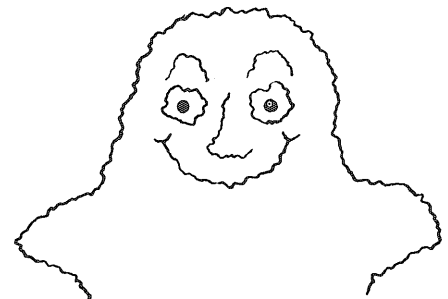


**FREE CHECKING?**



**FREE CHECKING**

If You're Under 22?



**FREE CHECKING**

If You're Under 22!

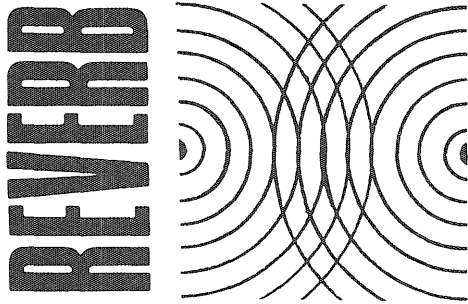
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## The Invisible Minority

It is time for all of us to become aware that stereotypes are a form of prejudice and racism. A stereotype is a canned response, which prevents seeing the uniqueness of the individual and allows prejudging based upon myths and lies. These myths and lies continue to shape the perceptions and the relationships of whites to Asians.

The consequences of unfavorable stereotypes are obvious. However, so-called favorable stereotypes are a problem peculiar to Asian Americans. For example, Asians are "diligent," "self-sufficient" and "submissive." Since we are "fortunate" to have these characteristics attributed to us, we have no right or need to complain in the eyes of white society. Yet, inconsistencies exist. The yellow face, whether Japanese, Korean or Chinese has always been a "potential" traitor. This has resulted in the World War II Japanese internment camps, labelling Asians as "gooks" and "Charlie" and Asian women as exotic prostitutes vying for G.I.'s attention.

One of the most difficult struggles of Asian Americans is that of being on invisible minority. Until now, we have neither been considered white nor non-white. We ask that we be recognized as Asian Americans — a non-white, American-born minority group.

The only visible aspect of Asian cultures is a narrow one of suki-yaki, acupuncture, karate, chopsticks and rice bowls. The American history of ethnocentric attitudes and commercial exploitation strifles any appreciation and understanding that can result from cultural sharing.

Asian Americans are constantly being categorized as foreign students. While this is far from a slight, it must be acknowledged that many of us are second, third and fourth generation American citizens.

As Asian Americans, we cannot know the white person's experience in America, just as the white person cannot realize the Asian experience in America. Because we cannot live each others lives, we must respect and understand the differences and not dictate feelings. We cannot tell whites what they feel and neither can whites tell us how we feel. We must respect one another and regard each individual as an unique entity.

Joyce Yu

Dennis Wong

Joyce Miyamoto Faber

## Advice on Advising

In the February 1972 issue of the Minnesota Technolog, data from the IT Survey of 1971 was presented concerning the IT Advising System (See "Adviser, Where Are You?!").

The author used his viewpoint of the data to make certain interpretations which reflect quite negatively on the Advising program. The same data can be given and present quite a different view.

1. 73.7% of I.T. students state that their adviser is usually or always available. 21.6% of students state their adviser is seldom available and 2.9% have found their adviser unavailable.
2. 52.9% of students have gone to their adviser for help in planning their technical program. 43.4% have not gone to their adviser for this help.
3. 69.8% of students see their adviser at least once per quarter.
4. 75.8% of students find their adviser moderately or keenly interested in his advising role. 5.3% find their adviser completely disinterested.

5. 84.6% of students feel their adviser is competent or moderately well informed on technical areas. 10.8% feel their adviser is poorly informed.
6. 67.8% of students feel their adviser is competent or moderately well informed on liberal education courses.
7. 43.9% feel their technical program is coherent and well planned. 27.2% feel their program is haphazard. 24.7% have not yet evaluated their program.

Many of us would like to see responses disappear concerning advisers being unavailable, disinterested, or poorly informed in these areas. However, if 73% feel their adviser is *at least* usually available; if 75% feel their adviser is *at least* moderately interested; if 85% feel their adviser is *at least* moderately well informed in technical areas and 68% feel their adviser is *at least* moderately well informed in liberal education areas; and if also 70% of students see their adviser *at least* once per quarter, we know that some satisfactory interaction is taking place.

LeRoy Ponto

Office of the Assistant Dean  
I.T.





# B.A. = GS-5

## 'How much money will a government engineer make? You can expect to start at GS-5.'

by Anne Ludcke

If Today's Army doesn't want you after you graduate, don't despair—you may have the opportunity to work for the U.S. government as a civil service employee. The placement director of IT has noted an increase in the number of federal job recruiters visiting the University campus this year. Apparently, the government is stepping up its efforts to recruit engineers, architects, and scientists.

Engineers working for the federal government design defense weapons, power plants, drydocks, bridges, and machinery. They also construct dams and highways.

To qualify for federal engineer positions, the applicant must have received either an engineering degree from an accredited institution or sufficient training or technical experience. So, you may drop out of IT today and still qualify for an engineering job with the U.S. government if you gain from experience as much knowledge as students who completed a 4-year engineering program.

Architects plan, design and research federal architectural projects for laboratories, hospitals and schools. Landscape architects working for the federal government plan and design federal parks, forests, highways, airports and mili-

tary bases.

The basic requirement for architects is completion of a four-year professional curriculum. Appropriate experience, especially with proof of licensing, registration or certification, is qualifying, even though the candidate may never have graduated. A candidate who doesn't have his university degree must have one year of experience for every year he didn't go to school. That is, if Arnie Architecture drops out of IT after completing his freshman year, he has to work in daddy's architecture office three years before he can apply to work for Uncle Sam.

An applicant must submit a personal qualifications statement, supplemental qualifications statements, a list of college course and evidence of scholastic achievement. The federal government emphasizes that hiring and ratings will be based strictly on experience, education,

and training. (That's a subtle way the government says it doesn't officially discriminate against women and minority groups.)

A senior or graduate student may file before he (or she) completes all the scholastic requirements if he (or she) expects to complete them within the next 9 months.

How much money will a government engineer make? Unless you hold advanced degrees, are an honor student or have done research that would make even Albert Einstein say "oh gosh!" you can expect to start at GS-5. GS-5 is government bureaucrateese for "about \$7,319".

The federal government, realizing it can't place its employees into intellectual or economic straight-jackets, entitles federal engineers and scientists to certain professional rights. For instance, they can be free to publish, teach or lecture when they aren't working at their jobs.

For general information about employment for engineers, the booklet **Federal Jobs in Engineering, the Physical Sciences, and Related Professions** is a good source. It's available through the Federal Job Information Center, Room 196, Federal Building, Fort Snelling, 55111 (725-3355). ■



"Freddy," they said, "you need professional help. Let us, your friends, give you some advice. Go to this place, 'Roget's Resume Racket', and ask them to help you."

# The Legend of Fearless Freddy

by Mary Steil

The dismal reports from various government offices reporting the dearth of jobs this year are strictly rumor. Anyone with a little imagination can find a job. Take Freddy, for example . . .

Something was wrong, Freddy decided. He had been looking for a job for seven years, and so far, nothing. He had Ph.D's in five fields (chemistry, physics, psychology, political science and astronomy), recommendations from two Pulitzer Prize winners and a handful of "good conduct" medals, yet no one would hire him.

Freddy was honest. When he walked from office to office in his non-offending brown suit and unobtrusive black shoes, his hair vaguely short—semi long, he presented an amiable, friendly figure.

"Yes I blew up a lab once," he would cheerfully admit. "I was at Kansas State and I forgot how much of the first chemical I put in the bottle. It was too bad, really, but

I said I was sorry."

Or when the recruiter, noticing a break in Freddy's college, career, questioned him about it, Freddy could be overbearingly honest.

"Well, I did a bad thing and I knew I had to be punished for it. I tried a new concentrated formula for vitamin E enrichment in our college cafeteria. Unfortunately, some of the students got sick after a while and died. But after which I was in jail for 10 years, I was truly happy for the opportunity to repent my sins."

Usually by this time the interviewer was slowly inching toward the door. "Well, we'll see what we can do for you, young man — uh, we'll let you know."

But Freddy never heard.

"Freddy," they said, "you need professional help. Let us, your friends, give you some advice. Go to this place, 'Roget's Resume Racket', and ask them to help you. Do it for us, Freddy, do it to help your-

self."

So Freddy, feeling he had to be fair to his friends, went to Roget's. There's really nothing they can do for me, he thought. I've been as honest and complete in my resume as I could be, what more can I do?

Roget's however, soon showed Freddy what else could indeed, be done.

"Freddy," said the helpful Roget's consultant, Esoteric Eddie, "you're a fine person and you have talents which must be put to use to save mankind and preserve the union. You must, for the good of all needy peoples on this earth, find a job."

"I will, I will," Freddy shouted.

"We need your help, Freddy, you must get a job and help those of us who are waiting for your answers. How much longer can we wait for help Freddy, how much longer?"

"I'm coming, I'm coming . . ."

"But this is where Roget's service comes in, Freddy. We will



help employers realize the good you can do, help them look at your experiences with the correct perspective. Now beginning here with your early life, did you really flunk out of grade school nine times?"

"Well, yes I did. You see, I was always rewiring the intercom and plugging in a local rock station."

"Oh, a boyish interest in electronics, Freddy, is perfect for your resume. Let's see, 'Early interest in electronics and communications systems led to breaks in school career while working on various projects.' Very good. Now we can go on to your high school years."

"But, but . . ."

"Now in high school you were arrested once for malicious destruction of property?"

"Yeah, well, I made this tank," Freddy said excitedly, "it had four on the floor, a souped-up engine and leather seats . . ."

"Yes, but what did it do?"

"Well, it got loose once and flattened a few houses . . ."

"Oh, I see, you just put it poorly. You see, it would be more effective like this: 'In high school, I became interested in community improvement, and took part in campaign to rid our town of its slum neighborhoods.' There, you see, Freddy, it's all in how you say it. Your problem was that you just didn't know

how to state things clearly.

"All right now, in college, you had a little explosion in your lab. Well, I think it would be better stated this way: 'My enthusiasm for experimentation had no bounds, I once undertook to develop a formula which would quickly demolish old buildings. My formula was successful and was received by the college community with raves.'

"And this vitamin E incident can also be clarified like this: 'The sight of undernourished and nutrition-ignorant students around me spurred an even greater experiment. I decided to provide a simple way of insuring that students received a cor-



rect amount of vitamin E each day. However, I soon found that some students were too poorly nourished for my idea to work. In spite of my work, some students died.'

"Now Freddy, doesn't that provide a brighter, clearer picture of you? Now get out there and show the world you are ready to help them. Go on Freddy, give it the old fight — give me a J, give me an O . . ."

Armed with his new resume and renewed enthusiasm, Freddy went job-hunting again. Within days, he had a job at Antonio's, a top-secret government research agency.

"I don't know how I got this job," he said one day to some of his fel-

low scientists. "I've never even worked in a research company before. I've never even seen a real scientist before."

"What'dya talking about, kid? What'cha think we did before we got here?" asked one of the people Freddy worked with, a broad-shouldered, burly man. "I never been to college before," the man said, "I just told 'em in my resume that I was a pneumatic technician."

"What's that?" Freddy asked.

"Ah, c'mon stupied, I was a driller!"

"Sure kid," said a woman scientist, "before I came here I never even knew what a test tube was. My resume said I'd had experience as a food scientist and a data-analyzer."

"What did you do?"

"I was a checker at Red Owl."

Freddy was freaking out. "But how can we do this work? This is an important research facility, we've got to turn out formulas before the Russians do . . ."

"Hey kid," said a short little man on Freddy's right, "d'ya ever meet the director of this place?"

"No, who's he?"

"An organic chemist, specializing in anatomy and cell processes," his resume said.

"What's that?" Freddy asked.

"It means he's a butcher." ■





How would you like to run a nuclear reactor aboard an aircraft carrier?

Not your bag exactly? Well, how about working in an Army chemistry lab under a sergeant who never took a college chemistry course?

If you've been intending to apply your IT education to a career in the Armed Forces, you'd better take your pick. That's about all Uncle Sam can guarantee you if you're set on a scientific job in the service.

It's no secret that the civilian job market has been a tough nut to crack lately. The Armed Forces have been affected by the same political and economic trends as the big civilian employers. As the cost and extent of American involvement in Asia have been sharply reduced, so have the budgets for many military programs.

The situation in the Air Force is typical. "It's been kind of bad lately," said M/Sgt. Martin Sterner, an Air Force recruiter, "We used to have a scientific and engineering program to use people graduating in these fields."

But budget cutbacks have put a freeze on filling scientific positions with newly commissioned officers. As positions open up now, they are quickly filled by officers who have been taken off flight status for medical reasons. At present, the only way to get an Air Force commission is to become a pilot.

There are unlimited openings for college graduates as officers in the Army, Navy and Marines. The catch is that there is only one program that will guarantee a choice of assignment—the Navy's nuclear propulsion program.

Anyone who has been in the service knows that it can be disastrous to enter the military without a written job guarantee. If you're lucky, you'll get a boring job. If you're not, you'll get stuck in a combat assignment.

If you're willing to go in as an enlisted man, there are a lot of choices. Unfortunately, most of them are about as exciting as that Army chemistry lab slot.

An Air Force recruiter put it mildly when he said, "The jobs for enlisted men aren't usually too challenging for somebody with a college education. College men are oft-

en unhappy being supervised by men with less education."

Add to that the traditional complaints of enlisted men and the picture is far from rosy: low pay (although that's getting better), petty harassment (they say that's getting better), and separate-but-unequal facilities.

Given all those drawbacks, you may still be desperate enough for a job to want to enlist. If so, your recruiter has a wide assortment of technical jobs to offer—everything from jet mechanics to computers to civil engineering.

The picture isn't too good if you want to be an officer, though. If

# FILE 39549 Military Jobs

by  
John Hollenhorst

you want to be a pilot, you have it made. The Air Force always needs pilots. But if you want a scientific job, you'll have to count on being too unhealthy or incompetent to make it through flight training. Then you would have to be lucky enough to get a scientific assignment after washing out of flight school. The odds are against you.

The pickings are just as slim in the other three branches. It's worst in the Marine Corps. Maj. Kenneth Zike summed it up in an interview: "A technology student wouldn't be advised to join the Marines if he was interested in working in his scientific field."

As a matter of fact, every officer program in the Marine Corps is "specifically and definitely oriented toward the combat role," Zike said. Although only 31 percent of new officers are assigned to infantry platoons, most of the rest end up in such fields as artillery, tracked vehicles, motor transport and supply.

There are very limited openings in communications, combat engineers and air control, but the officer candidate would have absolutely no guarantee of getting these assignments. The same is true of a small research and development program the Corps conducts at Quantico, Va.

The situation in the Army is not much better. There are a few scientifically oriented slots in the Army but an officer candidate is not promised the assignment after he gets his commission.

The job itself may not be very challenging either. S/Sgt. Billy Mode said, "In essence, they would be military men, not scientists. Their job would be basically administrative and supervisory—if they were lucky enough to get the job."

So much for the bad news. Now what about that nuclear reactor program?

Any IT grad would be eligible for the program if he is under 26 years old and in generally good health. The basic academic requirement is a bachelors degree with one year of college physics and math. A B average is required in these courses. If the applicant's major was physics or in an engineering program, only a C average is required.

If you apply for the program, the Navy will subject you to a battery of tests and interviews, including a personal interview with Admiral Rickover at the Pentagon. If you pass muster, the Navy will guarantee you an assignment to a nuclear submarine or aircraft carrier.

If running a reactor doesn't appeal to you, and if you can't see washing that sergeant's test tubes, then the military is probably not for you. Since things probably won't be changing much in the near future, your best bet is to keep those dossiers flowing out to civilian employers. Maybe someday they'll write back. ■



**WHO NEEDS YOU?**

# Gallery of Travel

by  
Anne Ludcke  
&  
Mary Hillstrom

**T**he American tourist. That label conjures up a great variety of images—most of them bad—to Europeans. He's the fellow wearing shorts with the camera hanging around his neck like a holy crucifix. No, it isn't fair to label all American tourists like that. But, there seems to be some mysterious identifying characteristics that singles out the American.

Americans are often ignorant and intolerant of other cultures. Many don't understand European customs and don't feel obliged to follow them.

Although cleanliness is next to godliness for many Americans, it's next to impossible for poor Europeans. Americans are accustomed to sterile supermarkets filled with hermetically-sealed, refrigerated meats. A vigilant grocier would track down and exterminate any wayward fly that buzzed its way into the store. In Italy, however, flies, as well as pigeons, land freely on pork hocks, which are sold from unrefrigerated stands in the streets. Americans, frequently react with a very loud "oh ish."

Artwork By Bert Nielsen



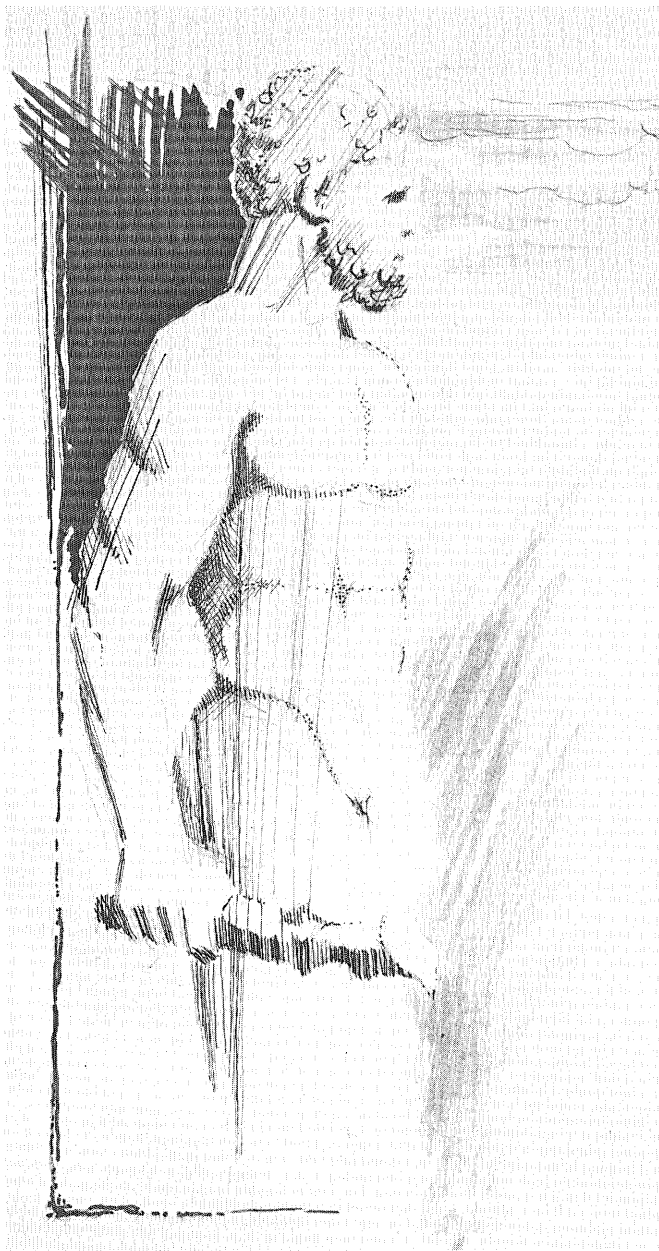


Many Americans can't understand why European bus drivers and waiters can't speak the Golden Tongue—English. I remember two off-duty American soldiers shouting at a non-English-speaking ticket seller: "Is *Hair* in English?"

Most Europeans are pleased and surprised when an American tries to speak their language—even though the attempt may sound like a language textbook conversation.

Some tourists not only insist on speaking English, but also talk as loud as possible. In the Anne Frank House in Amsterdam, we filed quietly through the small rooms, reading the story of the Jewish families who lived there two years, never going outside until the Gestapo discovered their hiding place and sent them to Bergen-Belsen. During the tour, one American couple shouted at another: "Hey, weren't you with us on the Paris tour last Spring?"

Besides believing English is *the* language, many Americans secretly believe the dollar is the only re-



spectable currency. Often, Americans don't bother to exchange their traveler's checks. Instead, they simply wave their bucks or American Express checks as though they were gold from King Solomon's mines.

An American couple entering a watch shop in Switzerland (where else?) asked to see "the kind of watches you can't buy in the States." After looking at dozens, the couple selected four. "How much are they?" the man asked. "About 240 francs," the salesman replied. "How much is that in dollars?" the tourist demanded. "About \$60." "Oh, hell, I haven't got that much on me now," he said. "Can I pay for them in real estate?"

More and more Americans are going abroad. Since 1965, passport applications have steadily increased by about 20 percent every year. In 1960, 1,000 persons applied for passports in Minneapolis; in 1971, 15,000.

Why are they going?

For many Americans, Europe is just another bauble on their chain of status symbols. "Doing Europe" for these tourists involves one-day stops in London, Paris, Rome, Madrid, Munich and maybe Vienna. In their two week "Grand Tours," they frantically gather souvenirs and experiences. After returning home, they'll have enough Instamatic slides to be the hit (or the bore) of their crowd.

Europe is more than Buckingham Palace, the Berlin Wall or the Leaning Tower of Pisa. It's more than taking snapshots of buildings experts have judged beautiful or famous.

Although some people go to Europe only to impress others, other tourists go to Europe to see what's most important to them—art, architecture, history or theater.

European tours have become increasingly popular in recent years. These relatively inexpensive tours offer peace of mind — the tour company takes care of all flight, hotel, meal and sight-seeing arrangements in advance.

Although these tours may be ideal for junior high kids or senior citizens, most people find them boring and restrictive. In many ways, they're like a class field trip to Chicago. The group size is determined by the capacity of the bus. These tours provide a potpourri of experiences which please some of the people some of the time. During a week, the group may visit art museums, theaters, operas, night clubs and sports events of a dozen countries. For a week or two, this all-American busload covers thousands of miles. Occasionally, the people are let out to stretch, go to the toilet or even see a famous Gothic cathedral.

The tour crowds are easy to spot — the people usually have anemic bus complexions and rush frantically through the museum to see the high points and maybe buy a few post cards for the relatives before the bus takes off. London tours claim to show you the city's historic sights in two hours. The only problem is that you see them as they flash by the window. Five minutes at the Tower of London isn't long enough, especially since lines to see such tourist magnets as the Crown Jewels are usually 30 minutes long. By that time, the bus would have left

for Westminster Abbey.

In these large tours, Americans get very little opportunity to meet Europeans. The secure touring bus is a microcosm of America. Segregated from the Europeans who speak different languages, wear different clothes, and have different customs, an American could become more knowledgeable about European culture by simply reading guidebooks at home in Bloomington.

Many disadvantages of large tours and short stays are obvious. Seeing a country in two days gives a deceiving and even a wrong impression. It's like seeing New York and saying you've seen America.

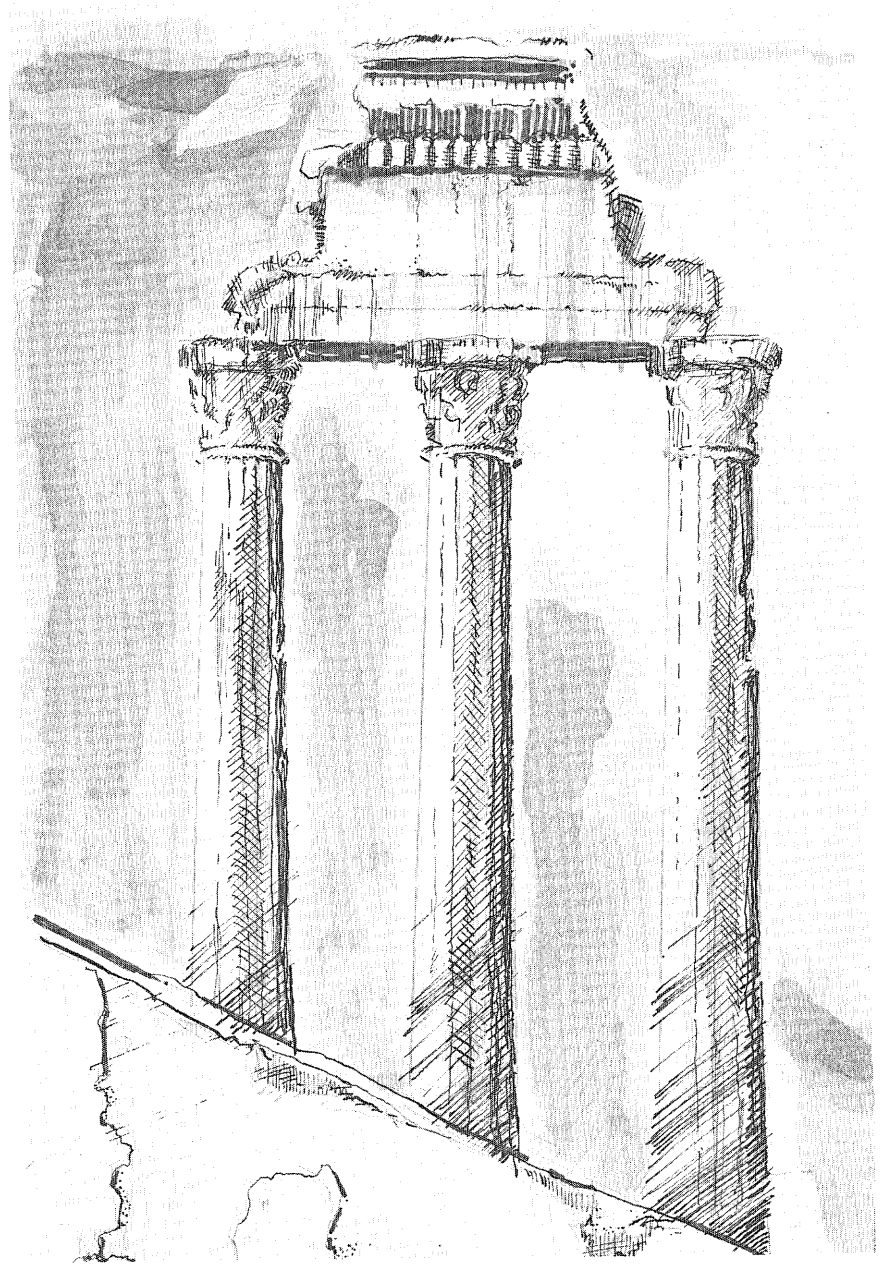
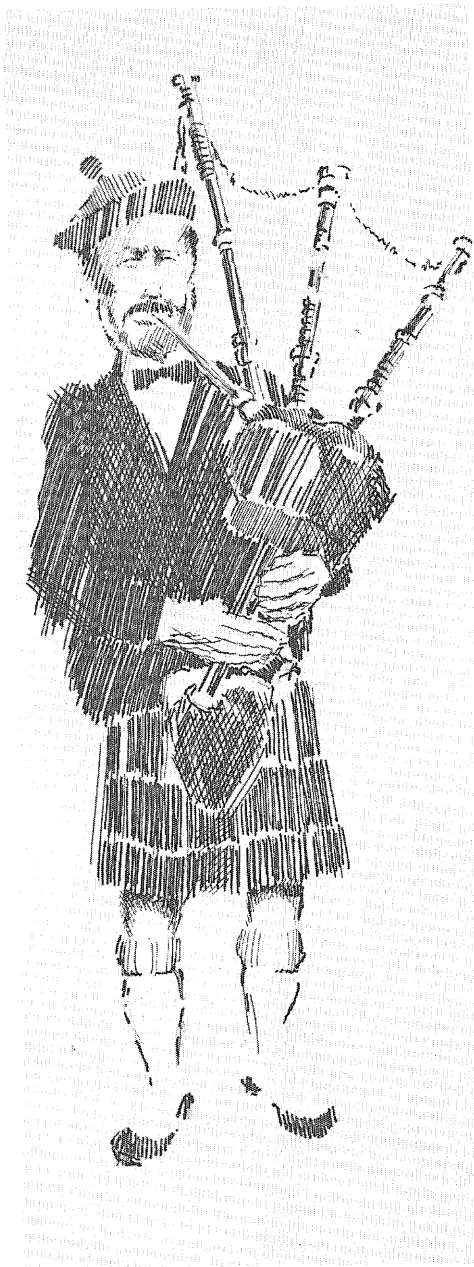
One subtler disadvantage of rushing around from museum to museum and church to church becomes obvious only after you get home. It's best described as "the blur." Churches merge into one great Byzantine-Gothic-Romanesque hodge-podge. Paintings are remembered vaguely, if at all. In the rush to see and do as much as possible, Americans sometimes

forget that vacations are for relaxing, too.

Students are eligible for reduced air, train, car, ship and bus rates in Europe. Anyone seriously interested in European travel has probably done his homework about cheap air fares and knows that the cheapest way to travel to Europe is with a large group charter flight. The University offers many summer flights from Minneapolis to Europe for students and their families.

"Students should rely on reputable charter organizations," Nan McFerren of the International Study and Travel Center in 231 Coffman (a non-profit travel service for University students), said. "Often, students are stranded in Europe, after they thought they had bought bona-fide round-trip tickets," she added.

Another way to cross is by freighter — and it isn't as bad as it sounds. Traveling by freighter is clean, and leisurly, but it costs \$180 to \$275 one way. The crossing takes 8-12 days. A good guide to freighter



travel is available from Harian Publications, Greenlawn, N.Y. It's called "Around the World by Passenger-Carrying Freighters."

The dream of working your way over is little more than a romantic myth. It's virtually impossible to land a job because of strong maritime unions. Even if freighter companies hire you, you still may have to pay \$100 for the honor.

Serious travellers have also, no doubt, looked into cheap train travel. The Student-Railpass is probably the best deal available to students. The Railpass, which costs \$130, allows students to travel two months on the trains of 13 countries. Travelling by train is clean, fast and a great way to meet Europeans. Besides unlimited travel on trains, the Railpass holder is entitled to free or reduced fares on many river and lake cruises, sea ferries and certain buses. If you want to do a lot of travelling, this is the most economical way—next to hitchhiking.

A lesser-known cousin of the Studentrail and

Eurail passes is available for travel through Britain. Britrail Youth Passes (\$40 for 15 days), Britrail Passes (\$30 for 8 days) and Thriftrail passes (\$40 for 1,000 miles) offer travel throughout England, Scotland and Wales. All rail passes must be bought in the U.S.A.

Bus travel can also be cheap in Britain. The Coachmaster ticket cost only \$20 and gives the holder unlimited travel for 8 days. And after it is bought there, clerks will take all the time necessary to plan an itinerary.

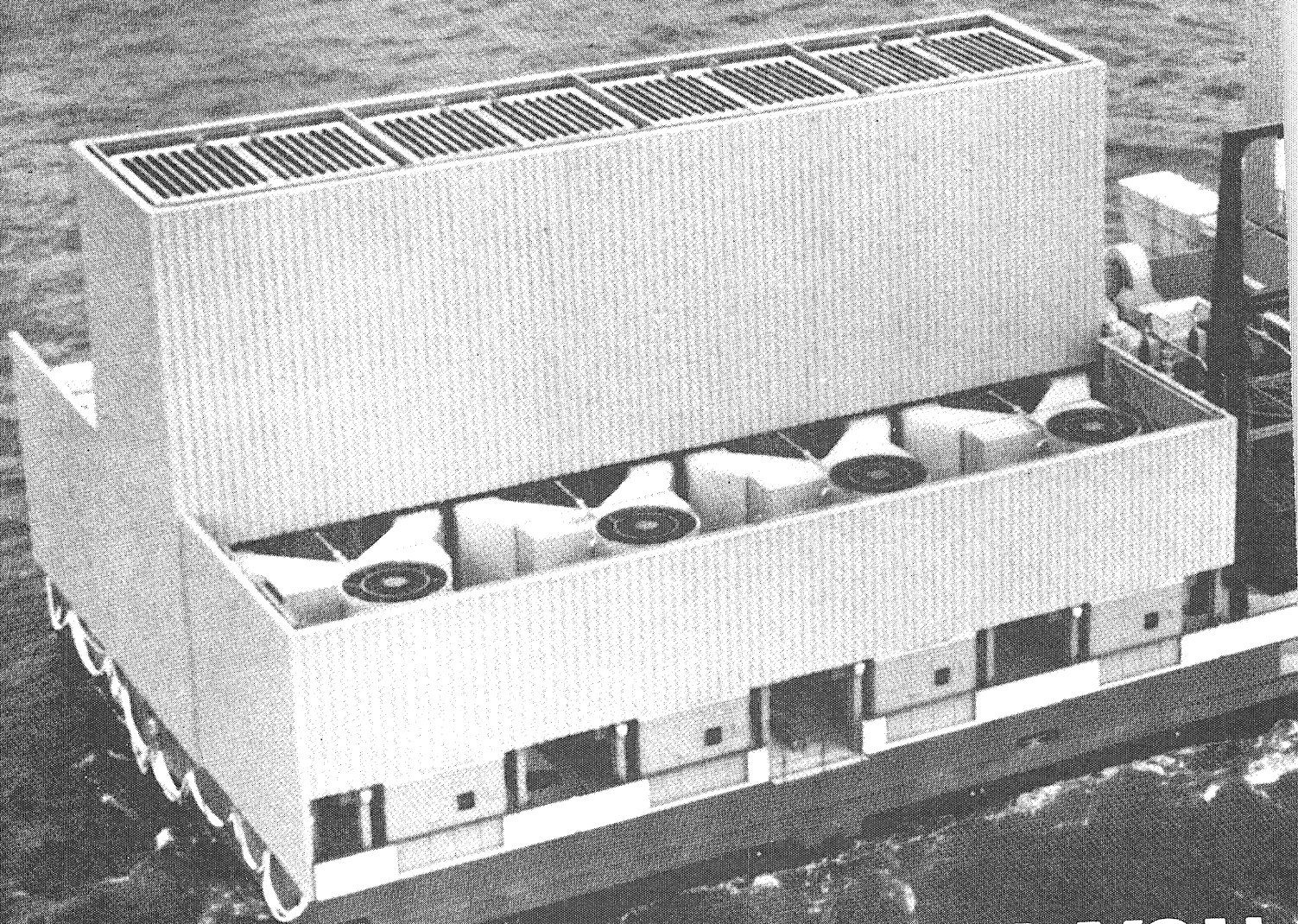
These bargains are well-advertised. But there are lots of less-touted bargains you don't hear about until you get there. Here are only a few examples.

Some airlines offer unscheduled night flights between major cities for reduced rates. In Britain special round trip day return tickets cost only a little more than a one-way ticket. A Red Rover pass in London provides a full day's unlimited travel on the red double-decker buses for \$1. If you dig a lit-

Continued on page 28







# INSTANT ELECTRICITY. YOU

**Portable gas turbine generators, mounted on barges and trucks, are being plugged into existing power networks to boost capacity. And nickel's helping make it happen.**

One tool that more power companies are using in both their short- and long-range efforts to close the generating gap is a down-to-earth cousin of the jet aircraft engine, the gas turbine.

A typical turbine, hitched to a generator, can produce enough power to light a city of 25,000 people. (Above, *eight* turbines are ganged on one barge. Combined output: 156,000 kilowatts!)

The beauty of the turbine is that it can be bought and set up almost anywhere in a matter of weeks. And it can be turned on and off in mere *seconds*. Which makes it ideal for those muggy summer evenings when everybody gets home and hits the air-conditioner button at once.

Gas turbines have proved such a boon to utilities that sales of them are soaring. Last year, they actually accounted for more than *one fifth* of power companies' total new generating capacity.





# CAN EVEN FLOAT IT TO TOWN.

At the volcanic heart of the turbines, where temperatures reach 1,800 degrees, only specially designed superalloys can be used. Almost all of these alloys contain a high proportion of *nickel*—up to 78 percent. Nickel is vital for the properties required for dependable turbine service. It helps to provide alloy stability and corrosion resistance.

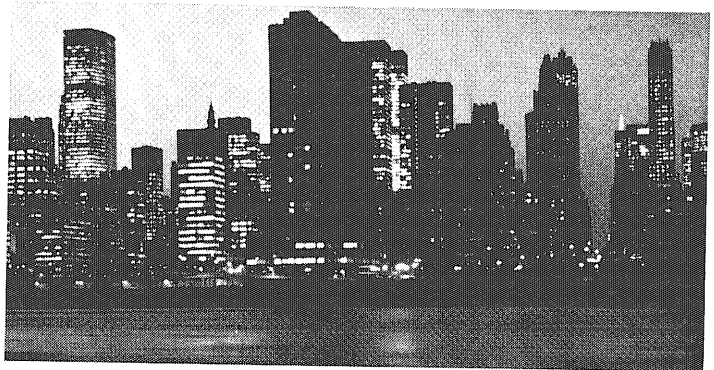
Just as our metal is a helper, so International Nickel is a helper.

We assist dozens of different industries all over the world in the use of metals. We offer technical information. And the benefit of our experience. Often, Inco metallurgists are able to *anticipate* alloys that will be needed in the future, and to set about creating them.

This kind of helpfulness, we figure, will encourage our customers to keep coming back to us.

And that helps all around.

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# WANTED:

## Engineer with five-year degree. Growing company in Twin Cities area offers positions in consumer safety. — Interview with Dr. Robert Plunkett

by Robert Pirro

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Q—Why is a masters degree so important to the engineer?

PLUNKETT—I don't think it comes as a shock to know that jobs are a little hard to come by this year. Looking at the unemployment figures, we're struck by the fact that the people who have the least trouble finding jobs and are the most secure in their engineering jobs are those with masters degrees.

Q—Did the university have a five-year program in engineering in the past?

PLUNKETT—Yes, but that was changed about five or six years ago. The reason we had a five-year program was because we honestly felt that it wasn't possible to develop an engineer in a four-year Bachelor of Science undergraduate program. Only three other engineering schools in this country had five year programs and employers gradually stopped giving a starting pay advantage to our graduates; in fairness to them we felt it necessary to adopt a four year program. In addition, this year we dropped the graduation requirement from 200 credits to about 190 credits, depending on the Department. All of this put together meant something in the program had to go, and what generally went was what we call the professional courses.

Q—You mean the upper division electives?

PLUNKETT—Essentially that, the professional and technical electives that are directly applicable to the study of engineering. Now we want to get those back in the program and so does the employer. I think this is a reason why people with M.S. degrees are more employable.

Q—What are other colleges offering at this time?

PLUNKETT—What's starting to happen in a number of different schools is that the student first takes a two-year lower division program almost identical to the one we have here. Then instead of moving into the upper division, he enrolls directly in a three-year program leading to a Master of Engineering degree. He passes by the Bachelors degree. We don't think that's the way to go right now. We think that the student ought to have an option, and we would like to make a five-year M.S. available to essentially all of graduating seniors. This program will now be available in every engineering department.

Q—This program is open to the senior class?

PLUNKETT—Yes. The candidate has to have a Bachelor of Science degree in an applicable branch of engineering. Generally speaking, he will take a Master of Engineering degree in the same branch in which he took his bachelors, but not always. It's possible in some cases to shift. In general, it's designed for the man with a B.S. degree in engineering from either the University of Minnesota or a school which offers an equivalent program.

Q—How much time and how many credits are involved?

PLUNKETT—It will take twelve months or four quarters to complete. The program involves 27 credits of classwork and a very substantial project we're calling professional study, which is the equivalent of 18 credits.

Q—Is there any appreciable difference between this program and the regular M.S. degree?

PLUNKETT—The Master of Science degree is a research-oriented degree. The Master of Engineering is not a research-oriented degree; it does not prepare one to go on to the doctor's degree. The Master of Engineering stands by itself. It prepares one to go into the practice of engineering, not into the research area.

Q—So the aim is to produce an engineer with a M.S. degree who can go right out into field and work?

PLUNKETT—That's correct. We're talking here about a professional program which will for example prepare a man to go into a Civil Engineering design office and do structural design using the current computer methods, or prepare someone to go into one of the local electronics firms and design micro-electronics. This is for the man who wants to get into the technical aspects of the business.

Q—What role does the graduate play in the program? Is it in fact run by the graduate school, by IT, or by a combination of the two?

PLUNKETT—An M.S. implies graduate school, but we're not really fully committed to whether this program should be administered by the graduate school or strictly as a professional program by IT. For the present it's being administered by a joint committee, of which I'm the chairman, appointed by IT and the dean of the graduate



school admissions office. Now because it's being administered by the graduate school, and because it has the title Master of Engineering, we feel ourselves bound by the stated standards of the graduate school. This requires a GPA of 2.8 in the course work programs. We don't feel that that's a bad standard and we honestly don't think that it's too demanding for this type of program. After we have more experience under our belts we may look at it again, but those students now enrolled don't seem to have any difficulty meeting the standard.

Q—How many of the graduating seniors do you feel could be admitted to this program?

PLUNKETT—From our current experience we are certain that anybody with a 2.5 undergraduate GPA can make it, and those people will be admitted pretty routinely. However, we expect to admit a great many students who are under 2.5 where we'll be looking for improvement in the upper division, for better performance in the professionally-oriented courses. At current reading about two-thirds of the graduating seniors have a 2.5 or better. And out of the remaining one-third we honestly expect that a very large fraction of them will be eligible for this program. I don't know how many, but certainly over half of them should qualify so we think that something on the order of 90 percent of the graduating seniors should be eligible for the program.

Q—Is there a fear that with these high figures the degree will be cheapened a bit?

PLUNKETT—Yes. We do not mean that everybody with a bachelors degree would automatically be admitted. The key here is that a student has to demonstrate somehow that he has the motivation, the incentive to do the work. We are not interested in getting the man who squeaked by, the guy who has played the numbers and worked out a program that got him through without exerting himself. We're not interested in him. We don't think he's good enough.

Q—Is there a greater need on the part of business for the Master of Engineering type of man?

PLUNKETT—Yes, certainly. Each year over the last 15 years the schools in this country have awarded about 35,000 bachelors degrees in engineering. In the last five years the number has been going up. They've also been awarding somewhere between 15,

000 and 30,000 masters degrees in engineering. Now this means that somewhere around 40 or 50 percent of the engineers in industry have been getting masters degrees, many of them on a part-time basis. While this has been primarily in the systems area, structural area, and the aerospace industry on the east and west coast, a number of other areas are becoming very important. This is happening in the automotive industry, home appliances and the sort of thing where consumer safety interests are becoming more and more important. This is where an engineer has to qualify as an expert in order to be able to professionally certify a piece of equipment.

Q—What do you mean by certify?

PLUNKETT—There's a great misunderstanding about certification for safety. What an engineer means by certification is that he has used good current expert engineering judgment, the best anybody knows how to do, and in order to say that he must be able to say "I'm an expert, so I know." How does he demonstrate this? Well, one way he can demonstrate it is by saying, "I have a Master of Mechanical Engineering in light machinery design." That says something. I can tell you that this area in which the companies are really worried, so in our opinion this is going to become more and more important to the engineer.

Q—In this case a Master of Engineering is more valuable than a Master of Science degree?

PLUNKETT—We don't think, for example, that our Master of Science, our research-oriented degree makes a man specifically more proficient in engineering. That isn't its purpose. A man might want to say, "I'm an expert in lawnmower design, therefore I know what I'm talking about from a safety standpoint." To point out that he has a Master of Science degree doesn't say that, but a Master of Mechanical Engineering would. We would encourage all of this year's current crop of bachelors candidates to seriously think about getting into this program. We think it's going to be to their best long-range interests to do so, for a number of reasons.

Q—Especially since the job market is so tight?

PLUNKETT—It's tight. It means they've got to have a little something extra to crack it, and we think this program is going to give them a little extra leverage. ■

# So You Want to Go Camping

by Joe Campbell

Camping has become very popular the last few years, but for those who haven't experienced an outing in the woods, there is a good deal of information to become familiar with. There are numerous types of camping and camp vehicles, each having its pros and cons. Also, many variables involve the outdoors enthusiast himself—age, budget, driving experience, vacation preference, and so on. Recommending one type of camping over another then, can be quite a gamble. Fortunately, an outdoorsman can tailor his sport to fit his age, income and interests.

For the 'back-to-the-woods' type, there is backpack camping, and done right, there's nothing to it. For the family and for groups, there are tents, folding tent trailers, travel trailers, campers mounted on pickup trucks and mobile home vans.

For those who plan one-night stands, the wheeled vehicles are more convenient than a tent, with the better rigs being the pickup camper, the travel trailer and the motor van. These vehicles involve no pitching, dismantling, or, if it storms, packing wet canvas.

Although convenient, the tent trailer—a small two-wheeled trailer with a tent attached to it—requires some erecting, dismantling and repacking. If extra rooms are used, these also must be detached and repacked before the trip can be resumed. Some campers prefer to use station wagons, sleeping in the vehicles during overnight stops and saving tent pitching for longer stays.

## Tents

Tents have many advantages for the beginning camper. They are relatively inexpensive, need not be towed or maneuvered into position and are comfortable except during extreme weather conditions. Tents can be carried to and put up in places not accessible to a driven or towed vehicle.

The lightweight tents can be backpacked and pitched in a few minutes. Yet at minimum cost they afford protection from storms, insects and snakes. When pitched on platforms found in many campgrounds, and protected by a fly, a canvas covering, larger models provide extremely comfortable and durable summer homes.

Tents can be bought so many sizes, materials and designs that nearly any preference can be satisfied and a group of almost any size accommodated. Tents of good quality, given reasonable care, will last for

years. Another great advantage is that they can be stored easily and take little space.

Additional tenting equipment offering much convenience include air mattresses or cots at about \$25 each and good sleeping bags (with three or more pounds of insulation) starting from \$25. A gasoline or propane two-burner stove will cost about \$20 and a lantern using the same fuel costs a similar amount. An ice chest may cost upwards from \$15 depending on size and quality.

Of course, you can eliminate the cots or fly, but for all practical purposes, the lantern, ice chest and sleeping bags are necessary. Get the best sleeping bags you can afford. They can be used for all types of camping, will last for years with good care and will be important to your comfort from the very first night.

On the other hand, tents do have their drawbacks. They require an area that is fairly smooth and level. They must be put up and taken down. They are subject to damage from sparks, little animals such as mice and chipmunks, sharp objects and an assortment of other things. If packed away when damp, tents may mildew, although many modern fabrics have been treated against this hazard.

## Tent Trailers

Tents have been in use since prehistoric man, and in spite of all their shortcomings, they are still preferred by the great majority of people who spend their spare time out of doors.

Tent trailers are roomy, affording off-the-ground living and sleeping for as many as a half-dozen campers. They have numerous built-in conveniences, including stoves, iceboxes, sinks, and in some cases even toilets, plus zip-on rooms and plenty of storage space. The beds are large and even come with mattresses.

The ground on which a tent trailer is parked does not have to be smooth or level. If necessary, the contrivance can be moved into position by hand. These advantages also make it a simple matter to park a tent trailer in your yard or driveway unless this practice is prohibited by local zoning laws.

The disadvantages of tent trailers include their initial expense, several times that of a tent of comparable size plus accessories, and the fact that they are not allowed on some parkways. Such trailers must have a license, and the user must learn how to maneuver them.

## Travel Trailers

Travel trailers of almost any towable size boast far more conveniences than do the tent trailers. These include hot and cold running water, refreshing showers and even electric lights. Travel trailers require no erection, of course. They can be warm and comfortable in any type of weather.

The average passenger car can tow one of the smaller travel trailers easily and with little loss of gasoline mileage. And once you've arrived at the camping spot with the trailer, you can disconnect the car and use it for sightseeing and other purposes, an advantage not to be had with pickup campers and motor vans. Travel trailers need little maintenance, and they come in numerous sizes and designs.

There are disadvantages to using travel trailers, however. Like tent trailers, they are banned from some parkways and in some areas may not be parked in yards or driveways. If the trailer uses bottled gas for stoves and other appliances, it may be prohibited from passing through some tunnels. The expense of a travel trailer can be a high hurdle, also. These trailers must be licensed. Maneuvering them takes some practice. And much to the regret of the younger members of the family, no one may ride in a trailer while it is being towed along a highway.

In addition to being easier to maneuver and park, pickup campers have several advantages over a trailer. They are ideal for many hunters and fishermen in that, because of the rugged construction of the pickup truck on which the camper body is mounted, they can be driven into country that can't be reached by a towed vehicle or even a low-riding passenger car. They usually cost no more than a good travel trailer and are often just as convenient. Riders are allowed in the living quarters of the camper while it is enroute, and when it arrives at the campground it can be connected to electricity, water, and sewer system.

The expense of the pickup camper is foremost among its disadvantages, although this cost may be spread out if you have a genuine use for the truck once the camper body is taken off. Again, local laws may prevent the parking of such vehicles in yards and driveways, as well as keep them from using certain parkways and tunnels.

Unfortunately, once the pickup camper is parked at a campsite, the truck cannot be used for side trips as can the vehicle towing a travel trailer. It is true that some camper bodies can be removed from the trucks and stored on jacks. However, this chore is not recommended for the casual camper.

#### Motor Van

The motor van is the most luxurious of all mobile living arrangements. Such land yachts boast all the conveniences of a large travel trailer. Yet they are commonly classified as pleasure vehicles, opening parkways to them that are closed to trailers and campers. Vans handle well, and can really be a home on wheels, affording shower, toilet, running water, closets, double beds, electricity, and other features.

Its high cost and the fact that it has virtually no use other than as a mobile home are foremost among its disadvantages. Vans bearing propane gas tanks may be turned away from tunnels and the van owner requires another vehicle for general transportation.

Motor homes, travel trailers and pickup campers simply are not economically feasible for most beginning campers but I present them here to show the alternatives available to campers. After sleeping on the ground for a number of years, I can testify that it was indeed a comfort to move to a tent trailer with mattresses and off-the-ground camping during rainy weather. I would like to have a more luxurious vehicle for travel-camping in the future, but nothing can take the place of a tent in the wilderness. Expensive rigs offer convenience but cannot offer the personal relation to nature that backpacking or canoe-camping does.

Many would-be campers ask about campground fees and other such expenses. Privately owned campgrounds usually charge \$1 to \$3 a night per campsite and sometimes offer special weekly rates. Often this fee includes firewood, hot showers and the use of recreation rooms and laundromats.

None of our large national parks charge for camping other than the small park entrance fee, which may be \$1 or \$2 and there is no charge for any camping in our national forests. State parks generally charge a small amount for using facilities. Even with campground fees, your trip will be inexpensive.

If there are just two of you and you'd like to take a hiking vacation, the journey will cost even less. You'll get along with a big tent, lantern, ice box and big stove, so your outfit will run well under \$100.

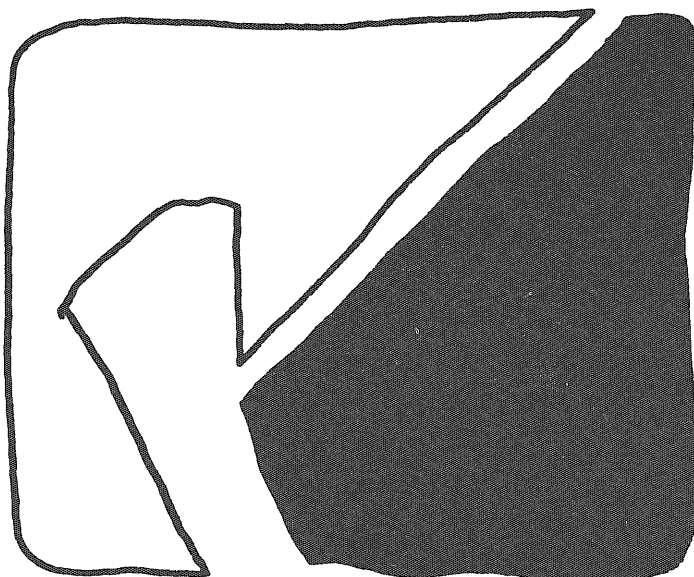
Some individuals who have never camped ask, "But what can you do?" To those who have enjoyed the pleasures of camping, this is an easy question, for there are innumerable things to do, at little or no expense. There is often fine fishing, boating, hiking, canoeing or mountain climbing. Camera buffs will have a ball on any camping trip.

Numerous camping areas have boats and canoes to rent. Riding horses are frequently available. Some campgrounds have libraries for those who would like to relax and read. These may be a small zoo or museum.

Many campgrounds are within a short drive of some natural wonder, historic site or settlement where movies are shown. Or, if you would like to simply relax and enjoy the freshness of your surroundings, there's no happier place to loaf than under a shady tree by a lake or stream.

Camping provides an inexpensive introduction to the outdoors and permits many people to take vacations near scenic beauty, historical sites and other places that they might never be able to visit under other circumstances.

If economy is a vital consideration in your vacation plans, give serious thought to a camping trip. You'll find fresh new sights and sounds, new acquaintances and relaxation. And, best of all, the price is right. ■





# Action is Looking for You

by Mary Steil

The number of bright orange cards outside the Institute of Technology's Placement Office have not been as plentiful lately as they were two or three years ago. The current economic situation has forced some companies to discontinue recruiting on this campus, and other organizations have made last-minute decisions to cancel their interviewing dates.

But while others are cancelling interviews or offering fewer jobs, one organization which sent interviewers to IT this year sought applications from 200 engineers and almost 70 architects to fill a slightly smaller amount of available jobs.

The salary offered by this organization, however, is considerably less than other interviewers may have been offering — \$75 per month. The person hired is also required to remain on the job for two years.

The recruiter was, of course, ACTION Peace Corps/VISTA and the figures mentioned refer to the number of applications the Peace Corps is seeking to fill jobs which begin after the next training session in July.

The Peace Corps, an American overseas volunteer organization, first sent 800 workers to foreign countries in 1961. Ten years later, 9,000 volunteers in 60 countries were using their skills to assist developing nations in a variety of ways: organizing community health programs, building and teaching in schools or designing and constructing buildings.

Peace Corps volunteers remain at their posts for two years, after completing a 12 to 14-week training program. The pay is minimal: the program works because of volunteers, with the government paying transportation to and from an assignment.

Engineers are especially "in" at the Peace Corps now. The Corps is placing a greater emphasis on skilled volunteers and there is a definite place for engineers, particularly civil engineers. About 75 percent of the requests made by countries to the Peace Corps ask specifically for civil engineers.

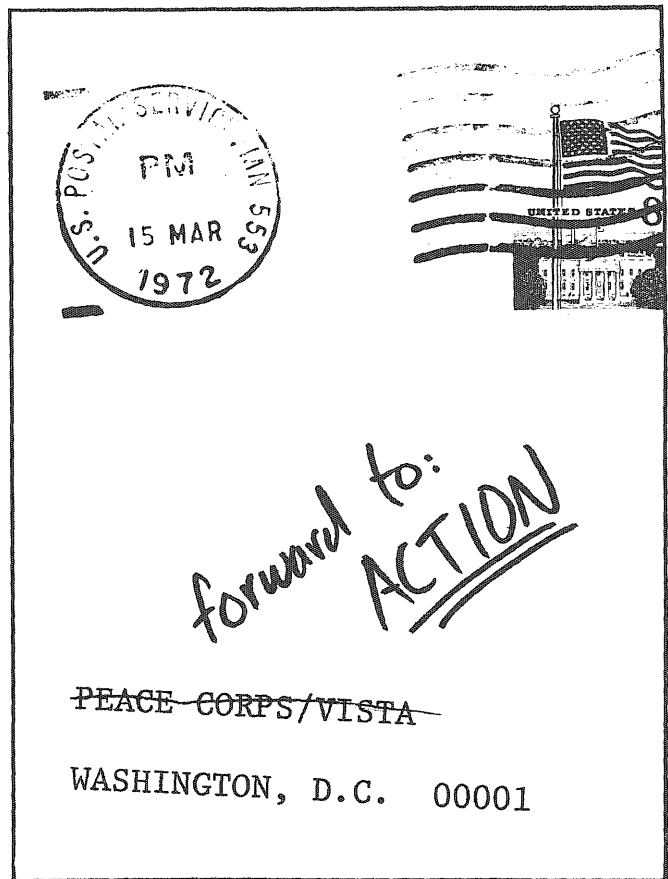
These engineers need not have post-school experience to be accepted. Although the Corps usually requests that engineering volunteers have at least two years experience, "most of the volunteers are placed right out of college," said Paul Willis, ACTION area manager. "We may not always find an engineer with two years experience, so next we consider those with no experience."

If all engineering positions are filled, a recent graduate can apply for related jobs, Willis added. Some engineers in the Corps teach math, physics or other subjects they know about.

The Peace Corps has positions for engineers in six specialty areas and also jobs for architects:

## CHEMICAL ENGINEERS

— plan and construct lab facilities, test equipment, design equipment and develop procedures for use in chemical production. Qualifications: BS degree or above in chemical engineering with 2 years experi-



## (Looking for Action?)

ence.

### CIVIL ENGINEERS

— There are four divisions of civil engineering volunteers: 1) Civil engineer-generalist: works in the planning, designing and erection of steel structures; 2) Civil engineer: work in road construction; 3) Civil engineer/sanitation engineer: responsible for designing and overseeing construction and operation of waste disposal plants, drainage systems, watersheds and other sanitation systems; 4) Civil engineer/hydraulics: job is related to that of the sanitation engineer but concentrates on structures involving water. Qualifications: BS in civil engineering, and usually two to three years experience.

### ELECTRICAL ENGINEERS

— plan, design and prepare specifications for electrical equipment, and layouts for transmission and distribution lines; inspect existing equipment and recommend repairs; train native employees. Qualifications: bachelors degree in electrical engineering; a minimum of two years experience in one or more of areas: electrical machinery, equipment manufacturing, telephone and telegraph, power and transmissions.

### INDUSTRIAL ENGINEERS

— largely managerial, upgrading existing industries and developing new ones, improving plant efficiency

## The Corps is placing a greater emphasis on skilled volunteers and there is a definite place for engineers . . .

and productivity. Qualifications: bachelor's degree in industrial engineering with a minimum of two years experience.

### MECHANICAL ENGINEERS

— design power distribution systems, supervise construction of systems in both small industries and primary and secondary distribution systems, work in local power company, train local workers. Qualifications: bachelor's degree in mechanical engineering and/or related fields with preferably two years experience.

### MINING ENGINEERS

— supervise and instruct local workers in mining techniques, organize field trips and do reports. Qualifications: bachelor's or graduate degree with or without experience.

### ARCHITECTS

— construction of public and private structures, designing simple zone plans, long-range village and town planning.

**QUALIFICATIONS:** The VISTA architect must have an architectural degree, but not necessarily experience. The volunteers work with professionals in "community design centers" and for their work may receive credit toward their architectural license.

VISTA (Volunteers In Service To America) is

looking for architects. "We place all the architects (including landscape architects) and city planners we can get," said Willis.

VISTA architects work with a professional staff in helping concerned neighborhoods improve themselves. The architects also provide the people with the technical information they might need in dealing with government agencies in their fight for neighborhood improvements.

Some other IT graduates looking for jobs with VISTA may not find a job for their particular skills. The organization has few jobs open which require engineers, Willis said. But there are jobs for the engineer who is willing to adapt himself to VISTA'S needs. Jobs are available in car repair and other levels of mechanical repair. VISTA is also a governmental volunteer agency, but its workers join for just one year and the jobs are all in the U.S. Applications in both Peace Corps and VISTA are increasing steadily this year, and Willis feels the quality of applicants we have been getting has "just been amazing."

For more information about either the Peace Corps or VISTA, contact Paul Willis in the ACTION Peace Corps/VISTA office, room 166 of the Old Federal Building, 3rd Ave. and Washington, Minneapolis. Phone 725-2596. ■

## Research opportunities in highway engineering

### The Asphalt Institute suggests projects in five vital areas

Phenomenal advances in roadbuilding techniques during the past decade have made it clear that continued highway research is essential.

Here are five important areas of highway design and construction that America's roadbuilders need to know more about:

**1. Rational pavement thickness design and materials evaluation.** Research is needed in areas of Asphalt rheology, behavior mechanisms of individual and combined layers of pavement structure, stage construction and pavement strengthening by Asphalt overlays.

Traffic evaluation, essential for thickness design, requires improved procedures for predicting future amounts and loads.

Evaluation of climatic effects on the performance of the pavement structure also is an important area for research.

**2. Materials specifications and construction quality-control.** Needed are more scientific methods of writing specifications, particularly acceptance and rejection criteria. Additionally, faster methods for quality-control tests at construction sites are needed.

**3. Drainage of pavement structures.** More should be known about the need for sub-surface drainage of Asphalt pavement structures. Limited information indicates that untreated granular bases often accumulate moisture rather than facilitate drainage. Also, indications are that Full-Depth Asphalt bases resting directly on impermeable subgrades may not require sub-surface drainage.

**4. Compaction and thickness measurements of pavements.** The recent use of much thicker lifts in Asphalt pavement construction suggests the need for new studies to develop and refine rapid techniques for measuring compaction and layer thickness.

**5. Conservation and beneficiation of aggregates.** More study is needed on beneficiation of lower-quality base-course aggregates by mixing them with Asphalt.

For background information on Asphalt construction and technology, send in the coupon.

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## The Asphalt Institute

College Park, Maryland 20740



Graduates using the placement service may have as many interviews as they desire.

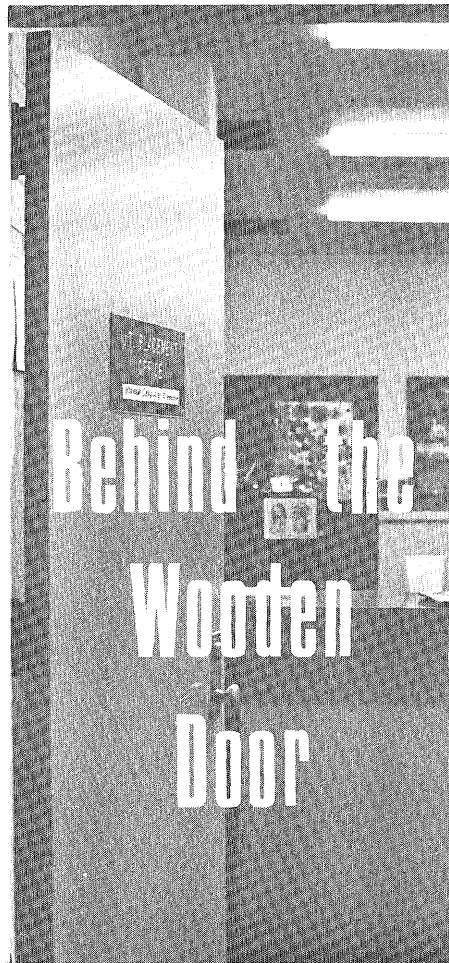
Behind the single wooden door of 235 Experimental Engineering, work is proceeding normally. IT students enter the office to register for job interviews, and to ask placement secretary Rose Garner a few questions. Outside the office other students are scanning the bulletin boards listing the interviewing companies on bright orange cards and making a list of those they are interested in.

The restrictions issued fall quarter limiting each IT student to 10 interviews have been lifted, and now the winter and spring quarter graduates using the service may have as many interviews as they desire.

Behind his desk in a raised part of the office, part-time placement director Norman Ceaglske is trying to organize statistics about the number of IT students using the service and how many graduates have found jobs. It is his first year year as director, and he also teaches chemical engineering. Ceaglske is looking forward to next fall, when, for the first time, winter and spring graduates will be allowed to sign up for interviews with the office. Formerly, only fall quarter graduates could interview in fall, while spring and winter graduates could only begin interviewing in January.

It is normal work for a not-so-normal time. The current economic situation has made placement of engineers, especially aeronautical engineers, difficult. Graduates who left IT two or even three years ago are coming to the office in an attempt to find jobs. Last fall, 82 of the 280 students registering with the placement office were alumni, a few from as far back as 1967.

Less companies are sending representatives to interview IT graduates. "In a good year," said Ceaglske, "the number of recruiters per quarter would reach 250. We've got a little over 100 coming this spring." Government recruiting is also down. "We used to have organizations like the Atomic Energy Commission and the U.S. Army



by Mary Steil

Corps of Engineers recruiting," he said, "but not anymore. They've had cuts in research funds and can't hire any new people."

It doesn't seem to be a good year for student use of the placement service, either. "Only about half or 60 percent of IT students even use the Placement Service," Ceaglske said, his eyebrows raised in surprise. "And only half of those that use the service reply to our card asking if they got jobs. So you see, all I can say is that I know what one-fourth the IT graduates are doing." Last spring, about 60 to 70 percent of the graduates he knew about found jobs, but again this is only one-fourth the total number of graduates. Thirty-six of IT's 83 March graduates are now using the service. There is a lack of accurate statistics from the office, a fact Ceaglske is trying to correct.

There are some national statistics which can be considered by IT students. Dr. Frank Endicott, Northwestern University's place-

Appearance as well as personality affects the interviewer.

ment director, found in a recent survey of nationally-established companies that engineering and accounting graduates have the best chance of finding jobs, with starting salaries averaging \$852 to \$880 a month (from the Placement-Recruitment Exchange).

A study conducted by the College Placement Council reported that jobs for engineers should be up 17 percent this year over last year.

Pete Veruki, Bethlehem Steel recruiter, also predicted (in Placement-Recruitment Exchange) a rise in demand for undergraduate engineers and accounting majors.

Another recruiter representing an electronics company said, "I anticipate that the recruitment picture for 1972 graduates will be substantially the same as for 1971. Students majoring in accounting and finance will still be the most sought after, with majors in most engineering disciplines and liberal arts graduates having greatly diminished opportunities."

Most of the companies sending recruiters to IT Placement Office are out-of state organizations, although the majority of IT students usually find jobs in Minnesota. In '68-'69, 52 percent of the IT graduates found employment in Minnesota; in '69-'70 the figure was 58 percent. (Placement Office statistics)

Grades, according to Ceaglske, are still of prime importance to a recruiter. "The ones who usually have the hardest time getting a job are those in the bottom one-third of the class," he said.

Appearance is also important, he said, as well as a personality which strikes the interviewer favorably. Sometimes, Ceaglske said, recruiters have rejected a student because of some character quirk which struck the recruiter in a bad way.

"In addition to the placement service, students can do a lot on their own to find jobs," Ceaglske said. "They can write up a resume and send out copies of it to companies. Some students have gotten good jobs just by writing to companies." ■



# LOG'S LOG

## The Last Note

Well folks, this will be the last Log's Log for the year. As is traditional, we will now give out the appropriate awards.

First to Ace's Standard Truck Stop, for overextending our credit, getting us gassed, and turning our crank, we present the Flying Finger Award. To Super Steve, for pull-us out of the mud on the river flats, and in memory of his Ford, the "Southern Bellie" who died in the effort, we give a golden knob.

To the (w)hole Log Staph, for winning the First University Invitational "500" Competition, a set of Playmate cards.

To Riff-Raff, our tokin' frosh, for everything he's done for us, we present nothing.

To Big Daddy Ron, for proving that you **can** kill a Honda in three months, keeping the rats from leaving our sinking ship, and pushing soft drinks down in the office, we present the tongue of a dead yak.

And last of all to "Blunder and Pest" our sponsors, makers of the "Hemmoron" and exclusive distributors of "Federation Surplus Starships," we give our thanks.

Rhube and Co. would like to thank you, our readers, for putting up with us for a full year. So from Craig and Pete, Ace and Zeus, Kevin and Sandy, Lars and Helga, and Rhube and Co., peace in the valley and on the floor and in the bed, take it easy (but take it) and "Keep on Truckin'." Amen.

The following is a true story. Scene: Rhube and Co. truckin' down a dark, lonely highway. Craig is at the wheel.

Pete: "Where do 'ya wanna stop ta eat?"

Craig: "There's a little place up ahead."

Pete: "Any good?"

Craig: "Must be, all the tourists stop there."

Pete: "Hey, what's this?" (He pulls a letter out of the glovebox.)

Craig: "Put that back!"

Pete: "Hmmm, smells nice, per-

fume, it's that expensive stuff, 'Three nights in Chicago', right?" "Stuff costs \$3.98 a gallon."

Craig: "That's a letter from my woman, put it back."

Pete: "Let's see here . . . (rips the letter open)".

Craig: "Come on now, put it down!"

Pete: "Ain't that cute, Dear cuddle bunny."

Craig: (Blush)

Pete: (Reading on) "You 'ol dog, on the porch, on the sofa, under the sofa?"

Craig: (Still blushing) "Well, I read alot."

Pete: (Reading further) "Six times in one night?, wow! . . . Oh, this is choice! 'I don't believe this.'"

(Rips out a page and throws it out the window)

Craig: "Hey, let me see that!"

Pete: "I'll fill 'ya in on any good parts."

Craig: "That's my mail, now . . ."

Pete: "Oh-oh . . ."

Craig: "What?"

Pete: "Oh, nothing."

Craig: "Come on, tell me." (Cheap organ music starts in the background.)

Pete: "She says that you're never around and that you're just using her."

Craig: "That's not true."

Pete: "And she's leaving you for another."

Craig: (sobbing) "No, she can't."

Pete: "She can and did." (Music get's louder)

Craig: "I can't go on, life isn't worth living, I'm gonna kill . . ."

Pete: "Hold on 'ol buddy, take it easy."

Craig: "But . . ."

Pete: "I know, but settle down, it's not the end of the world, you can find another girl. She just uses men, she was no good for 'ya, we'll get 'ya another REAL woman."

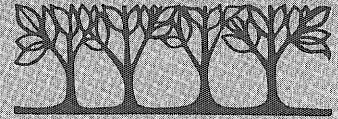
Craig: "Maybe you're right."

Pete: "'Course I am."

Craig: "After all, she was your wife." ■

This is not  
a recruiting advertisement.

Any of these engineering firms will be happy to inform you of the opportunities existing this year in the **CONSULTING ENGINEERING** field.



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# WHAT'S NEW

by Kiki Koras

## Engineers: IT Takes All Kinds

In mid-February, nearly 70 Twin Cities area minority-group engineers and scientists held a demonstration at the University of Minnesota.

Blacks, chicanos, and Indians demonstrated in a determination to help young minority-group people achieve more in life, particularly in living up to their potential.

Harry Kaye, an engineering student from Chicago, one of 15 minority-group students currently enrolled in the Institute of Technology said, "It's the best thing I've seen happen at this University in the two years I've been here."

Those present had three main things in common: Most of them had "made it the hard way"; all had an interest in science and technology and a belief in these means as a way of improving man's life on earth; and they demonstrated a sincere interest in determining what they could do for young minority-group members.

The meeting of minority scientists and engineers was called by Jack Moran, associate professor of aerospace engineering, to ask what could be done to correct "the dismal record of IT in graduating minority students."

In his opening remarks to the group, Richard Swalin, dean of IT, said, "If I were a politician I could report to you that our enrollment of minority students was up 400 percent. This doesn't mean much when you consider that this is only an increase from one student in a program to four students."

Those present then moved from a concern with college-level student problems to more basic questions about the educational system in general.

Engineers are being laid off jobs every day and yet it's being asked what can be done to recruit young minority students into science and engineering. Thus there are some

credibility gaps to be filled.

William E. Hobbs, Ph.D., head of microbiology and quality control at the James Bell Technical Center of General Mills, said, "When recruiting kids from minorities to go into science and engineering, we need to keep in mind that they're not just being recruited for personal achievement. They're being recruited to change the establishment."

The group agreed that teaching methods must be changed to give minority students as much of a chance as others have.

Students interested in engineering and medicine now can prepare for careers in areas such as biomedical engineering or medical electronics. The existing programs in electrical engineering, chemical engineering, and mechanical engineering permit undergraduates to take courses which will provide some background in biologically-oriented

subjects.

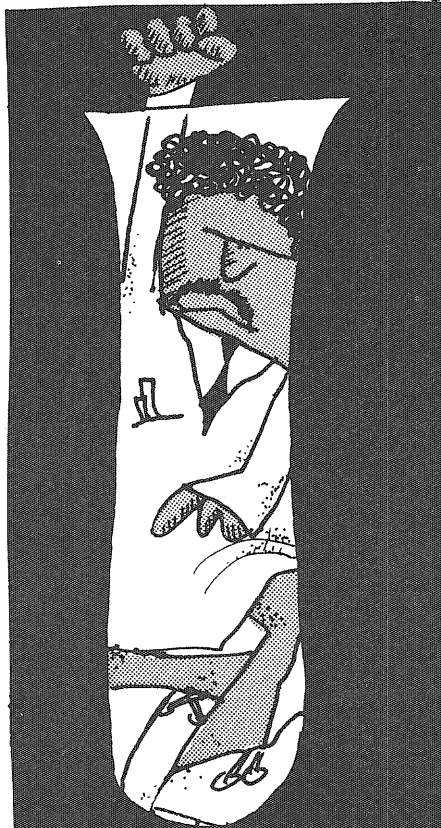
The present electrical engineering program is flexible enough to allow specialization in bioengineering or pre-med as well as more common choices such as computers, systems, or circuits. The student can work out an interdisciplinary program involving both electrical engineering courses and courses in the life sciences. In this way, the strong points of the engineering student, such as science and math, are combined with a liberal education and lead to a greater chance of being admitted into medical school if desired.

At graduation, a student can either apply for admission to the medical school or continue toward a masters degree in EE in such areas as medical electronics, prosthetics, or biological systems. These programs also continue up to the Ph.D. level.

A new program was recently proposed which would lead to a Ph.D. in bioengineering. This program would also be administered by persons from electrical engineering, mechanical engineering, the medical school, and other interested departments. Action on this program is expected soon.

By the end of the meeting, most of the group signed up to work as tutors for science students, take students on tours through their firms, which included General Mills, Univac, and Gillette Co., and especially, to find a way to help minority students from grade school to the university level deal more effectively with teachers and counselors.

To encourage more minority students from inner-city schools to enter IT, Moran provides information to high schools under the "Project Technology Power" program. Partial scholarships for minority students, special math sequences to help those with a limited math background and special tutors are also included in the program. ■



National from page 5

anical engineering department at the University, predicts that this picture will be brighter in the future. Fortune magazine predicted a greatly improved market for engineers in 1973, when the economy takes an upswing and the supply of engineers diminishes because of a 17 percent drop in enrollment in engineering schools.

In a report released last November, the Engineers Job Council (EJC) announced that the depressed job market in 1970-71 had created an engineering "employment problem" rate of 4.7 percent. This rate included all unemployed engineers and engineers who were working only part-time or doing non-engineering work because of inability to find full-time professional employment.

The figures were obtained by a survey conducted last summer by LJC for the National Science Foundation. The survey included one-fifth of the 500,000 members of 23 major engineering societies, which represents all fields of engineering employment.

Because of the membership qualifications of these engineering societies, the survey includes only engineers who are probably more qualified and professionally-oriented than the total engineering population. This elite membership presumably has fewer employment problems than unaffiliated engineers.

Out of every 1,000 engineers in EJC's "employment problem" category, 678 were out of work, 119 were doing part-time engineering work while seeking full-time employment, and 203 were working in non-engineering positions because engineering jobs weren't available.

According to the survey, engineering unemployment almost doubled between March, 1970, and June, 1971. In comparison, the national total unemployment rate increased only 27 percent during the same period. Unemployment in engineering has increased drastically since the Golden Age of Engineering in the 1960s. Between 1964 and 1969, less than one percent of surveyed engineers reported themselves out of work.

The depressed job market has not struck all categories of engineers equally, however. The following groups are particularly hard hit:

- \*Engineers under 30 and over 55.
- \*Engineers without college degrees.
- \*Graduates whose highest degrees were in non-engineering curricula.
- \*Electronics and aerospace specialists. Other specialties with substantially higher than average employment problems were in manufacturing engineering, computer and mathematics, systems engineering, and industrial engineering.
- \*Self-employed engineers and those in educational and non-profit institutions.
- \*Engineers living in Seattle, Wichita, Los Angeles and Orange County.

Jordan, who is also chairman of the Joint Task Force on Engineering Employment of the Minnesota Society of Engineers said the overall unemployment rate last fall in Minnesota was 5.7 percent. He said this figure could not be compared with EJC figures, because it represented the total engineering group, not just members of professional societies. One must consider that the EJC statistics also include part-time engineers and engineers working in other fields while the Minnesota figure doesn't do this.

Jordan attributed some of the Twin Cities unemployment to personnel cutbacks at major companies like Honeywell and Control Data. He mentioned that many unemployed engineers were trained in highly specialized fields which evaporated during the recession and cutbacks in defense contracts. "It's simply not the same job market for graduating seniors as it was when they entered school," (the University), he said, adding that the United States is reordering its priorities.

Jordan, chairman of the Engineering Program Study Committee, coning education to adjust to these tended IT was changing engineer-changed priorities. "These (engineering) students coming out of school will have a great impact on society — we'd better be sure they have a good impact," he said. Noting the 17 percent national drop in enrollment of engineering schools last year, Jordan predicted there would be a shortage of engineers in a few years. "If I had a son gra-

duating from high school now, I'd advise him to go into technology," Jordan said, adding that the job market in four years will be very good.

The EJC survey, which calculates "employment problems," instead of just the unemployment rate, helped

Continued on page 31



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tle, you'll find plenty more.

Driving is the most convenient, but probably not the cheapest way of seeing Europe. Persons interested in leasing or buying a car can make arrangements through Avis, Hertz or European companies before they go.

Hitchhiking and renting bicycles and motorcycles are cheap and popular ways of getting around. "Thumbing it" is a good way to meet people.

Probably one of the most important things to remember is a little-followed rule—travel light. Bring only a knapsack or one small suitcase filled with crease-resistant, washable clothes. It saves money (porter fees, laundry fees, checking fees), blisters and time!

But doing homework on air fares and rail schedules isn't the only homework to do. Too many people go to a city with little or no knowledge about what they will be seeing. How much more interesting to stand on a seemingly ordinary spot if you know that Marie Antoinette was decapitated there! How much more moving to gaze upon David if you know something about the sculptor, Michaelangelo. Guidebooks are often useful for brief background information.

Probably the things the natives know best is to stay off "Route 66". They know that Paris, Venice and Rome in July and August are unliveable. Everything is cheaper and more pleasant when the tourists leave. This doesn't necessarily mean traveling only in the winter months. Late May and September are good times to hit the noted tourist attractions.

Europeans also know, however, that the countryside and the people usually become the most memorable part of the trip. The small Spanish resort town of the Costa Brava is an example. It's almost too much trouble to bother with for the average rushed American traveller. It takes two hours by bus over torturous mountain roads to reach Cadaques, a picturesque village packed with white-washed houses and narrow streets. But not tourists.

The famous guidebooks are useful, of course, but they can't help you find an unspoiled place like that. If they could, it would be inundated with tourists in the wink of a Spanish flea's eyelash.

The guides like **Europe on \$5 a Day** are very good for finding shops and sights and giving out tips on travel. But unless you want to stay in a hotel or eat meals only with Americans, avoid using them when-

ever you can.

You can find lodging easily on your own. Some cities find it hard to accommodate the influx of tourists, so they have to improvise. In Amsterdam, you can rent sleeping space on the convention center floor for 50 cents (a cot costs \$1); in London, Wormwood Scrube Park has been turned into a campground during the summer. Cheap hotels are plentiful on Paris' Left Bank and in London "bed and breakfast" hotels are everywhere and charge as little as \$2.50 per night.

Membership in the American Youth Hostels, Inc. entitles members to stay at hostels, located in large and small cities throughout Europe (and the U.S. for that matter). Membership costs \$10 and entitles members to stay at hostels for between 50 cents and \$3 per night. Youth hostel rules can often be restrictive requiring residents to be in by 10 p.m. and up by 7 a.m. Communes for transients are usually as cheap but far less restrictive. They are friendly, and clean and pleasant — if you don't mind what's going on in the next bed.

YMCA'S, YWCA'S, pensions (cheap hotels with bath rooms down the hall) don't require student identification and cost anywhere from \$2 to \$4 a night.

In Istanbul, I stayed in a student hotel with dirty sheets and cockroaches in the bathroom in exchange for my dirty, frazzled-bottom jeans. One time we accidentally stayed in a whorehouse—but it was the cheapest hotel in Venice. Cheap hotels are often conveniently located near the railway stations.

Camping is one way to avoid the crowds. Bring a sleeping bag or buy one there. Equipment is usually cheap on the continent and can usually be sold back. Campgrounds are plentiful and well-equipped. Most have hot showers. Most major cities have one campground—Rome has three. In Lisbon the municipal campground holds 5000 people, has two pools, restaurants, tennis courts, a lanudromat, grocery store and still costs less than 75 cents per day.

Museums, art galleries and other tourist attractions usually charge admission. And these small costs add up. Many museums on the continent have special student rates. It's always worth it to ask. Usually a International Student Identity Card is required. These are available in the ISTC office in 231 Coffman for \$2, a fee statement and a passport photo.

Buying souvenirs is always a strain on the budget.



The best places for bargains are the markets. Every city has one. In London it's Petticoat Lane; in Paris, the Flea Market; in Florence, its Straw Market, and in Istanbul, its Covered Bazaar. In these open-air collages of sight and sound, you can find anything from leather vests and marble chess sets to jellied eels. Unfortunately, many Americans, who are not used to this system of barter and exchange, can't find bargains. It takes a little work and a little determination. At the Flea Market in Paris, we saw a leather vest. "How much?" we asked in broken French. 110 francs (about \$25) "That's really cheap," my friend said reaching for her purse. I intervened quickly and got the price down to 75 francs (about \$18). It's expected and everyone does it.

Touring a country will give you only a cursory and sometimes false impression of it and its people. Living there is, of course, the best way to experience a new culture, perhaps learn a language and most certainly, get a whole different perspective of your own country.

An American can study at European or American Universities in Europe. Many programs, which last 30-40 weeks, are especially designed for students wanting to study foreign language.

The Rotary International sponsors exchange programs for engineers and engineering students. IESTE, France-based organization with 42 member countries, sponsors exchange programs for engineering and architecture students. Undergraduates and graduates work two or three months, while earning

their room and board. Expenses for airfare and travelling usually range from \$500 to \$700.

IESTE also offers long-term programs lasting three to 12 months. The University Study and Travel Center has brochures about these programs.

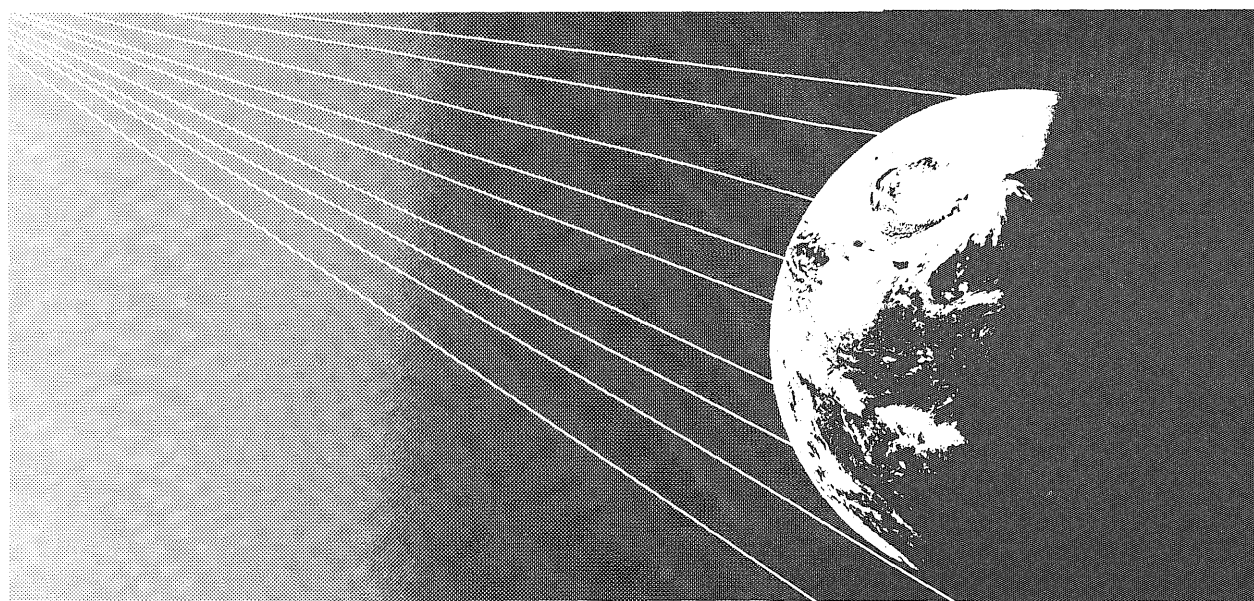
Getting a work permit for short-term unskilled work in most countries is almost impossible. In England, you must have the job before you are allowed to land. In other countries, regulations are not so stringent.

People who speak English can sometimes pick up work in crowded resorts as barkeepers or waitresses or they can teach English (especially in Spain, Italy and Greece) by advertising in the paper or asking the U.S. Consulate for referrals.

Some organizations sponsor programs offering students summer jobs such as clerical work in London, being a nanny in France, picking strawberries in Scotland or being a bartender in a German hotel. There are many agencies like this, of course, and some are of a very high quality; others are not. Some charge as much as \$450 simply for providing round-trip air fare and finding the job. It can be done for much less on your own.

The best place to get information about the countries you plan to visit is from their travel information service. Any travel agent has a complete list of these addresses. These organizations can answer specific questions you may have about travel, study or working in a particular country. They also send free brochures, maps and other descriptive literature. ■

**EARTH WEEK 72**



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# SPINTERS

After looking at some sheer nylon panties, the girl shopper asked if she could have "If you can read this, you're too darn close" embroidered on them.

"We can do that," assured the clerk. "Do you want block or script lettering?"

"Neither," was the reply. "Put it in Braille."

\* \* \*

SMITH: "Is Virgil getting ready for this year's fishing season?"

CARTER: "Must be; saw him buyin' an enlarging device for his camera yesterday."

\* \* \*

Two drunks were sitting at a table, staring mournfully into their drinks. One of them, cupping his hands together as if they contained some object, asked his companion:

"What I got here in my hands?"

His companion thought for a moment and then replied: "The Golden Gate Bridge?"

"No."

"The Belmont race track?"

"No. But you're gettin' warmer."

"A horse?"

The first drunk opened his hands a little and peeped in. Then looking up eagerly he asked: "What color?"

\* \* \*

A West Virginia farmer placed this warning in front of his watermelon patch to keep people out: ONE WATERMELON IN THIS HERE PATCH HAS BEEN POISONED. That evening a group of neighborhood kids converged on the patch to make a raid, but to their dismay noticed the the sign with the warning on it. The group left the patch, but returned a few minutes later with a marking pen. The following morning the sign read: TWO WATERMELONS IN THIS HERE PATCH HAVE BEEN POISONED.

"How did you spend this hot weekend?"

"Spearing through the ice."

"Spearing through the ice? What the hell for?"

"Olives."

\* \* \*

We know a man who was able to rid himself of two hundred pounds of ugly fat in just four short weeks. He divorced his wife.

\* \* \*

A high society lady was instructing her new maid prior to a very important dinner party.

"Now remember, Hilda," she reminded, "you are to stand at the ballroom entrance and call the guests' names as they arrive." So Hilda stationed herself at the door, and as the first distinguished gentleman arrived, she said: "Good evening, you greasy son of a . . ."

\* \* \*



. . . . . And then there's Marvin.



National from page 27

clarify the real nature of the engineering unemployment problem. It emphasized that engineers who possess strong educational qualifications are much less likely to be unemployed than individuals who received their preparation in other

fields. Engineers with less than a Bachelor's degree, had a 6.5 percent employment problem rate; with a Bachelor's degree, 4.3 percent; Master's, 5.3 percent and Doctorate, 3.3 percent. ■

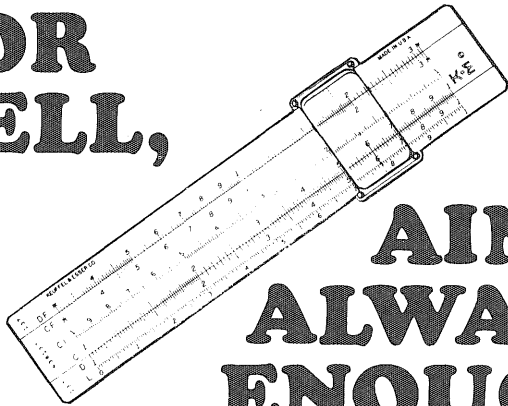
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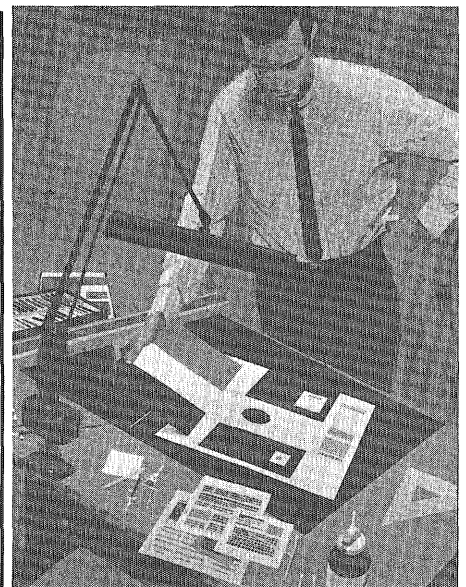


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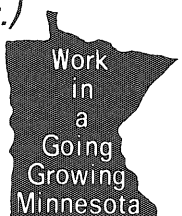
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# NEXT MONTH

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How will new and extensions of present technology affect our society in the twenty-first century.

## "Bowman's Layout"

The winning entry in our Science Fiction Writing Contest, written by David Wetzel.

## UCC

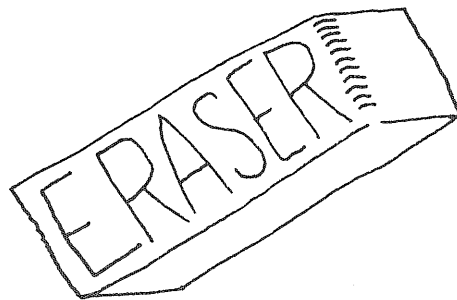
A look at the University's computer facilities.

## E-Day

A review of the festivities, and events.

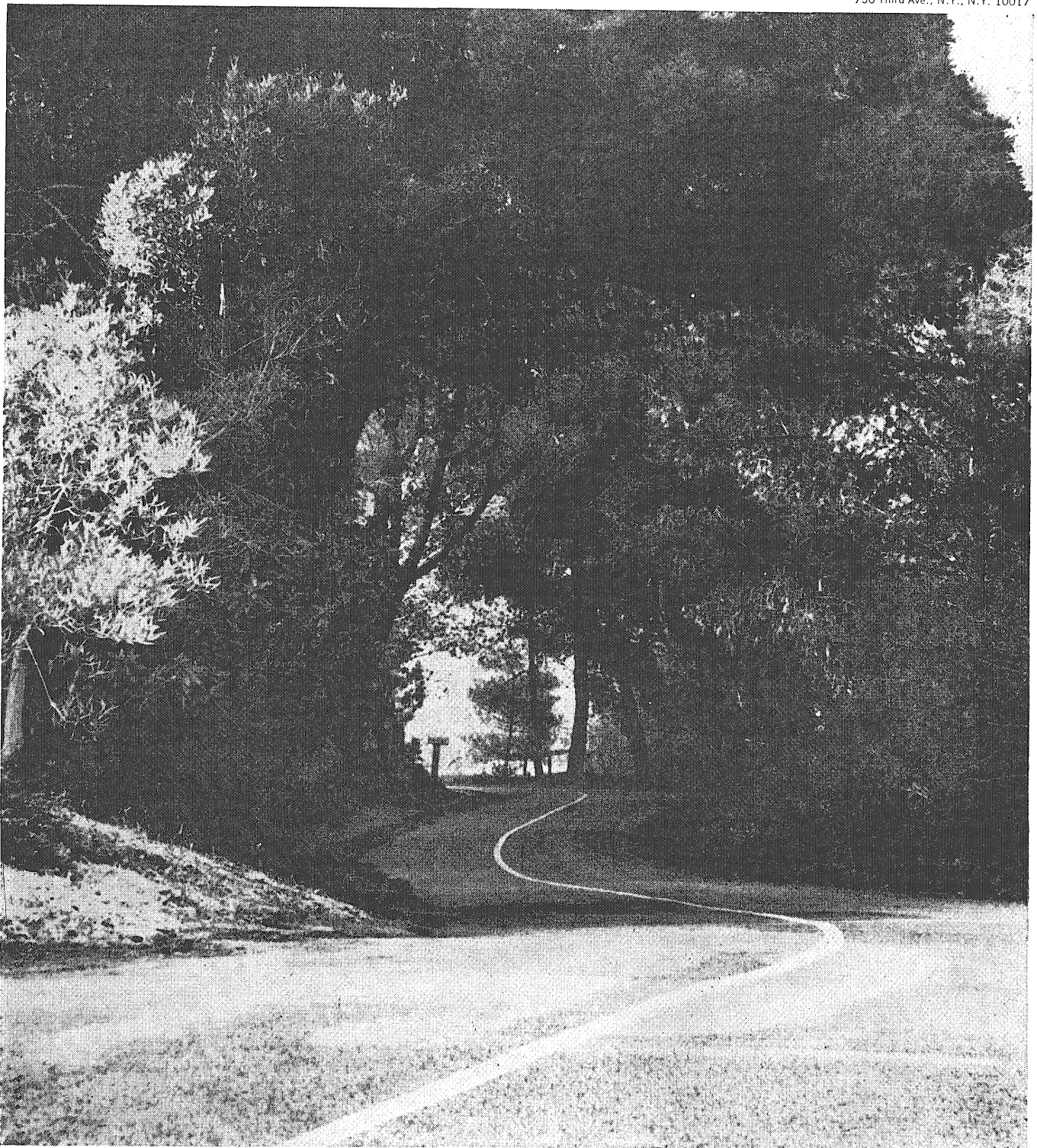
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# HOW CAN A MICROBE HELP TURN GARBAGE INTO FOOD?

The petri dish at the bottom of the page holds a special strain of thermophilic microbes. What does it have to do with garbage?

The microbes digest cellulose. And cellulose is what nearly two-thirds of all municipal garbage and farm refuse are made of.

So the microbes can digest your garbage. But that's not all they can do. They can convert it into a high-protein substance that livestock will accept as food.

This strain of microbes was first isolated in a General Electric research lab a few years back.

Today, our engineers are working to design a pilot plant to make the waste-conversion

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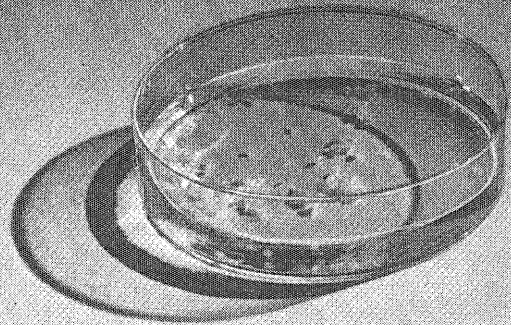
It's a technological innovation with a good chance of solving one of the biggest problems facing the country today. But, then, that's hardly surprising. Technology is one of the surest ways of solving social problems.

That's why, at General Electric, we judge innovations more by the impact they'll have on people's lives than by their sheer technical wizardry.

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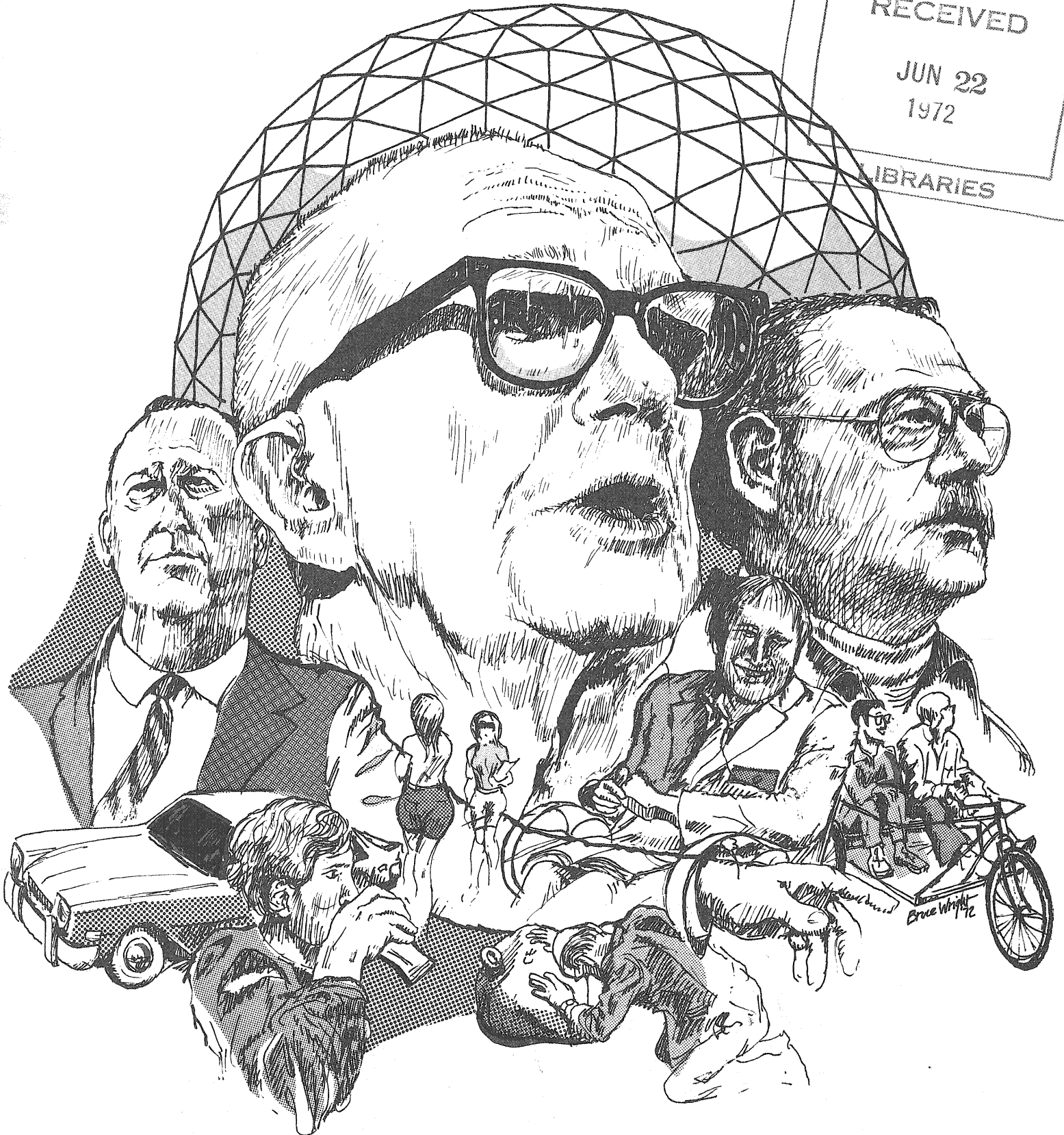
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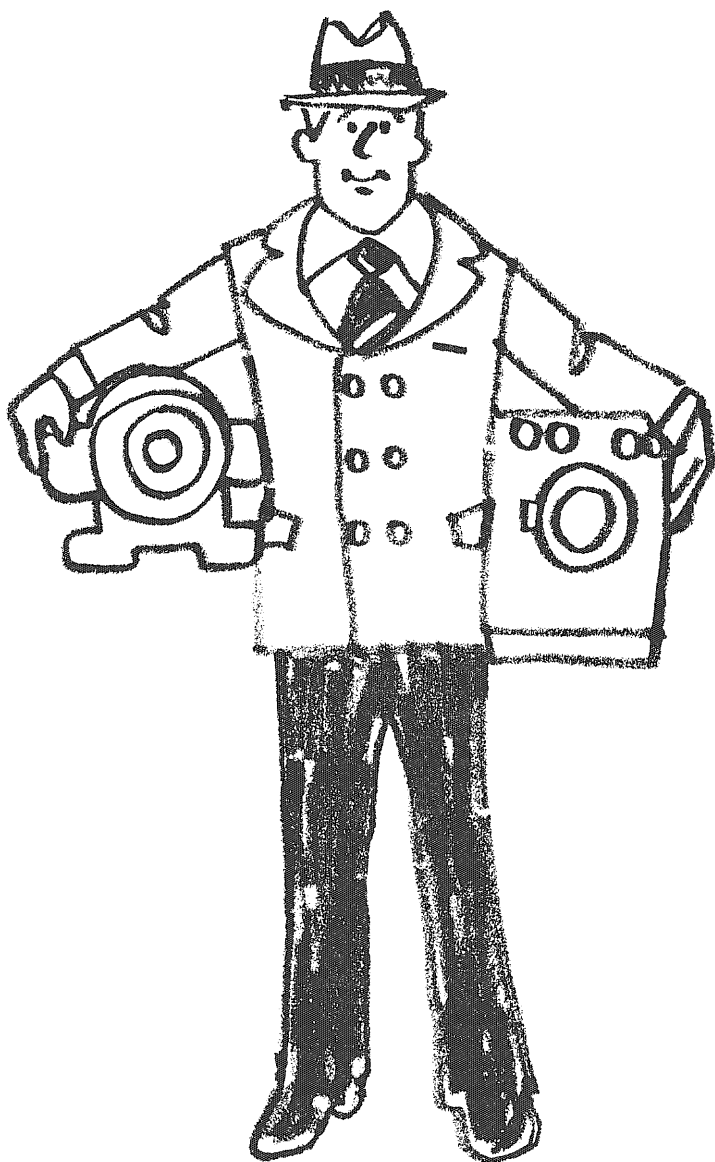
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# TECHNOLOG

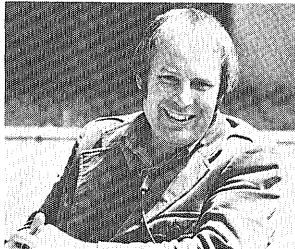
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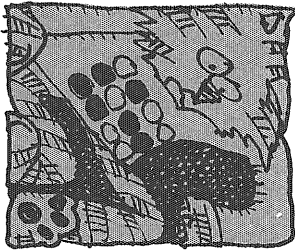
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FEATURES

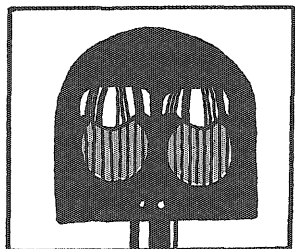
DEPARTMENTS



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## What Can We Do for the Pane?

Is the Washington Ave. bridge turning into a plywood tunnel?

3

## Earth Week and E-day

5  
8  
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17  
28

## The Middle Man

The engineer will become an interpreter between the sciences and the humanities

7

## To Search for Tomorrow

Frank Stodolka provides alternative lifestyles for the future

9

## Bowman's Layout

The science fiction contest winner

18

## 6000: A Computer Odyssey

Introduction to the University's computing facilities

21

## Fake

Is the Blarney stone real?

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## Forum

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### MEMBER OF ECMA

Published monthly, October through May. Second class postage paid at Minneapolis, Minnesota. Office: Room 2, Mechanical Engineering Building, University of Minnesota, Minneapolis, Minnesota 55455. Telephone: 373-3298. Printer: Aircraft Press, 425 South Fifth Street, Minneapolis, Minnesota 55415. Publisher's National Representative: Littell-Murray-Barnhill, Inc., 60 East 42nd Street, New York, N. Y. 10017. Publisher's State and Local Representative: University Engineering Magazine Advertising, F. P. McGrath, Manager, Box 14026 University Station, Minneapolis, Minnesota 55455. Telephone: 612-225-0708. Member of the Engineering College Magazines Associated, Chairman: Daniel L. Griffen, Iowa State University. Subscription rate: \$6.00 per year, single copies 50¢. Advertising rates upon request. Any opinions expressed herein are not necessarily those of the Institute of Technology or of the University of Minnesota. Copyright © 1972 by the Minnesota Technology Board. All rights reserved. Reproduction in whole or in part without written permission is prohibited.

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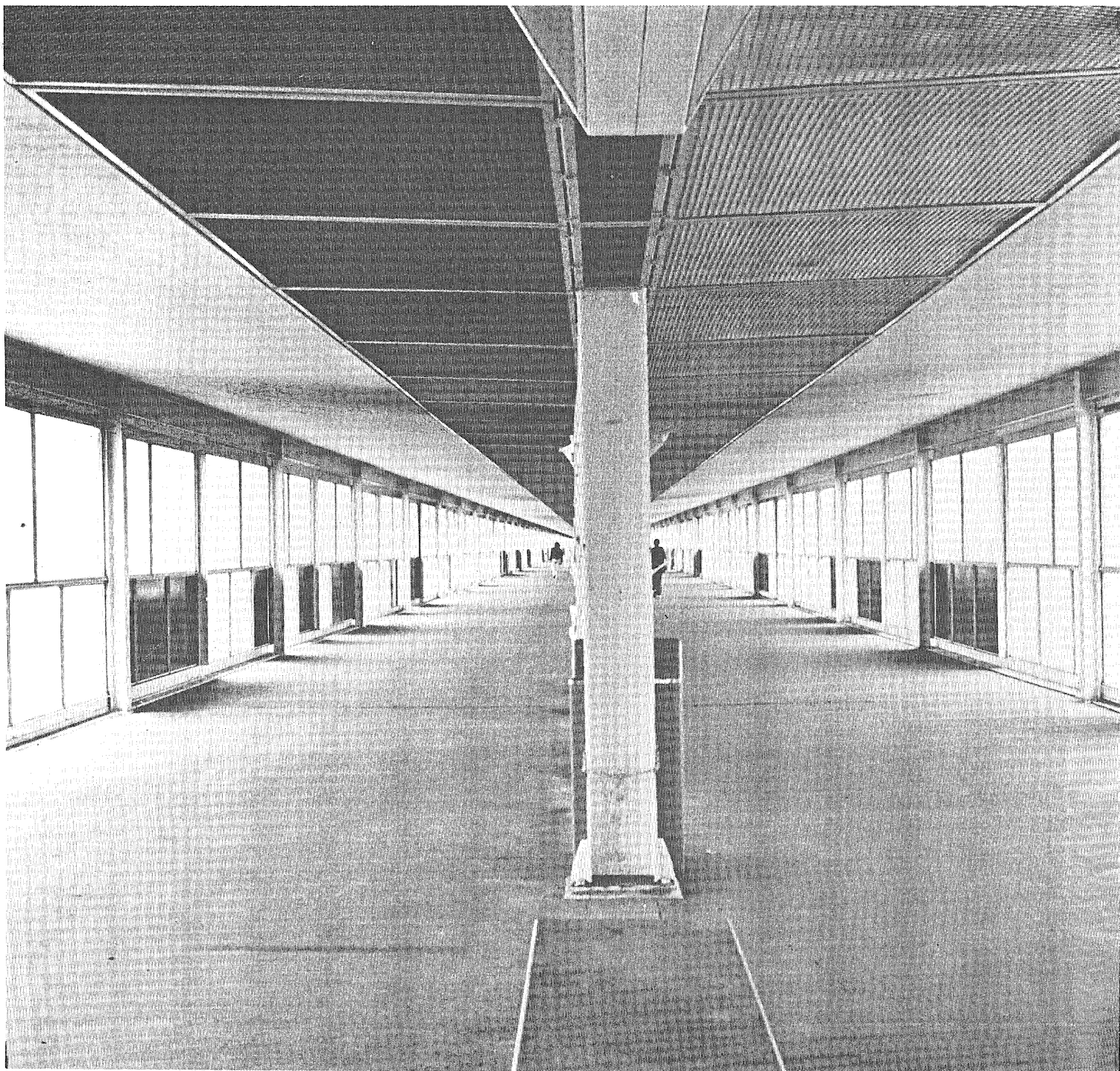
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**N**early every product of engineering goes through an evolutionary process as it develops from a gleam in someone's eye to a resistor-capacitor or concrete-steel reality. Additions, deletions and alterations occur daily as a given technological creation is acted upon by increased demands upon it, changes in related technologies and natural and social forces.

One of the most involved and expensive local examples is the covered walkway from East Bank to West Bank.

The process began with the old Washington Avenue Bridge. Old-timers will undoubtedly remember the bridge with a touch of nostalgia—a two-lane affair supported by huge, old timbers; the roadway was dotted with potholes that filled with muddy water in March and April; the walkway was windswept to the point that only Eskimos and native Minnesotans could survive the walk from East to West in January and gaping holes in the wood-plank sidewalk offered harrowing glimpses of the river below.

Eventually, the complaints of soggy pedestrians reached sympathetic ears. The splashes from the potholes were minimized by erecting plywood splashguards along the sidewalk. Some time later, concern for public safety and increased traffic flow led the highway department to design a new bridge. Somewhere along the line it was decided to put a pedestrian walkway above the bridge. After that changes accelerated: "Why not keep the rain off?"—so the walkway was covered; "Why not keep the wind out?"—so



the walkway was enclosed; "Why not make it light inside?"—so the enclosure was made of glass; "Why not have some ventilation in summer?"—so some of the glass slid open in huge panels; "Why not make it warm in winter?"—so it was heated. All this for the comfort of the pedestrians who used to complain that they were splashed by buses.

But then began the problem that is with us today: people began testing the strength of those expensive things that "kept out the wind and

let in the light." Hundreds of windows were smashed senselessly year after year and the cost of maintaining the bridge began to climb. Editorials failed to deter the vandals. The doors were locked after certain hours, but the vandals smashed windows to get inside the walkway.

Now, after many years of replacing glass with more glass, the planners have arrived at a new solution—replace glass with wood. The black panels on the bottom rows of windows are here to stay. This

spring, the broken windows will be replaced with specially treated plywood panels. The plywood costs less than glass (about \$40 per panel less); plywood is more resistant to breakage (the relatively fragile glass is  $\frac{1}{4}$  inch thick; the more durable plywood is  $\frac{5}{8}$  inches thick); the plywood panels will offer better insulation in winter; but they won't let in much light. For this reason, the upper windows will still be replaced with glass.

There are more than 1100 panes of glass in the walkway. If all the broken or missing panes were replaced with glass it would cost slightly more than \$12,000; replacing the lower panes with plywood will reduce the cost to about \$6000.

While replacing glass with wood helps solve one problem, it has led to another—the wood panels are being used as bulletin boards. At the beginning of March, two custodians and some rather elaborate cleaning equipment removed bulletins and placards from many of the panels, a seemingly never-ending process.

What lies ahead for the walkway? In light of the past, it's anyone's guess what might happen. Some have suggested putting shops or a bookstore on the walkway, but the highway department says the bridge wasn't designed to support such things. Perhaps a few more bulletin boards will spring up to take care of the notices that now end up on the windows.

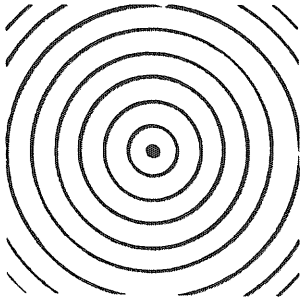
Meanwhile, the bazaar (or perhaps more accurately, bizarre) atmosphere offers a quaint, sometimes refreshing break in the monotonous walk between East and West. Where else can you hear Indian drums and bells and popular folk guitar at the same time? Where else does the pungent scent of incense mingle with the country-kitchen smell of hot chocolate? Where else can you find such an array of candles, leather bags and belts, rings and records, books and beads, wax-carved mushrooms, incense sticks, pottery and homegrown art? It's nice to sit and talk with friends and feel the warm sun through the windows on a brisk winter morning. But if some irresponsible people continue to break the windows, the next change demanded may be converting the walkway to a black plywood tunnel.



# What Can We Do For The Pane?

by Joe Campbell





## Straight from the Shoulder

Since this is the last **TECHNOLOG** for the school year, this will be our last opportunity to boldly venture forth and fearlessly speak out on the various vital questions of the day (including our own survival). Throughout the school year we have been painstakingly objective, fair, unbiased, and thoroughly impeccable in our editorial presentation. This essay will be no different, as we once again defy anyone to intelligently argue that **TECHNOLOG** presents a slanted or distorted editorial point of view. Many people have recently criticized the engineer. Our profession has been charged with social awareness, immorality, and groundless accusations. We would like to answer these charges and show that the engineer is indeed involved in many significant activities. Take for example, the case of the 1967 testing of a pipeline in Alaska. The media at that time charged the engineers with being "careless" in their procedures. But how many people considered that the manner that the engineer used to test the line for leaks (filling the pipes with water, allowing the water to freeze and crack the tire system) was in fact a successful attempt to preserve the ecology of the area? In this case, a handful of dedicated engineers held the big oil companies from further development of an entire region.

Of course the engineering student has also been under attack. Even though the attacks come from questionable sources, they will be easily answered here. How many people have stopped to notice the long lines of engineering students who are eager to actively participate in student organizations? You have no idea of the stacks of letters the **TECHNOLOG** has received for its **REVERB** page. You have no idea how actively involved the engineer is in his environment, his society, and the future. Everybody's future. You have no idea. Neither do we.



## Growing up is... the crushing of real life alternatives

by Robert Pirro

**D**r. Arthur Harkins, Professor of History and Philosophy Education and Director of The Center for Applied Social Science and the Future, spoke on Wednesday of Earth Week on the subject of future societies.

Dr. Harkins decried the current negativist view of the present and past. Our view today should be towards expanding the number of alternative futures for all men. The key here, he stressed, is not to deny, but to re-interpret the facts of the present. People should no longer look at the past as damning the present or limiting the future.

There is tremendous pressure today against an individual man designing his world of tomorrow. Dr. Harkins criticized the liberal intellectual community as not recognizing that they do not allow for individual participation in the design of personal life styles. Many

people have found themselves in decision-making processes which negate and eventually end any individual participation in the expanding of future alternatives for themselves and for all people. He said; "A lot of people have essentially, whether they know it or not, bought into and have been bought by the kinds of decision-making structures that essentially invalidate them as human beings. Invalidate them in the sense that the individual has not had . . . an opportunity to truly participate in expanding his own set of alternatives and the alternatives for his own people, his own planet."

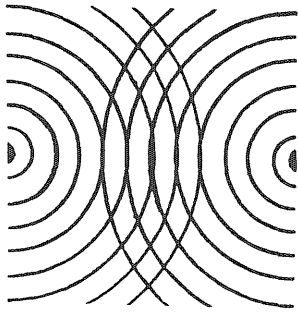
This crushing of alternatives was called by Harkins as "growing up." "To be mature," said Harkins, "is to be in a situation where ones real life alternatives are constricted rather than expanded."

Harkins then suggested a new de-

inition of power. According to the Professor, people who have opted into constricted systems are in effect becoming less and less powerful as time goes on. The old definition of power, one person or group to do the will of the first should be amended. The new definition of power should be this; that power exists to the extent that individuals and systems have the capacity to de-commit from a course of action and re-commit to something else. "To de-commit from war . . . a continuation of genocide . . . schools which do not teach or allow learning . . . from religious frameworks which constrict the concept of self and cause people to turn away from the here and now and focus on the afterlife . . . And to re-commit to a cleaned-up environment, . . . to a free planet where people can travel across borders that no longer exist as barriers . . . to controlled population, to adequate foodstuffs and housing."

In the models of the present there is an inability to convert desire to action. Harkins showed that "We cannot function to reach that alternative image within the present constraints of our situation. We cannot function because our actual set, our model of the situation, does not allow us to move." Private businesses and public utilities have become frozen or rigid in their ways of doing things. It was described as "the inability to convert informational input into rational or effective or more desired action, in short, to be locked in, or frozen, or rigid." This is particularly serious because these companies consume vast amounts of money and natural resources, to say nothing of the people involved. He suggested that men should work today to create a reference model, that is, a way of looking at the past and present world that has direct relevance to the future.

This is not meant to change the system but to change the awareness of the society to what the image of tomorrow should be to its individual members. "It is not to change the System; it is to change Ourselves. In this society, we must bring the perception we have of the real world, which includes ourselves, much more into line with our image of tomorrow."



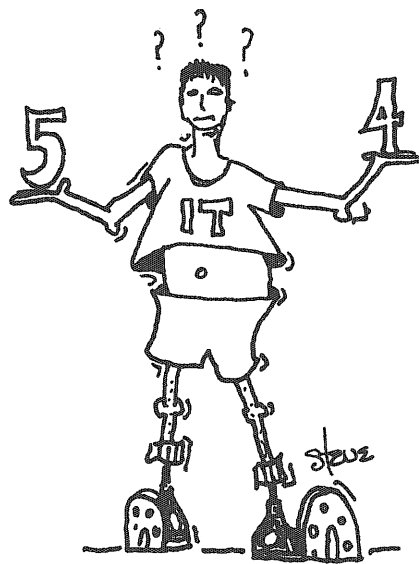
# To Take The 5<sup>th</sup>

Excellent. The March issue FORUM has put the finger on a very critical problem in engineering education. How does an engineering student gain the technical competence to successfully practice his profession in four short years, while at the same time gaining the experience and knowledge to hold his practice in perspective with the rest of society? Engineering is only one of many pursuits of man, albeit a most vital one. Arts, literature, music, and the social mesh are but a few of his needs beyond those provided by engineering talents.

We are finding it difficult to master even the basic skills in sciences of exponentially growing knowledge in four years, much less keep abreast of contemporary economics, social issues, political questions, and environmental consequences of technology in any detail. I believe that the basic engineering degree should be a five or even six year program, so that the recipient of that degree should be more than a technician with some theoretical background. He should have the professional standing and responsibility, of a medical doctor or attorney. He should exercise a moral independence from compromise for the dollar.

The new program should be solid in the basic sciences, perhaps even enriched from the current programs. A more difficult program will raise the par of the engineering profession. The difference is that it should be distributed over a 25 or 50 percent longer period of learning, and preceded by some trying sessions in humanistic obligations. Another difference would be the addition of courses and experiences to teach engineering types the important skills of interacting with other professions, of judging the consequences of engineering activities and of assessing the impact of proposed technology. We need "adversary" engineers who will question some of

the current directions of technology and expose its sometimes negative impact both on people and on the physical environment. I would propose a course that will really confront the engineer in training with the types of decisions he will be expected to make. The course should be early in the program, since it may prove to be a rather difficult encounter for many. Case studies should be made where the causes and effects of a new technological development are traced in both time directions from the release upon society. How do large compan-



ies actually utilize engineers? How are engineering decisions related to macroscopic arenas? What are the motivations in developing a new product or process? The questions are abundant, but the questioners are yet too few.

Roger A. Peterson  
Senior, Mechanical  
Engineering

*Amen*

I think the reaction to your article is absurd. In the first place, if it hadn't been for that glory-monger, Ted Graecen, the reaction might have been minimal. In the second place, your references to "acupuncture" and Chinese water torture are not uncommon in dramatizing for effect. In the third place, Graecen's remark, "You can't punish a person for having a personal feeling, but a magazine should be kept very pure.", is a lot of hogwash. Graecen's talking through his hat and is really the one who is responsible for the Chinese reaction.

I can understand how the Chinese-Americans might feel a little offended over such remarks as mentioned in your article, but the remarks by Miss Hohmann are definitely distorting the principles involved. She is using your article for her own self-satisfaction.

The entire matter has been deliberately blown out of proportion, which is to the credit of the *Minnesota Daily*. If you want to talk about prejudice, why don't you attack that paper for smearing you, *Technolog*, and the Board? In essence, the paper is taking advantage of its freedom to destroy yours.

No apology is needed by Mike Chase or *Technolog*. The apologies should come from Graecen, the Chinese-Americans, who have no real gripe, and the *Minnesota Daily*. They have distorted the entire picture, intended by the article.

I think that the editor, Reichenberger, should hold his ground, and that *Technolog* should reassert the claim that it is not responsible for the opinions of its writers.

You are being wronged and I would love to write an article in your defense.

Jack Groholski  
Senior, UMD

*This is an unsolicited letter from a former friend of Mike Chase.*



# THE MIDDLE MAN

"...the engineer will be shoved right into the interface between technology, economics, and politics."

by Dean Richard Swalin

Historically, engineering has passed through two periods and is now entering a third important period. The first period (covering the years up to World War II) was the craft period. Technology moved somewhat slowly, the scientific aspects of engineering were relatively unimportant, and the practice of engineering was founded more on specific knowledge than on broadly based principles. In many ways engineering was more of an art or craft than a science.

The second period (covering the years 1945 to about the present time) saw a tremendous influx of scientific knowledge into engineering. New devices and approaches were developed at an exponential rate. Many, if not most, of these developments were based on scientific principles and could not have been developed without sophisticated scientific input. During this period scientists and engineers became working partners for technological progress. This was a revolutionary departure from prior practice. In

fact, many older engineers who were educated prior to 1939 still shake their heads in bewilderment due to the rapid movement of events after World War II.

The third period (which we are just entering) is apt to be as revolutionary as the second. This period will probably encompass the characteristics of the second period but will require a great deal more breadth. The computer will become dominant as a working design tool. It is actually rather easy to envisage many aspects of this new age. All we have to do is to examine some of the fundamental problems which face societies. Among the needs, which we may think of are:

- development of an adequate medical care delivery system
- development of an adequate urban environment with minimization of pollution and with an adequate transportation system
- information handling in a complex society
- developing processes for meeting energy requirements of the world without consumption of all of our natural resources and with protection of environments

Many of these problems have existed for some time. The new factor, however, is for the first time the average citizen appears to want the problems solved and believe that they can be solved.

It seems obvious that engineers should play an important role in the solution of these problems. If this occurs, the engineer will be shoved right into the interface between technology, economics, and politics. A little speculation will indicate that extremely exciting careers await individuals who have adequate breadth and intelligence. Generally speaking, the engineer who will function best in such an environment will not have narrow specialties but will be involved in design in the broadest sense. To quote J. Herbert Hollomon, "The educated engineer will have to understand modern science, the use of research, the nature of society and its industrial, political, legal and economic institutions, while he learns to conceive, build and design useful systems to meet the needs of the time."

The engineer will increasingly become an interpreter between the two worlds of science and humanities. If this is to occur, the proper education must be provided to the proper type of students. New career approaches must develop. At present, engineering students, in order to advance past a certain point in an organization, often must move into a management position. In the future, if these broad problems in the public sector are to be attacked, an alternative to the traditional management route should be created. Professor C. L. Miller of M.I.T. has discussed the need for "master designers" which fit this need. The master designer will be concerned with generating design concepts and with deciding among significant alternatives for broadly defined problems. He will work directly with highly responsive design systems based on large-scale information systems. Professor Miller suggests that the engineering design process be formalized and organized into a highly sophisticated strategy for the optimum use of man and machine.

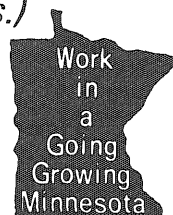
Continued on page 31



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## Earth Week

The engineer is in a key position in the fight to save the environment. By raising the engineering consciousness to examine the long range impact of applied technology, future products can be designed that won't be harmful to either man or nature. As Dr. A. Fredrickson (Prof., ChemE) said, "We need a technology that recognizes environmental constraints . . . not a 'space ship earth' where man controls nature . . . but a world in which man recognizes his relation to natural processes and other biological processes." Preservation rather than control. "We need a better understanding of the interdependence of organisms on each other and the organic and geological processes that naturally renew the earth without man," said Dr. Fredrickson.

"Our environmental problems are too important to be left to the experts," advocates Dr. W. Zimmerman (Prof. Physics). "We need better disclosure laws of what products really are. The consumer is in the dark about what's really in many commercial products." Dr. Zimmerman is currently developing a class in basic physics of environmental problems that will give the ecologically-minded consumer the science to get involved in "watch-dogging" pollution, which involves the ultimate disuse of such products as phosphates, cans, and non-biodegradable plastics, and preventing the development of the new products potentially dangerous to the environment. "The cooperate engineer must look beyond cooperate



interests and take into account the long range effects of products on the environment."

A starting point is to educate the I.T. student to be ecologically minded in his role, as well as making him aware of how legislation involving the use of technology is made. ■

## A New Approach

A growing concern for the quality of the environment has created a demand for an engineering program which prepares students for dealing with a range of environmental problems. Now the University of Michigan offers an undergraduate program specifically designed for students interested in dealing with environmental problems.

Dr. Jonathan Bulkley, assistant professor of Civil and Water Resources Engineering at the University of Michigan, outlined the program to a small group of students during Earth Week.

The program was created, said Bulkley, because of the "rigidity of other engineering programs." In the past, an engineering students' background in environmental sciences has been "very narrow," he added. As an advisor in the program, Bulkley urges engineering students at the University of Michigan to take courses in the school of natural resources.

Another aim, he said, is to get the student involved in ongoing local issues and expose them to public processes of action. As an "advocate participant" a student is en-

couraged to intervene and give ideas to engineering management.

The environmental program includes courses in biology, atmospheric and ocean sciences, geology, thermodynamics and others. These courses provide a base for a specialized program option. The program, decided on in advance with an advisor, consists of a series of courses designed to develop a degree of proficiency in an area of the environmental sciences, life sciences or social sciences.

"What we are looking for is an advanced level of capability in one area," said Bulkley.

Students can choose from a variety of program options. They might include environmental chemistry, waste management, land management, urban environmental problems and others.

Before entering the program, a student must provide a "statement of intent." This is to indicate that the student has given the matter careful thought. It also services as a method of gaining feedback and shows how the intentions of the program creators measure up to the actual ideas of the students.

"One reason that was brought up for not implementing the program," said Bulkley, "was that there was no guarantee about jobs." This situation has changed, he added.

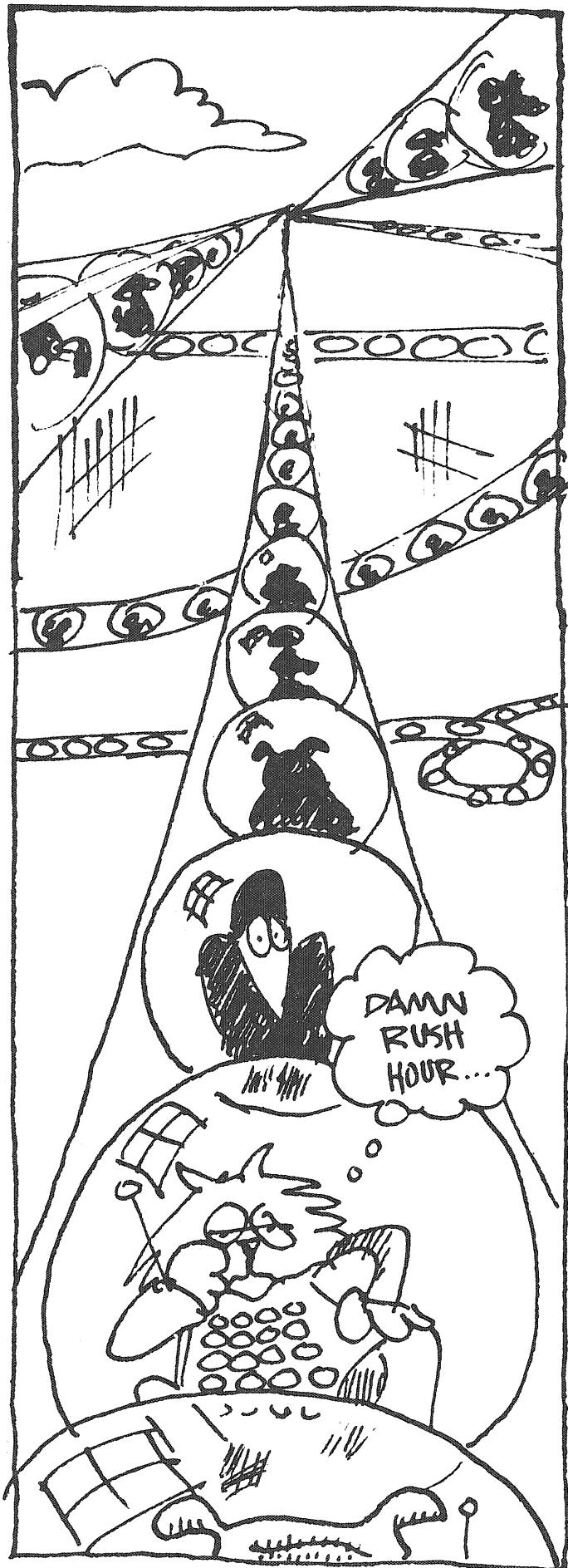
Jobs for environmental engineers are now available with companies such as:

Ebasco Service Inc.  
Mitre Company  
Gibbs and Hill Inc.  
American Electrical Power Service Corp.  
U.S. Atomic Energy Commission  
Bureau of Land Management  
and more

Under a mutual cooperation program, a University of Minnesota engineering student can spend one year studying at the University of Michigan. The environmental courses are also designed to enable a student to combine them with another major course of study in engineering.

Inquiries on engineering and transferring from another college should be addressed to:

Assistant Dean  
College of Engineering  
University of Michigan  
Ann Arbor, Mich. 48104 ■



# To Search for Tomorrow

**"Yes, Virginia, there is a way to avoid future shock, ecological disaster, thermonuclear suicide and acne . . ."**

by Frank E. Stodolka

It is easy to be negative about the future. The unimaginative extrapolation of raw materials and energy consumption can point to disaster. Increased power demands are leading to the depletion of our mineral reserves. Pollution from thermal and thermonuclear wastes may endanger our very existence. These and many other factors can motivate people to extreme frustration and a wish to tightly regulate industry and utilities.

These negative feelings all assume one fact to remain constant; that the way raw materials are extracted and consumed will indefinitely remain the same. The fact is that by rigorously testing a broad



range of alternatives to our present culture's way of life we can shape the use of technology to positively serve our future way of life. To think positively and open-mindedly about a future for everyone is the key to solving the dilemma surrounding our present national priorities. By showing that a broad range of alternative futures are possible is the best hope for approaching tomorrow in a constructive manner.

To explore some alternative futures, let me construct two future scenes which will present possible solutions to the problems of tomorrow. In conjunction with mathematical extrapolations, computer simulations, delphic probes, econometric input-output analysis, and other tools of the futuristic trade, the scene can present some fascinatingly realistic projections about the future.

#### SCENARIO I\*\* THE COMMUNIVERSITY

It took some persistent pounding at the door, but I finally got the attention of the old bloke who was next on my sample list. When he came to door I gave him the standard line for the survey; "Good morning, I'm John Lund Smith, student from Cramalot University. We're doing a survey on crime control in this neighborhood to test the effectiveness of our school-park-welfare program. Do you have a few minutes to answer some questions?"

"Why of course. You're only the third student I've seen from Cramalot today. Come on in and have some coffee, young man."

I thought he was joking but in an effort to establish a rapport I accepted his invitation. He motioned for me to sit down after he poured me some coffee from what must have been a ten gallon urn in his living room.

"By the way, I'm James Stark. I'm 97 years old, which is the average age around here, and I'm a neighborhood city planner—professional class I—by occupation."

"Well that answers my first three questions. How long have you lived in this neighborhood?"

"About 20 years. We moved here shortly after I graduated with my second PhD in public affairs."

"You say 'we'? How many other people live in your household?"

"Oh, about a dozen, give or take a few. Every so many years someone leaves or joins, I can't keep track." "Sounds like you've got a good commune going. Tell me, are you aware of or have you been a victim of any crime which occurred in the last three years around this neighborhood?"

"Not really, sonny. Like I was telling this other young fellow from Cramalot earlier today, since the federal government dropped the idea of purely physical renewal for cities and began focusing on social renewal . . ."

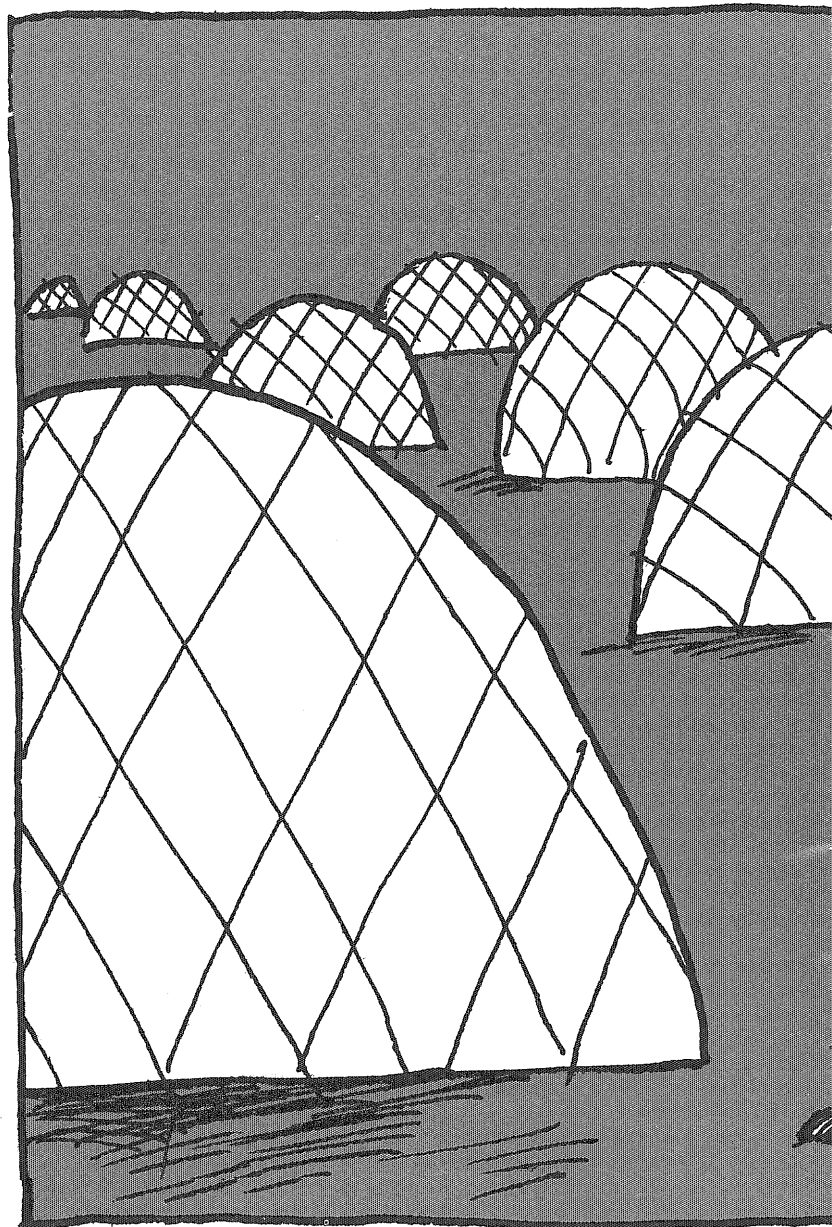
"Yes, I realize that, sir. My own study relates to a typical total involvement organization which works with both parents and children on an almost 24 hour a day basis, providing a unified program of job retraining, health care, and . . ."

"Don't they ever teach you young fellows from Cramalot any manners? Like I was saying to that other young fellow, by focusing on social renewal we have regained control of the streets of our cities.

Granted, that renewal of our decaying institutions was necessary in order to encourage the young to stay in the city rather than leaving for the suburbs like previous generations, but only by providing for gradual increases in urban density by using new technologies could we fulfill the modern city's promise of diversity and excitement without destroying neighborhoods at the same time."

"I don't understand. We seem to be talking about the same thing."

"Renewal of organizations is only a part of the picture. Renewed higher educational systems have reopened employment opportunities within the city so that students who are job-climbing don't have to move to the suburbs to find a better job. A much greater emphasis on long range planning has assured enough subsidized and unsubsidized housing for both students and business. Lastly, only an adequate mixture of housing types and ages which were built up over several years could meet the needs of the more affluent students. Some wish to start their own procreation groups, and eventually step into something



like . . . well . . . this!", as he gestured grandly at the spacious sunken living room around us. Then I noticed that besides the communal coffee urn there was an expensive looking holographic transceiver-recorder set in the middle of the room. At one end of the reclining oval there was a control panel with enough buttons and dials to keep any space shuttle captain happy.

James reached behind him and slid out a smaller remote version of the main control panel, "Simple little gadget here, even a young fellow like you . . . oh, hold it! Here comes the queen! Sound the trumpets!" As he spoke his fingers flew on the buttons.

A rousing chorus of drums filled the air and this marvelous young blonde stepped radiantly into the living room as a crescendo of horns from "Thus Spoke Zarathustra" rose to greet her. The music subsided but not my heart. She couldn't have been more than 23 and curved as daintily as a porcelain figurine. After she poured a cup of coffee from the urn, she turned to greet us.

"Cloris, this is uh . . . I mean—John, another stu-

dent from Cramalot."

"Hi, John. Have a cup of coffee? Oh, I see you already have some. I suppose old Uncle Jim has been burning your ears with his city planning stuff, huh?"

"Well, I guess a man his age has a right to be proud." Jim winced slightly at that. "After all, living alone on my salary I could never afford an expensive place like this—to say nothing of feeding and clothing a beautiful young woman like you."

"Why thank you John," she said smiling pettily, "but I'm 38 and I pay my share of the expenses just like everyone else."

"Yeah," Jim said as he wrapped his arms around her, "and in our place its 'share and share alike.'"

"Of course, those anti-senescence drugs are marvelous for maintaining vitality. Why since I've started taking my injections . . ."

"By the way, my little Cloris," Jim interrupted, "how have your injections been lately?"

"Why fine, as you very well know, you dirty old man. Now lets show John the rest of the place before he calls the morals squad."

"Morals squad?" I inquired. "You mean we still have such things?"

"Well . . ."

"Show me the rest of your place. I'm fascinated." So they did. I was intrigued by the communal computer terminal where they shared programs and program problems and the huge library of recorded books, three-dimensional movies, and music. Their kitchen was a marvel of ecologic simplicity with an automatic waste recycler that ejected pre-sorted pellets of materials for the city pick-up. The food preparations were tied in with the computer, and they were almost automatic.

But what impressed me the most happened just as I was about to leave. When I started for the front door, a half-dozen students showed up for a class in planning. I voiced my surprise to James.

"Didn't I mention them?" he said. "I'm sorry. My associates and I in I.S., (Interface Systems) teach a complete system planning curricula, accredited with the AIP. We're pretty well recognized nationally. You know a youngster with your background in organization research might benefit from some of our courses. By the way, how old are you?"

"65."

"Yeah, I thought so. But think about it anyway. Well, you're leaving, right? Any preference in transportation?"

"No, not at all. I'll be heading back to the nearest campus."

"Cloris, dial John a PRT for the Einstein campus. You can ride on through to wherever else you might want to go from there."

"By the way, how did you know I just rode the PRT? I could have come via a leased electric car?"

"A student as impoverished as you? Come, your ride will be by any minute. Nice talking to you."

He was right. There is not much you can afford on \$15,000 a year.

I did a lot of thinking on the way back to my apartment. The U.S. had made a lot of progress since I



first went to school, (and not every kid's parents were wise enough to choose one of the more liberal schools). But despite the fact that our population was stable, some of the developing nations were still overpopulated. And the urban blight that had started in the core cities had made inroads on quite a few suburbs. Perhaps institutional renewal wasn't the only answer. Heaven knows some of the old renewal programs sponsored by HUD seemed to be successful.

That angle deserves to be checked out. Why isn't it part of my curriculum? My counselor never recommended it. Come to think of it, that must have been a poor research design we worked out in class since we sampled James Stark more than once in the survey. I think I'll cancel, get my refund back, and turn in my grade to the instructor and the counselor. That will be formality, of course. By canceling out we all received automatic incompletes. I couldn't flunk them, they couldn't flunk me.

Then I remembered. I never did complete that survey questionnaire for Mr. Stark. I think I'll go back and do my bit to reduce the generation gap. Who

knows? I might even be able to bridge the gap with Cloris.

The Second Scene describes a world more than one hundred years into the future. It is a world where the population has at last stabilized. Some national populations have even declined so that better standards of living could be realized by reducing international demands on capital goods, raw materials, and services. Population control was vital because biological and genetic sciences had almost doubled life spans. Genetic control was expanding human intelligence as well. Of course, good breeding and a superior physical environment do not always assure satisfaction in life.

## SCENE II THE COMPLEX.

"Well, if you're so smart why don't you figure it out?"

"I know this sounds futile, Hal, but I can't do it myself."

"But Bob, I grew up with you. You're my best friend! We've played together on the escalators and slide walks of the Complex when I was four. You're the best chess opponent this side of the World Data Bank and when I needed help you were always there with good advice."

"But **only** advice. Hal, I could run a matrix analysis of the interest profiles of every professional in the world who might be qualified for working on this problem. We could then convene a conference to discuss it or, if you want, or maybe a quick career trajectory analysis might reveal potential for these men to form *ad hoc* temporary organization . . ."

"But if our synopsis of the data available is correct, it would take too long to reach a consensus and it will be a long time before another opportunity to start comes along."

"Face it, Hal, you're the leading expert in negotiating this kind of economic problem."

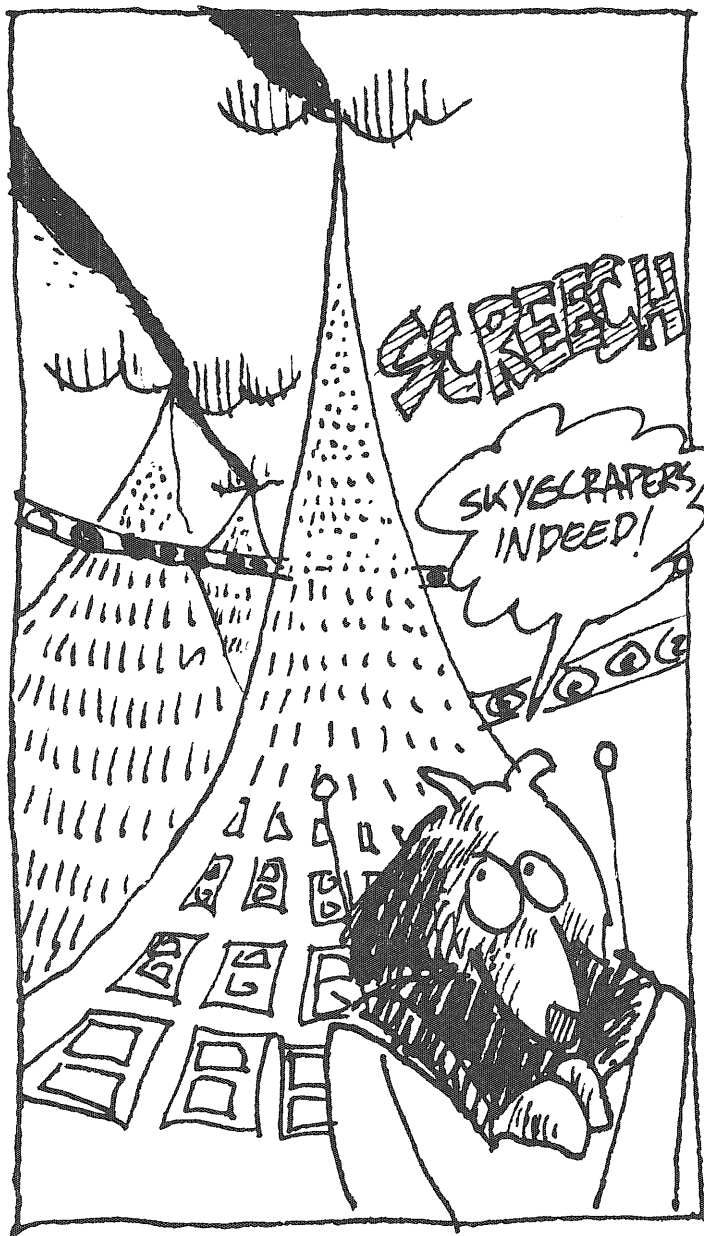
"Yes, but without your help I couldn't have done the right things. It was the two of us who developed and tested those simulations of world population shifts for the first proposed international Gravity Vacuum subways. And our economic analysis of construction costs using pulsed fusion tunnelling devices were right on the button too."

"But we're not talking about moving people or commerce through tunnels. We're talking about tunnelling to move oceans! The ecology of the Complex here is a toy in comparison."

"Look," Hal said as he switched a panel to transparency, "hundreds of thousands of people living and working in a few cubic miles of space. Every by-product of every industry is recycled by a transportation and conduct system into other industries. Liquid wastes, solid wastes, even heat and other radiations are redistributed cheaply. High density megastructures reduce the most of moving materials at the same time that it increases the diversity of industries and people that can have access to them."

"Yes, I agree. Its beautiful. Level on level of streets and parks protected under a blue geodesic sky that clouds but never rains."

A long hush filled the room as they watched the quiet flow of people moving up and down onescala-





tors and elevators. Some of those elevators reached straight down to the ocean floor far below to carry international trade from submarines and vacuum transports. And raw materials mined from the sea, as well as agricultural goods from floating farms, were carried on monorails weaving between streets of shifting lights and color.

Finally Hal spoke up, "By golly, Robert, you must have an answer in that old black box of yours somewhere . . ."

"No, I'm afraid you're over-estimating me, again. You're the one with the imagination. You're the one with the flair for working with people, bringing together new ideas, and inspiring hard work and sacrifice in others. Sure, I'm willing to help you get this initial study going. And there are still those experts that we can run a quick delphic probe on to check for anything you may miss. But ultimately you're the one who must solve the problem. Not only is it your responsibility but it is your challenge as a leader and a man."

"Yes, I guess that does put you at a disadvantage, doesn't it?" "You see, Hal, while we're alike in many ways, I tend to think in a logical linear fashion and you in quantum leaps. No matter how brilliant any concept I originate may seem to you and others at first, there will always come a time when you will look at it even as you look at the Complex out there. Look again at the wonder of the Complex. See the elegance of its architecture that has evolved as the the modulars have changed functions or been replaced. The complex started out as an international effort to mine and harvest the sea at a time when the world's population was still expanding. Huge quantities of raw materials were being squandered to sustain those populations because cities were sprawled into suburbs and exurbs. People isolated spatially as well as socially and legally felt the world falling apart around them because they themselves were consuming the resources vital to sustaining that world.

"As history has seen changes in man's attitude toward the city so also has it seen changes in the function of the Complex. Now we also bank and trade, translate and research for the many nations. Men are proud of this city because they designed it, built it, and changed it as only truly inspired men could over a span of decades."

"I see what you mean. We can't blame machines like the computer for our problems the way we blamed the automobile in the old days."

"And soon you'll blame the weathermen, too?"

"Perhaps sooner than many would expect, Bob, Your logic on the Complex has gotten to me. Lets set up a theoretical model integrating meteorological variables aggregated by the degree of diversity occurring in various political states and . . ." he paused and looked deeply into Robert's spinning prismatic eyes.

"You know, it just occurred to me, what a beautiful rainbow universe you must see in there underneath all those photocells and magnetic bubbles, Robert."

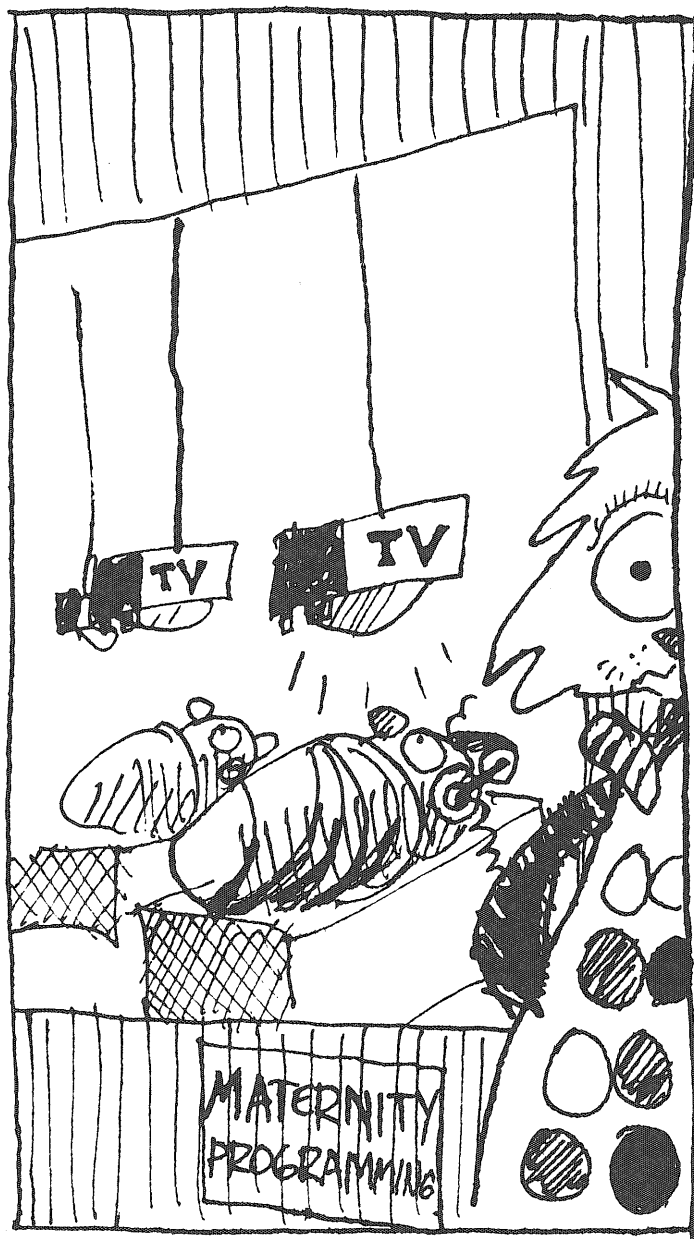
"It's only beautiful because you've made it that way, man."

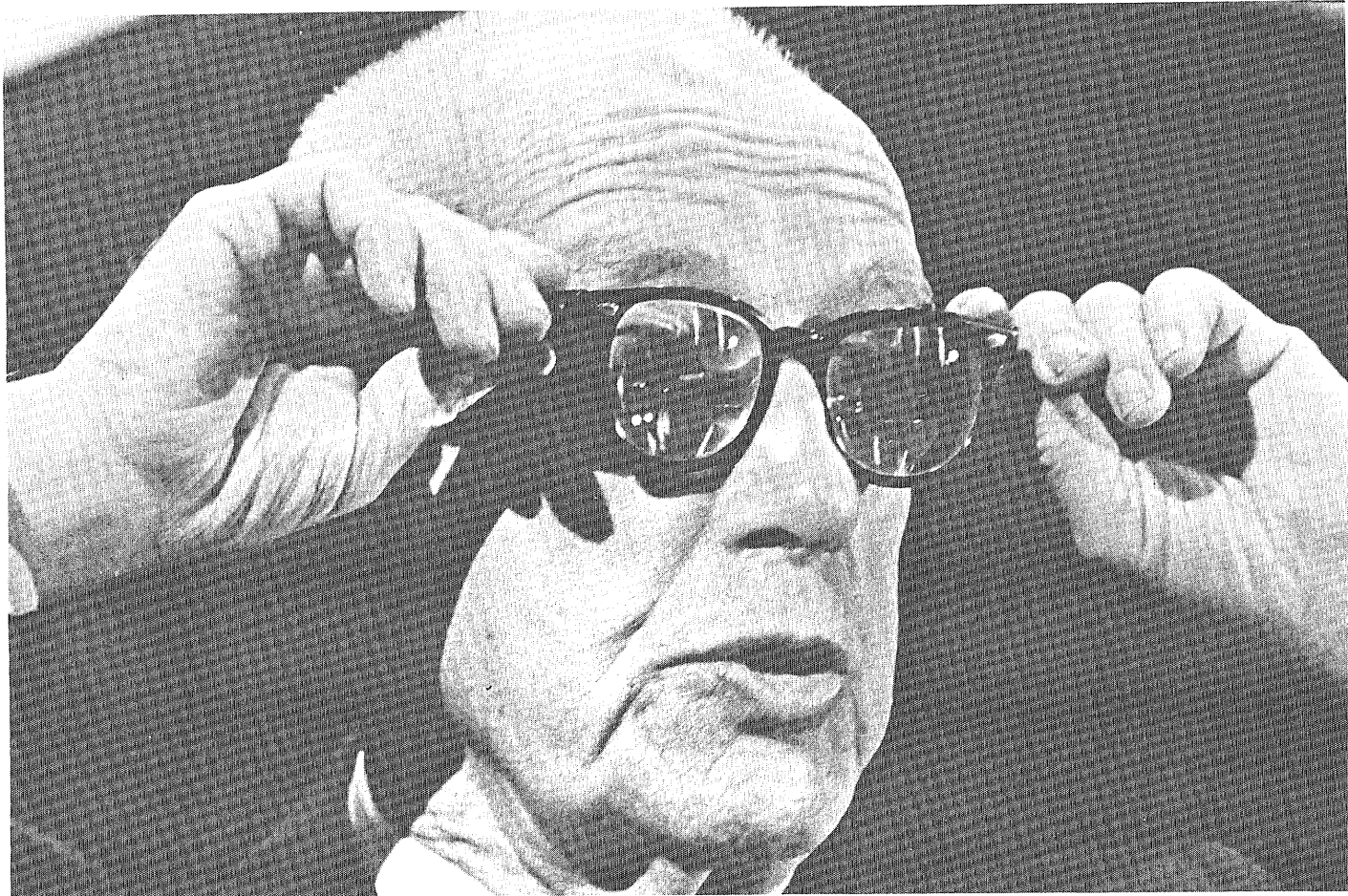
"Thanks, pal."

## CONCLUSION

I do not promise that either of the scenes outlined here will be seen as even vaguely near perfection, if they are ever attained by mankind. However, further elaboration of these model futures may change an abstract interest in exploring alternative futures into a commitment, not just to any one future but to the common ideals discovered in the process of exploration.

A person teleported through time and space from the depths of America's Depression in the 1930's would be awed by both our social and our technological advances. To that person the United States might be a dream come true through Social Security, the HA, and Medicare. In many respects we are his dreams and visions come true. Now new insights, both of the social and the physical universes are developing as the pace of change accelerates. And as our lives grow more and more different we must seek out new visions to replace those we have outgrown. We may in this way discover our humanity, our hope, and our faith in tomorrow. ■





# I'm the only one who minds everybody's business

by John Hollenhorst

*Synergy: The behavior of whole systems unpredicted by the behavior of their parts.*

"Some men think a lever is a very simple thing. Just a crowbar. But a crowbar is not a lever all by itself. There must be a fulcrum. There must be a load. We must consider the distance between the fulcrum and the load. Knowing all these individual parts we must still learn the beautiful mathematical principle which relates them. Then we can use it to do things man could never do before. A man weighing 200 pounds can lift a ton."

In his Earth Week keynote speech, Dr. R. Buckminster Fuller used this simple lesson in mechanics to introduce his audience to the concept of "synergy". Fuller believes

that we must learn the lesson of the lever if man and his world are to survive. Particular details of the universe don't necessarily tell us much about the universe as a whole. Only groping for and understanding the fundamental principles of the universe can man discover what his role in the universe should be.

Dr. Fuller, a world-famous architect, mathematician, philosopher, and social commentator, told an overflow audience at Coffman Memorial Union that time is running short for man to make this adjustment in his thinking. He said that man has historically attempted to solve his problems with local or short-term remedies which in time, often conflict with each other. "All the great self-remedies have to go

within the next five years if we are going to make it in the future," Fuller said.

"I decided about 46 years ago to peel off from society and try to get a distant look at it." Fuller claimed that one of the results of his new perspective was a belief that "evolution is trying to make man a success on the planet, despite himself."

"Man is the most complex organism in the universe," Fuller explained, "recognizing this, it seems obvious that we have some very important functions to fulfill." Even the relatively simple bumblebee has a very important role to play, although it is totally unaware of it. In its search for food, it unwittingly pollinates much of the world's plant life. The plants, in turn,

"allow us to take advantage of the nearest filling station, supplying us with energy from 93 million miles away." Man's role in this scheme still isn't fully known, Fuller says. "Right now we're just bumblebeeing around, sometimes doing the right thing for the wrong reason—but just as often doing the wrong thing."

About 1500 people gathered on Sunday, April 30th to hear Dr. Fuller's remarks. In fact, so many turned out that several hundred persons were forced to listen to the address over loudspeakers set up in the lounges and on the front steps of the building.

Earth Week organizers had constructed a five foot high replica of Fuller's most famous creation, the geodesic dome, which appeared to be lushly upholstered on its inside surface. Its presence on the stage led many in the audience to speculate that Fuller might sit in it to deliver his address. Instead, he sat on the edge of the stage in front of the dome.

The greatest obstacle to man's chances of arriving at a synergetic view of his universe, Fuller said, is man's traditional preoccupation with specialization. "All extinct species have one thing in common. They were all overspecialized. They became unprepared for new events and circumstances." Similarly, men become locked into established ways of looking at the things around them.

"Everybody is assuming that specialization is logical, desirable and inevitable," Dr. Fuller continued. "Yet children are born with an interest in the whole. They ask embarrassingly good questions trying to relate the microcosm to the macrocosm. They are really very synergetic. The human mind is naturally comprehensive."

But social institutions have tended to force men into individual compartments with the mistaken notion that security and efficiency will result. Fuller told a parable about a king who divides responsibility among his dukes so that all will efficiently serve him but none will be powerful enough alone to challenge him. The king tells them, "You mind your business—and you mind yours. I'm the only one who minds everybody's business. Is that good

and clear?"

Fuller touched off a burst of laughter and applause when he updated the parable to a university situation. An administrator tells a professor, "I'm going to grant you tenure. I want you to just lay eggs. Never mind what I do with them."

The appreciative audience listened to Dr. Fuller for well over an hour and a half and gave him a standing ovation at the conclusion. One member of the audience was less than enthusiastic, however. Dyolf E. (or E. Floyd), a member of the University protest establishment, interrupted the proceedings by shouting obscenities and unfurling a sign referring to Fuller as a "techno-fascist." As several audience members dragged him out of the ballroom, Floyd screamed. "Do you people think you're listening to God? There are a bunch of people outside listening to a voice out of nowhere like it belongs to God. This is like a goddamn Billy Graham crusade. It's disgraceful. He's just a techno-fascist propagandist. What a bunch of shit."

When it was clear that the rest of the audience wanted Fuller to continue, the architect launched into a criticism of the power structure which he feels has alienated students like Floyd. "The nations of the world spend 200 billion dollars per year to invent ways of killing. That's why this boy feels so desperate. What can you do about a power structure that invests those kinds of resources in death while people are starving?"

If we used our resources properly, by 1985 we could raise the standard of living to its highest level in history all over the world, Fuller said. But he also said he was sorry, that some felt compelled to use strong-arm tactics in the question of proper resource usage. If we're ever going to do it, we'll do it with our brains and not by shouting. Shouting is part of the power game because it is the first stage of power. You're simply trying to usurp the power that someone else holds.

Not only are our resources put to improper uses, Fuller feels, but many of them are simply wasted. "The overall efficiency of our technology today is about four per cent." That figure means that 96 per cent of the energy we consume

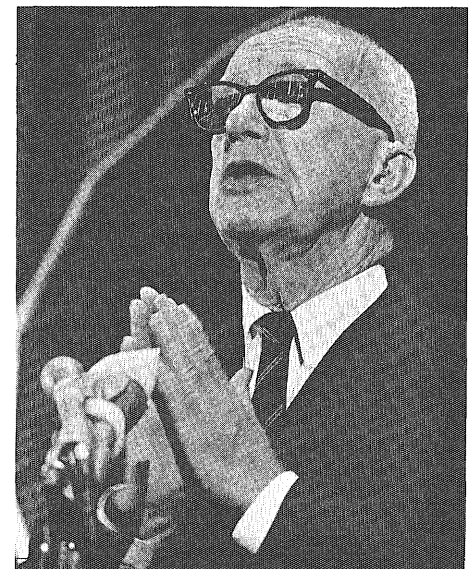
is wasted, Fuller explained. He gave as a minor but startling example the observation that "at any given moment there are about two million cars standing in front of red lights with their engines going."

By increasing our efficiency in the use of resources by just a few percentage points, we could vastly improve the standard of living of the entire world, according to Dr. Fuller. Such a development might free man from the curse of specialization. Our society would then easily be able to support those who don't care to materially contribute to it.

"Specialization means that we are forced to justify our existence," Fuller told his listeners. "We have to 'earn a living'!" When a man reaches a certain age, we tell him he must go to work. "It would be better to say, 'Why don't you go fishing?' It's a great way to do some thinking."

If our society and technology were performing at a reasonable efficiency, Fuller argued, we could easily afford to support non-workers. "They wouldn't be on relief," he said. "We would have won the right to support them."

"If we can go back to think about what we were thinking about before someone told us we had to 'earn a living', we can begin to get back on the main track of the universe," Fuller concluded. "We need to do it and we can afford to do it. The essence of whether or not we make it as a species is whether or not man is qualified—whether or not he has the integrity to make it." ■





# D-Day for Design

**"Design is  
much too  
important to be  
left to  
designers."**



by Brian Johnson

Designers are the people who decide what the 1973 cars will look like, whether the next stereo amplifier will be one hundred or three hundred watts, and whether "hot pants" or "maxies" will be in next year. These imaginative gods, whose job it is to shape everything we purchase, are responsible for a great deal of the environmental pollution, ecological mismanagement, and the general lack of direction of all the values in the world today." This is according to Dr. Victor Papanek, Dean of the department of design, California Institute of the Arts.

In his discussion given on Thursday of Earth Week, Dr. Papanek said that the design field has managed to use up our natural resources (including the working time of people), to over-package products, to force obsolescence, to over-gadgetize, and with the help of advertizers,

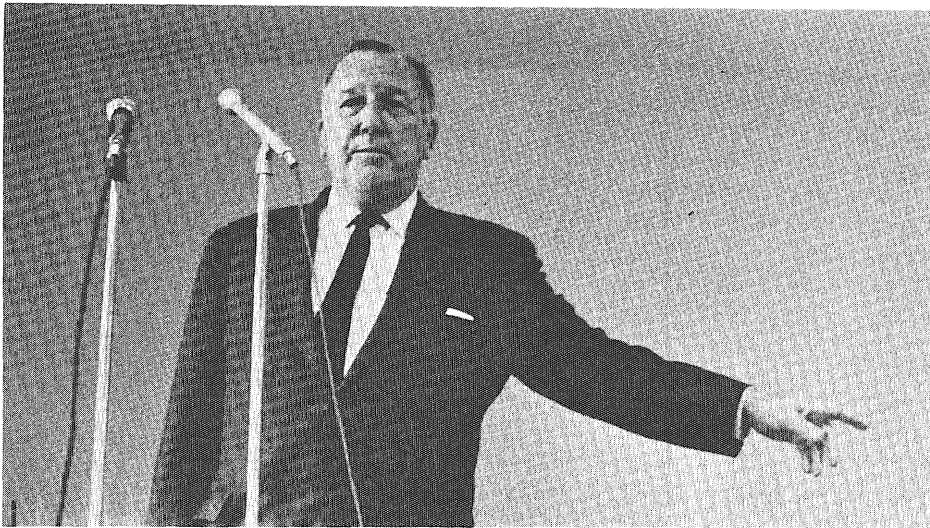
to oversell products that people don't really need, and to put murder on a mass production basis.

Our friendly neighborhood designers don't stop with waste and destruction, however. Because the design field molds ideas for white, upper middle class males, who are six feet tall and one hundred sixty five pounds, designers manage to completely exclude 60 to 70% of the U.S. population and 95% of the world population. This forgotten majority includes the poor, the blacks, the chicanos, women, and children. People with special needs such as doctors, farmers, the handicapped, the sick, and students, are also forgotten.

What can be done to change the design field? Papanek says that we as consumers can help by demanding that design be more relevant to our needs. However, he

went on to say that the fight for efficiency, durability, simplicity, and design that serves the needs of the people, lies mostly with the designers themselves. "Designers should be advocates of the people," according to Dr. Papanek. To serve their constituency, designers should thoroughly market test their products for quality and usefulness. The design field should set a precedent by molding products to the people who are going to use them, according to size and need. Dr. Papanek's final suggestion for designers was to develop a cross disciplinary team for the development of new products. One of the members of a design team should be a potential user of the product.

"Design is much too important to be left to designers," the consumer must have a hand in it too.



# Ecolibrium

by Terri Nye

"My mother, a Scotsman, was the great woman who introduced me to the problems of waste," said Professor Athelstan Spilhaus. A meteorologist, oceanographer and inventor of the bathythermograph (an instrument used to record the temperature of sea and fresh water as a function of depth), Spilhaus spoke on his concept "ecolibrium" on Thursday of Earth Week in Coffman Junior Ballroom.

"Ecolibrium" is the necessary balance between ecology (environment) and economy; stewardship of home on earth with view of productiveness," he explained. He stressed that we can't have a clean environment without food and shelter.

"Waste, a major concern, is stuff in the wrong place or material that we haven't had the wit to use," he continued. As chairman of the first Commission on Pollution in 1958, Spilhaus was a forerunner of the environmental movement.

"You can't dispose of anything," he stressed. "You have to remember, in no way minimizing the magnitude of the job, that we live in a healthier and cleaner society than ever was. Our failure to control our own numbers constitutes a pollution in itself," he added.

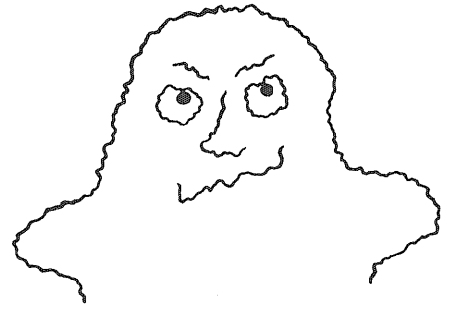
Population control is another of Spilhaus' major concerns. "Anything that involves excess negatively affects human living," he said. In the future he foresees voluntary migration from the larger cities

and immigration rules within cities and states. Population limitation is, in his opinion, politically difficult. We have the means to control population growth, he emphasized, but we are always held back by people and institutions. "You must design the off switch before turning on the on switch," he asserts.

"Nuclear energy," said Spilhaus, "is probably the safest power we have on earth." The problem is not the radiation given off by reactor plants nor the danger of reactor explosions, but the disposal of high level wastes. We could solve this problem by concentrating the wastes four times as much as they do now and shoot all the U.S. high energy waste into orbit and then into the sun. "This would be the real and practical result of the space program," said Spilhaus.

Another practical program Spilhaus desires is for people to view food, air and water as commodities. They are no longer free, he said. "Clean environment is not a political gift as some politicians would have you believe," he added. "When prices are kept down on things such as food," he said, "everybody wastes."

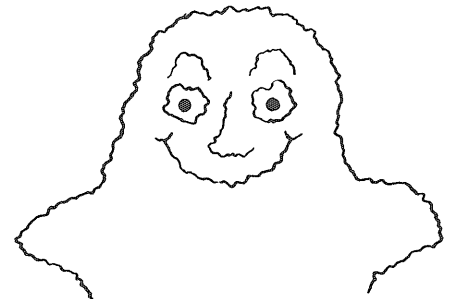
When solving environmental problems, "human wants must be considered," said Spilhaus. Under his concept of "ecolibrium" the "needs of mobility and of being alone to contemplate" must be met.



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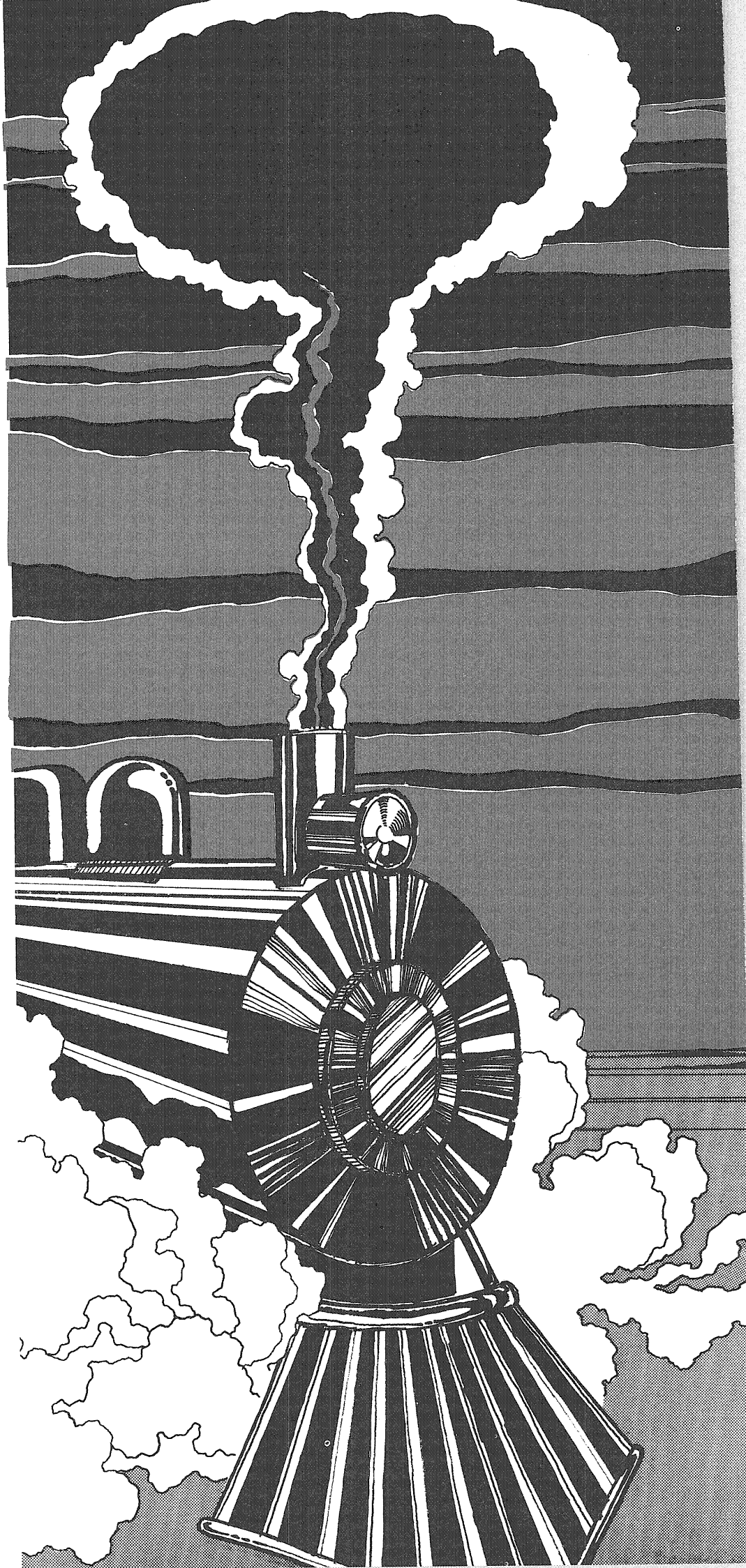
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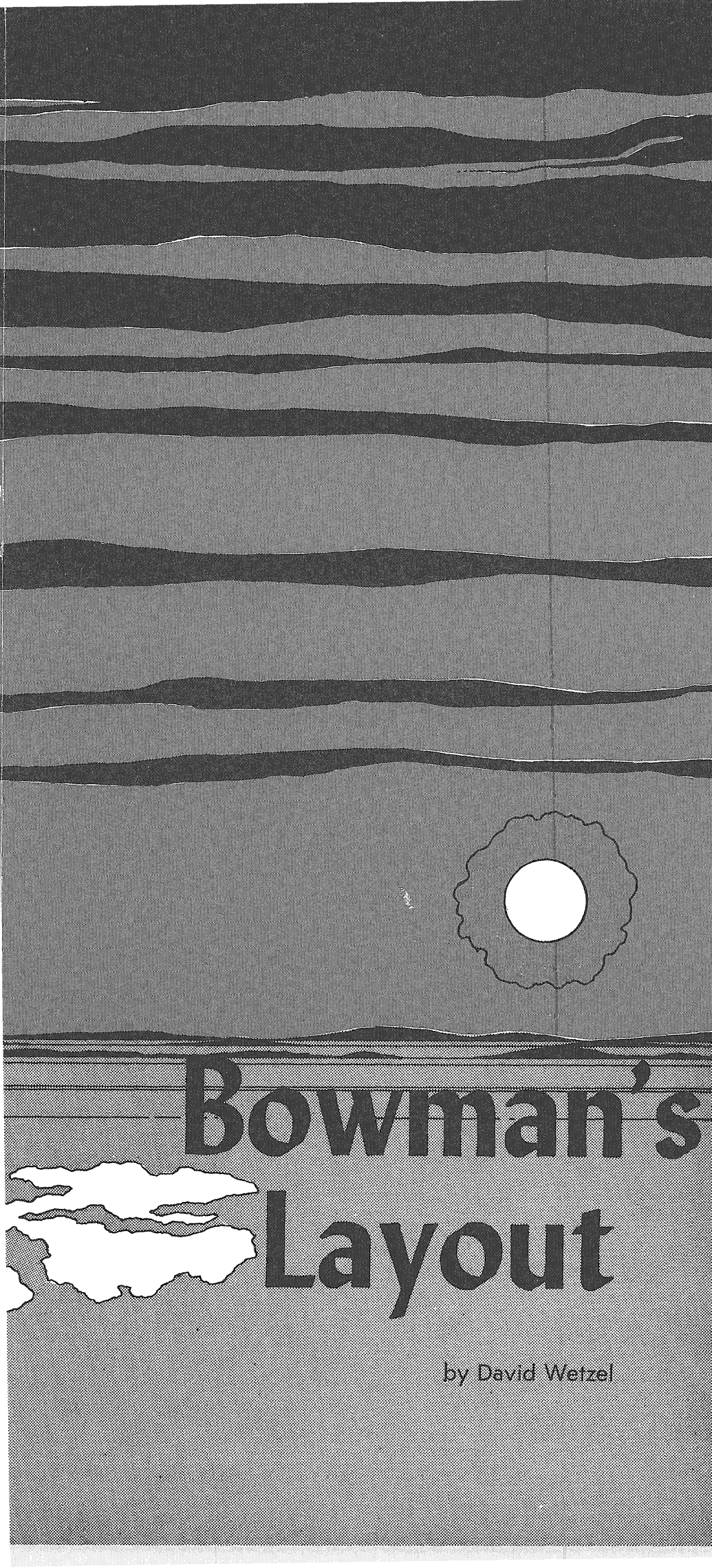
No question about it, Ben Bowman was a great artist and craftsman, but he was no less a scientist—a geographer, to be exact—a businessman, an engineer, a landscaper, and an empire builder. They will be writing biographies of him for years to come. And they will come to me, most likely, because I knew him best. For 40 years I have kept an old photograph from the *Seattle Post-Intelligencer* of Ben and me. It is smudged and faded by time and inferior paper stock, but still discernible as a rather stiff little boy and his kerchief-and-overall attired crank uncle posed in front of the layout, the first one, which Ben and I built in his basement. Even after two years, Aunt Helen's suffering and death showed in his face, but it could not suppress the other thing about him—the tense poise of his body, ready for the future like a runner who had come to the mark.

The early years with Ben were idyllic, as they would have been for any boy. I helped with with the layout every night, building frames and molding wire mesh over them for hills and mountains, gluing, pasting, and laying down the cork roadbed. Then, after hours of hard work, he would run the trains while I scurried under the table to pop up in the scattered access openings and watch the passing of the North Coast Limited or the Butte Special. Or he would let me send around my favorite, a single switch engine of bright red and yellow, which for authenticity's sake should never have been taken out of the railroad yard.

When the layout had completely filled the basement, a bright and inviting little world of towns, tunnels, bridges, mountain passes and railroad yards, I expected it all to end there — and happily enough, too, for I never tired of it. But Ben would not be stopped by four dingy cement walls; he had to expand. He took me out every weekend in search of a larger place, and finally found an abandoned warehouse near the bay which he could rent for \$150 a month. It was a large sum for postwar times, but he got at least that much from the National Deflection Casualty Fund as well as having saved \$10,000 in Cancer Society medical payments. (Aunt Hel-







# Bowman's Layout

by David Wetzel

en had staunchly refused medical help and drugs because, she said, there was no reason to pour money into a Terminal, unless it was a child.)

It was at this time that Ben conceived of his great scheme, a new and different layout that could expand indefinitely, that would not be merely a fantasy world for boys and old modellers but a history book in three dimensions, authentic to the last detail. Authentic but for one thing: he would lay the tracks he wished. He wanted a Grand Canyon, but it would be a Grand Canyon upon whose rim a railroad passed; he wanted a Yellowstone Park, but with a miniature Q-gauge set of tracks skimming by Old Faithful and crossing the Yellowstone River above the Falls.

He would find the best features and play them up. He could have enough room to give a sense of vastness, and if he started feeling cramped, he would just find a bigger warehouse. He laid it all out to me, but at the time it seemed like the misspent efforts of shut-ins who made toothpick bridges and sugar cube capitol buildings for the State Fair. Of course, I was only interested in the trains, in running them and coupling them and switching them, so the size of the thing made no difference to me.

Ben decided first of all on the route of the Great Northern and collected all the atlases, picture books, and geographical survey maps that he could find. He brought a neighbor, Mr. Ness, in on the deal, an old railroad man who had worked with him on the home layout. They dismantled the basement table, taking the parts that they needed, and moved it to the warehouse. They conferred on topography and landscape, what to put in and what to leave out, and on what town or two would best represent the others that once lay along the route. They settled on the most important sights: Glacier National Park, the Cascade Mountains, a touch of the rugged highlands of Montana, a not too dreary stretch of North Dakota plains, and a suggestion of Minnesota lakes and farmland.

In six months the rough plans were drawn up and the table was built, running the length of the

warehouse in varying widths of from 10 to 40 feet. We ripped up most of the old track and laid it along the flatlands, beginning with the old St. Paul Union Station in the corner. Then came the hard part: calculating the lay of the land, the height of the western Rockies, and the general elevation as the table moved west. Ben did all the figuring and guesswork, the drawings and marking, and Ness and I cut the wood and built the frames, always under Ben's supervision. I worked two summers on the project, along with a few friends I had recruited to supplement the work force of interested old codgers that Ness had brought in.

By the time I graduated from high school, the Northwest Route was almost done. The Cascades in the West stood as high as a man's head, the Dakotan plains, complete with grasses made from loose fiber carpeting that Ness had lifted from an obsolete golf course, stretched for 35 feet along the painted blue wall of the warehouse (not as far as the eye could see, but far enough), and a few respectable-sized towns had sprung up. From a distance, if you squinted your eyes, those paper mache mountains, clothed in painted snow and little plastic pines, took on some body and majesty, and in steep valleys you could see sparkling cellophane rivers and diminutive mining towns.

Ben was in business. After placing a few ads, he opened the doors to visitors, charging ten cents a throw. He constructed a catwalk over the layout and placed picture markers at strategic spots on the railing to identify individual features. He enlisted me as tour guide to describe the countryside as the Great Northern sped across the plains and laboured through the mountains of Washington. Meanwhile, he and the others went to work on the unfinished sections, closed off by crudely painted scenic partitions. The first customers were children, fascinated only by the trains, but soon their parents and their parents' friends were paying to see the display. I had no idea so many older people would be interested. They seemed more impressed by the landscape, simple as it was, than the shining green-grey diesel and the lighted passenger

cars. Of course, unlike myself and other young people who had never been east of Seattle, they had been along that route at one time or another.

But already Ben was dissatisfied. The layout was beginning to draw more and more people, but he was concerned about authenticity. He wanted the proportions more accurate; he wanted real earth, water, rock; he wanted to go higher and wider; he wanted space.

The layout was spreading south. The next project was to embrace the Tetons, the old mining country of Colorado, the Indian ruins of Mesa Verde, the ironically unspoiled Death Valley, and California's Yosemite.

At the end of the summer, I went back East to school. I had received a scholarship to the New England Institute of Technology, a child of

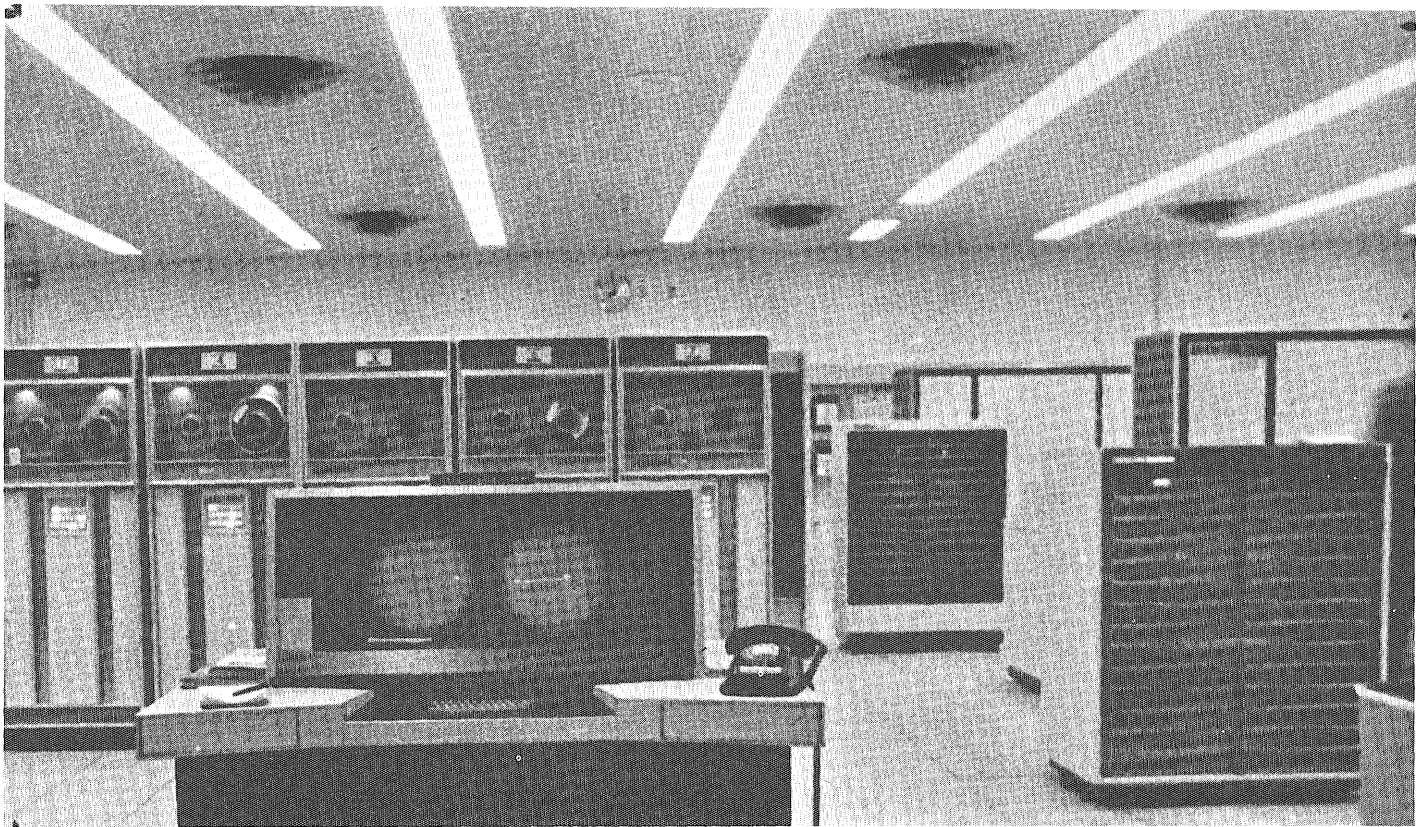
the MIT-Harvard-Rand Corporation merger. Ben insisted that I get plenty of credits in geology, geography, and civil engineering. He fully expected me to return to my work on the layout after graduation. Though he knew that my main interest was in electrical engineering (I had practically wired the entire board), he wanted me to get a well rounded scientific education.

As I look back on it now, the flight east was important for two reasons. It was the last time I would see Ben for 25 years, and it gave me a chance to understand, finally, what he was doing. As we left the fertile Coastal-Alaskan region of the country, isolated by the Rocky Mountains, we flew over the Area of Containment. Though the mountains were impressive still, the land turned brown and seared. Below the timberline, a massive tan-

Continued on page 26







# 6000: A Computer Odyssey

by Scott Wattawa

**A**s modern engineering has become increasingly sophisticated, today's engineer has become one who must be familiar not only with his own specialty, but must have a broad overview of related technology. He must be familiar with new and potentially usable tools. One of these new "tools" that modern engineering is using to solve many technical problems is the computer. Today computers have proven themselves to be such useful tools, capable of solving many diverse problems, that almost every engineering major recommends that the student become familiar with problem-oriented programming languages like FORTRAN, ALGOL, or BASIC. Unfortunately, many students learn to program, but few acquaint themself

with the computer itself. Many students have submitted jobs at remote stations like Experimental Engineering or sat at teletypes in Vincent Hall without having the slightest idea of the CDC 6000 level computer that compiles and executes their jobs. This article, then, is an attempt to introduce the student to the computing machines the University Computer Center (UCC) operates, and give some insight to the vast complexity of modern computers.

The University Computer Center presently owns and operates a Control Data Corporation (CDC) 6600 computer along with a CDC 6400 computer, both located at the UCC Lauderdale site. The 6600 computer was bought from CDC in 1964 and began operations in 1966. The

6600 handles the jobs submitted at Experimental Engineering, Lauderdale, and West Bank as well as performing various data accounting tasks for the University Administration. In short the 6600 is the University's main computer. The 6400 computer began operating in the fall of 1971 and comprises an integral part of the new Minnesota Educational Regional Interactive Time Sharing System (MERITSS). This system is available to Minnesota's institutions of higher education. The 6400 is the computer the student "calls" on a teletype, for example, at Vincent Hall. Both these third generation CDC 6000 level computers, characterized by solid-state macro-circuit boards, are for university and student use although anyone may become a "user" and



rent computer time. As 6000 level machines, they are basically quite similar in many respects and much of what can be said about one generally applies to the other; hence, only the 6600 will be discussed. Essential differences of the 6600 and the 6400 will be pointed out.

### The 6600 Computer

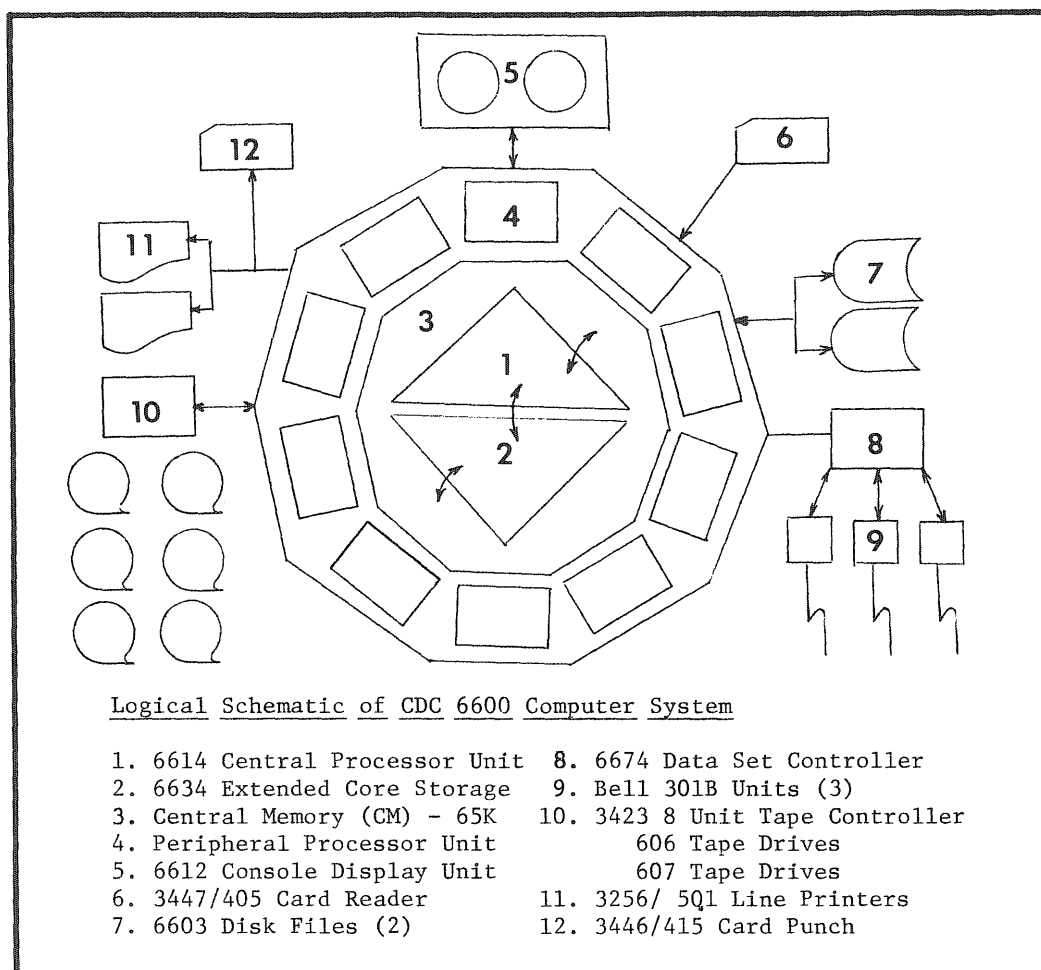
The 6600 Computer System consists of a 6600 computer mainframe and peripheral devices including line printers, disk files, tape drives, a card reader, a card punch and controllers. The computer itself is both logically and physically separated from peripheral equipment — (see schematic). Since the operating speed of the computer is much faster than most of the peripheral equipment, the two are not connected directly so that the computer does not have to wait for the slower peripheral devices to read/write data, thus saving potentially usable mainframe time. The mainframe is the device that compiles and executes a job, whereas the peripheral equipment only records the results of the mainframe.

The mainframe consists of memory and processor units. Memory units are characterized by type, size, and speed. All types store information by coding the data in binary (0 to 1) in units called "bits" (binary digits). Bits are strung together to form "words", each word being a set number of bits. Ferrite core, magnetic film, and paper are used to record data input/output of the computer. The memory of the mainframe, called Central Memory (CM), consists of 65,536 addressable words, each word containing 60 bits (in computer jargon, CM consists of "65K"). Central Memory is divided into 16 banks of 4096 words each which can be referenced separately. Because of large programs and sophisticated operating systems more "core" memory has been added with the Extended Core Storage Unit (ECS) which is a ferrite core memory of 262,144 60-bit words. Words in CM and ECS can be referenced at a maximum rate of one address per 100 nanoseconds (called a minor cycle). A read/write cycle occurs at 1 micro second (called a major cycle).

There are a total of eleven processor units in the 6000 level com-

puters, ten called Peripheral Processor Units (PPU) and the eleventh and most important called the Central Processor Unit (CPU). As the name suggests the PPU's deal with peripheral equipment and are really small computers that have their own private memories not accessible by other PPU's or the CPU, but can read or write in any location of Central Memory. Each PPU consists of 4096 12-bit words of ferrite core memory with a read/write time of one major cycle (one microsecond). These ten small computers are designed to feed data in and out of the CPU while monitoring data flow in the computer, be-

Extended Core Storage for memory, the CPU stores data in continuous memory blocks beginning at a given location in memory (reference address RA) and extending a given number of locations (field length FL). The CPU references data stored in memory relative to the current reference address, so whole blocks of data, (a program) can be shifted in memory so long as the blocks remain continuous (the field length remains fixed) and the reference address of the first word in known. The reader has probably come across a "dump" which is only a machine level copy of the part of memory that stores the program.



ing responsible for the highly efficient data handling of the computer (data in the broad sense of any information related to the program). All ten PPU's are located in the same physical device as the CPU but are logically separate from it.

The CPU performs all the computational aspects of the program. Restricted to Central Memory and

A good consultant can usually tell what went wrong with the program by looking at the "dump" and tracing out the steps that lead to the error.

To perform the computational aspect of the program, the CPU employs a variety of "registers." The CPU has eight 60-bit X-operand registers which hold operands and results for the functional units.

Functional units include floating point addition, integer addition, logical branch, boolean, shift, multiply, divide and increment. Another eight 60-bit registers comprise the instruction stack, holding instructions awaiting execution. By keeping several instructions waiting, little time is lost by the CPU looking for the next instruction, thus increasing operating efficiency. It must be pointed out that the 6600 and 6400 differ in the over-all manner in which execution of instructions occur. In the 6600, instructions which are not sequentially dependent are executed in one major cycle but start one minor cycle

The Peripheral Processor limit operates at one major cycle per read/write instruction which is the maximum rate of operation of the 6400. Because of the "overlap" concept the 6600 can, at best, operate at 1/10 of this speed. Ten PPU's read/write data in one major cycle, but one minor cycle apart. Hence, the 6600, operating at minor cycles rather than major cycles, can be as much as ten times faster than the 6400.

The Central Processor uses the Peripheral Processors to communicate the results of the work done by the registers to the outside world. The PPU's are connected

able of reading 80-column punch cards at a maximum rate of 1200 cards per minute, is one of the most commonly used machines for input. Each card is read twice at two different stations and if they disagree a "compare error" results. Usually a mispunched card or an incorrect read by the card reader at either station is at fault. The card reader can read either Hollerith coded cards or binary decks. The card reader is one of the slowest peripheral devices.

## Peripheral Equipment

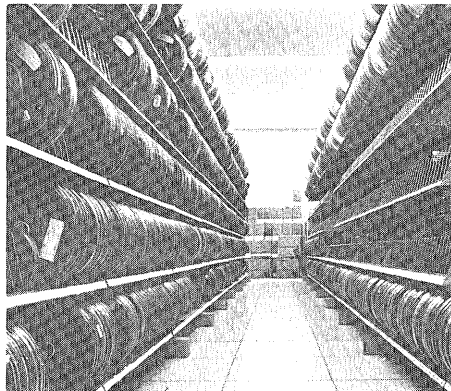
A much faster on-line piece of peripheral equipment is the magnetic tape drive. At Lauderdale, there are four CDC 606 magnetic tape units and four CDC 607 magnetic tape units. Seven track tapes of the standard 1/2-inch width travel at 150 inches per second (ips) during a read/write operation, recording information at densities of 200, 556, and 800 6-bit characters per inch in the 607 tape unit. At 800 characters per inch ("hyper" density) 120,000 characters per second may be read/written. The 606 tape unit operates at lower densities (200 and 556). Both systems are mass storage devices, Data is read sequentially so that if data is needed at the end of a tape, the tape unit must forward wind, stop, read, stop, rewind and continue, thus being a serious disadvantage for some kinds of programs. The UCC currently has approximately 4000 tapes in storage for users and other programmers who prefer to carry one tape reel rather than a truck-load of cards.

For programs with huge amounts of data, CDC 841 private disk packs are preferred. Holding the capacity of over fifty tapes and able to read/write large volumes of data faster than tape units, they are also available to the programmer (at considerably more cost). The disk packs are really stacked records coated with a magnetic film. Recording heads read/write all information on several tracks at once. The disk pack itself weighs only a few pounds and fits neatly into a "drawer" where it revolves at high speeds. Information can be read from any track, thus permitting random access to data which, for some programs, decreases operat-



Behind the "mainframe" of the CDC 6600, the wire scheme is without pattern to prevent "parity errors" caused by the alignment of magnetic and electric fields.

apart. The result is simultaneous execution of up to ten instructions. This happens often enough in programming to make this a workable concept. The 6400, on the other hand, executes instructions sequentially without instruction execution overlap. Thus the 6600 and the 6400 have different operating systems, and physically the 6600 has a larger "scoreboard."

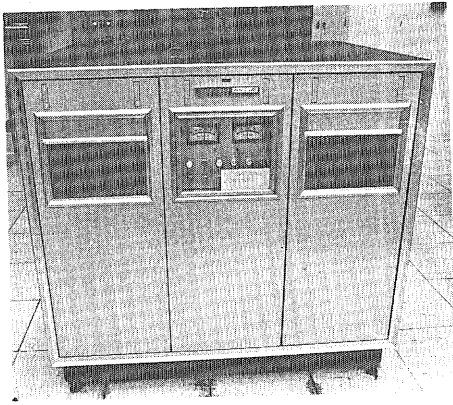


Magnetic tapes stored at Lauderdale

to 12 data channels to which all input/output devices are connected, each channel associated with only a specific amount of peripheral equipment (depending on the speed at which the peripheral device can transfer data). The PPU also has the special function of "exchange jump" where the PPU interrupts the program being executed in the CPU, stores all necessary information to continue processing at a later time and sets another program in operation. This "mainstream" switching occurs without loss of job continuity, thus implementing the multiprogramming operating system characteristic of large third generation computers (this exchange jump takes only two microseconds).

In real life, logical relationships of the mainframe are much more complicated, and the above is only an overview. Having some notion of the mainframe, peripheral equipment can now be discussed.

The CDC 405 card reader, cap-



ing time considerably.

Two CDC 6603 disk files are also connected on-line to the 6600. The disk files are large capacity (17 million characters) random access memories which can read/write at 1,111,111 to 1,428,571 characters per second, depending on the disk region. Information is stored and transferred in block units called physical record units. The disk files, one of the fastest input/output devices available, are like the disk packs except they are larger, remove faster, and can store more.

One peripheral device that catches a lot of attention is the CDC 6612 console display unit with a pair of cathode ray tubes and a keyboard. The tube is used to communicate between the operator and the computer, telling the operator such things as dayfile, tapes to be mounted and import/export. The operator can also interfere with any running job if some unusual circumstance merits human intervention. Thus the tubes permit the operator a much better command over the computer than just, say, a teletype.

Many input devices are also output devices (disk files, magnetic tapes, etc.) A few machines are strictly output. The CDC 415 card punch is one of the slowest output devices, cranking out 250 80-column cards per minute. Like the card reader, the card punch verifies its punch by reading the card to make certain of no mistakes or mis-punches. In the event of a mistake a new card is punched and the bad one is off-set and removed by the operator. Both Hollerith coded

cards and binary decks can be punched. Few students ever use the card punch, and most punched output is a binary deck of a de-bugged program or a source copy of an existing program stored on tape or disk.

One of the most used output devices is the CDC 501 line printer. The 501 prints at a maximum rate of 1000 lines per minute, 136 characters per line (with 62 different characters available on the 6600). The machine itself uses high speed rotating belts to position a whole line of printing heads at once. Form, thickness, and intensity are adjustable. Peripheral devices are not linked directly to the PPU's but to "controllers". The controller is a go-between that directs the operation of a machine by following instructions that originate from the PPU as well as being data channels for data flow. Several peripheral devices are connected to one controller (the number depending on the nature of the peripheral device), thus permitting a versatile computer configuration that can be readily adapted to the programming needs. The Lauderdale configuration is scientifically-oriented, utilizing a high speed CPU with relatively little in-

put/output equipment. Some readers may have seen computer systems used, for example, in the finance business, where 12 on-line printers, 30 private disk packs, and rows of magnetic tape units characterize large volumes of input/output but little usage of the CPU.

The 6400 System has only a cathode ray tube, the mainframe, a magnetic tape drive, and controllers in the physical configuration. However, many remote teletypes are connected on-line via telephone data paths so that output occurs miles away from the central site. The 6400 has been adapted to a different programming community with corresponding different needs. Hence, the differences in physical configurations.

### Operating Systems

So far only the physical configuration of the computer system has been discussed. The software operating system is a machine level program comprised of hundreds of sub-programs that actually supervise the data flow through hardware, guiding the program through the stages of input, execution, and output. The 6600 computer operates under SCOPE (Supervisory Control





of Program Execution), while the 6400 operates under the KRONOS system. Even though the 6600 and the 6400 are similar computers, their operating systems are vastly different. Operating systems are machine dependent and generally quite complex, and only the philosophy of the operating system will be explained. Those interested should have little trouble finding any one of numerous volumes written on the subject.

SCOPE is a file-oriented system where the computer considers everything within the system to be a file or part of a file. Every file is assigned a name which serves as a method of distinguishing a particular file from hundreds of files within the system. The file concept is especially advantageous to the non-expert in software for he need only worry about the name, disposition, and record structure of the file. Files are broken down into records separated by "record separators" (7/8/9 cards) and terminated by an "end-of-file" 6/7/8/9 card). Following the path of a program in the mainframe many give some insight to what happens to a typical student FORTRAN program.

First, SCOPE makes a copy of

the deck of cards with the FORTRAN program onto disk, turning it into a file called INPUT. Next SCOPE records the first record in the file (a control card) and stores the operating system instruction in the control card buffer. A priority is assigned to the program and it must wait until the CPU is free. Sequentially the control cards are read and executed and any special requests (like loading a tape) are noted on the display console. Then SCOPE loads the FORTRAN compiler (FUN or MNF, for example) into memory and instructs the compiler to take the problem-oriented language as input and generate a file of binary machine level program to do exactly the same task requested by the problem-level program, but one that is understandable to the machine. During execution a new file called OUTPUT is continually created in which the results of the executed program are stored. SCOPE is complex because not all steps are sequential so that the operating system must sometimes arbitrarily choose the next instruction to be executed. Consequently one can only guess at what the OUTPUT file will, in the end, look like. How the operating sys-

tem moves from advance job (AJ) to end job (EJ) is analogous to a marble running a maze and coming across equally likely paths to take. (This unpredictable aspect of the operating system is the "personality" some experts claim the computer has.) Once the OUTPUT file is completed, SCOPE purges the job from the CPU and assigns a disposition code to the file. The disposition code and the job are retained until an appropriate peripheral device is available whereby the results of the CPU are recorded for the outside world.

The file-oriented philosophy of SCOPE permits hardware independence from the student's point of view. The programmer is concerned only with the creation of the OUTPUT file and not with the details of how OUTPUT is created. SCOPE must keep track of all files assigned to current jobs using the CPU or in the system as well the disposition of all files created as OUTPUT. (A cathode ray tube is available in the user's room at Lauderdale for the programmer to follow the disposition of jobs as they enter and exit the 6600 computer system). SCOPE must search out open data channels and direct what devices will be used to record the file OUTPUT. Also, sophisticated operating systems like SCOPE permit the supervision of not one but up to seven programs to be executed simultaneously. Job priorities are assigned externally but are also "aged" so that no program sits in the system too long, waiting to be executed. Also, the size and memory allocation along with computing time are considered, the smaller, shorter jobs getting the higher priority.

The operating system (which is actually some 700 machine level programs stored in Extended Core Storage) has the purpose to read input files, create output files, dispose of input file, diagnose any problems, and to see that the output file is matched to the appropriate peripheral device. Jobs in the input queue pass through the control point to the output queue, guided by a "scheduler" (a hardware device). The scheduler has three main functions: (1) search for input jobs, (2) find a vacant control point, and (3) set up a job at a control point.

(Continued on page 29)



## Layout from page 20

gle of needle-stripped dried word lay like an immense logjam in the canyons. Erosion worked down into the valleys as though huge plows had cut raggedly into the fall of the mountains, turning the earth to bake in the sun. Out of these ravines, nearly as deep as the canyons themselves, spread ever widening deposits of silt and mud, sloughed off by the rains. To the south, the Yellowstone country was bald and streaked with the black and purple lichen strains that had emerged and spread in recent years.

In all directions, the pulpy infected earth seemed to recede from the great teeth of the Rockies, and to wash away. On the high plains of southern Montana, yellow grass, mixed with an unfamiliar red stubble, grew in isolated patches and island chains, a feeble covering for land that was wrinkled, collapsed and eroded, and given over to fissures and wadis. There was more of the same as the country dipped down from the plateaus to the low, rolling plains of South Dakota and Minnesota. Here lay a dry, scarred, wasted desert, as naked a territory as you would want to see.

It was not until we had reached a point just east of the Mississippi River that the land turned green again, along a line so sharply demarcated that it looked trimmed. Beyond was a sea of green farmland and wheat and lines of poplars and dark woods so rich after what had passed as to be staggering. That line marked the end of the East and the beginning of the Great American Desert, which marched behind me clear to the Pacific seaboard. The Coastal-Alaskan region, north of the Columbia River, had been preserved only by the frantic Containment efforts that destroyed almost as much land as the Deflection had.

Nevertheless, it was obvious that the policy of Deflection had been the best defense, the only defense. We had to thank God for the preservation of part of the Cornbelt and a number of good wheat states. Then, of course, we still had the entire South and East. A nation could at least survive without the Dakotas as long as it had Wisconsin, Iowa, and Illinois. It could do equally well without Montana, Wyoming and Colorado if it could still

count on Arizona, New Mexico and Texas. Its greatest loss was California, whose dying was as slow and painful as Aunt Helen's. But those times were gone, thank God, and fruit was plentiful in Florida and Hawaii.

Ben wrote often, and I to him. He was making enough money from tickets to hire full-time craftsmen—Ness and his cronies and a man who used to own a model shop. According to Ben, the old layout was nearly obsolete, though it was used for visitor showings. He was doing the Craters of the Moon now, and Arches National Monument

State-Defense. For the first time in three years, I heard his voice over the phone.

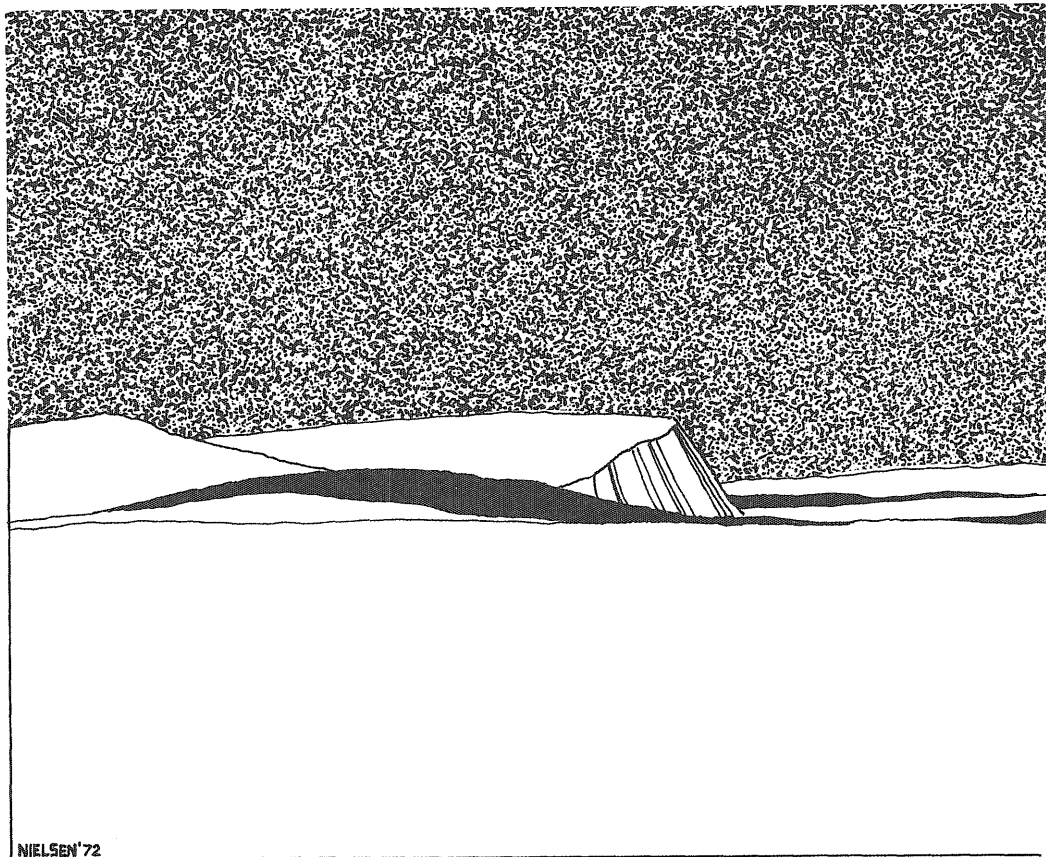
"Bastards," he said.

"Come on, Ben." I said, "That's not true. It's a necessary job—it's a vital job."

"They planned the Deflection. They worked the whole thing out in secret and then sprung it on us. They knew the ABM wouldn't work."

I didn't want to argue, but I had to defend my job—in truth, my whole career.

"Ben," I said, "It was necessary under the circumstances. Would



and shortly would start on the Trinity Alps of northern California. He wrote of the new materials he was using, and of elaborate mixtures of sand, rock, and plaster of paris. In the near future he planned the reconstruction of Salt Lake City as it was before the turn of the century, and he would include the Mormon Temple. And always, he wrote, he needed more room. The warehouse restricted his vision.

Then, in my last year at New England IT, we had our falling out. I told Ben of my intention of becoming a projection-programmer, and that I had been offered a job at

you have wanted the whole country to go up? Everything we have is out here in the East—population, cities, growing land—everything."

"California," he said.

"That wasn't hit during the strike. That went later, from Biochem stuff blowing across Nevada. Everybody got out."

"Almost everybody," he said. "And what of all those little towns and farms scattered all hell across the West?"

"The fact is—cold as it may seem—that the West had the least population, excluding California, of the whole country. It had the least

rainfall. It had, frankly, the least to lose. And we can still mine it, by remote control if need be."

"Come out here and see Yellowstone first, and the Tetons," he said, a softer tone, the old tone, in his voice.

"I've seen them."

"No, mine," he said. "Mine."

"I can't. I'm going to take the job."

It ended easily and sadly. We didn't communicate after that, but we wouldn't have been able to write much anyway, since I was terrifically busy in Washington and Ben was of course absorbed by the lay-

warehouse, and in fact out of Seattle. He had, appropriately enough, selected a new site in St. Louis, Gateway to the West. The layout would be housed in an enormous domed baseball stadium which Ben had gotten for a song in an auction. Half of the stands would provide seating for the hundreds each day who came to see the vast but tiny landscape spread out before them; the other half of the stands would become part of the layout, allowing Ben to take his mountains up as high as he wanted. And treading throughout, like a toy dream of every boy who ever lived, would be

and grasses. He was forever changing and broadening, making space, lengthening mountain ranges, including more and more of what once were "sights." At last I heard that he was constructing his beloved Grand Canyon, digging it out with a small steam shovel and putting ten students to work with trowels for the refinements.

The layout was becoming a nationally famous attraction and Ben a figure as revered as old Walt Disney or Cecil B. De Mille. St. Louis couldn't have been happier to see its hotels fill up with tourists who normally would have gone to Miami. These people would stay two, three days at a time and leave without seeing enough. The older ones would weep openly; the younger ones would gape at the attractions they had never before seen: Yosemite, Virginia City, the Bear Tooth Mountains, Rainbow Bridge and Mt. Rushmore.

Ben and I had no formal reconciliation; we just came together again. For one thing, I had left State-Defense for Insurance, had settled in Chicago, and had promised my wife to take her to see the layout. Ben was as warm and full of life as ever, as visionary as ever, and as eccentric. He took us on the ground tour, first by closed circuit TV, which operated from tiny cameras in the trains and projected five different scenes to theatres in the superstructure of the stadium, then in a moveable overhead platform that skimmed across the unfinished portions of the layout. Last, he took us to the control room where we could survey his vast and varied lost world in one panoramic view.

He let us look and we looked long. Then, smiling his old crank smile at me, he said:

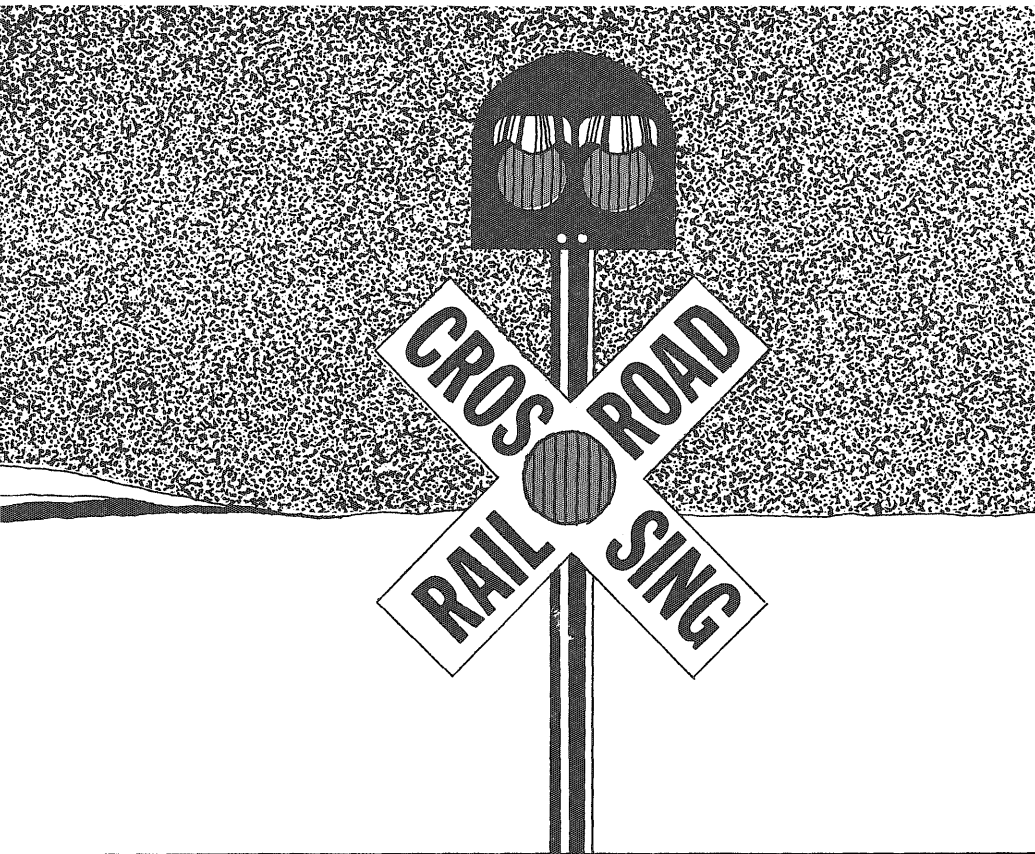
"Sure you don't want to come back to the layout?"

"No, thanks, Ben." He was being kind; I wouldn't have been an asset.

"Well," he said, pointing off, "why over there—see where we're gouging out the land . . .?"

"Yes."

"That's going to be the Bay, That's going to be San Francisco. It will have to a small San Francisco, about 1855, but San Francisco nevertheless." ■



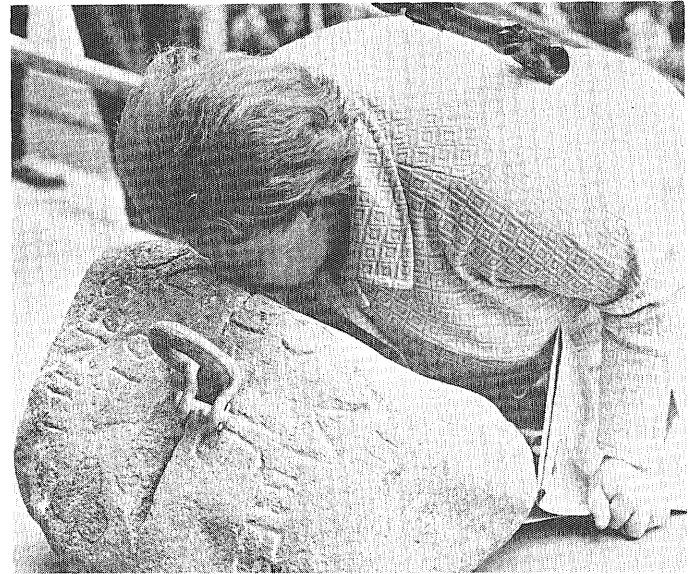
out. I hoped it would some day work out, as generation differences do. Of course, the real battle was between the older people themselves; it was not the worry of the young, who were realists enough to accept land limitation and other consequences of the war.

I began to hear of Ben, though, in other ways. The layout was getting occasional coverage in the papers, mostly the Sunday supplements. Once there was a good article in the *New York Times* which wrote up a history of the project and interviewed Ben about his plans. He was, finally, moving out of the

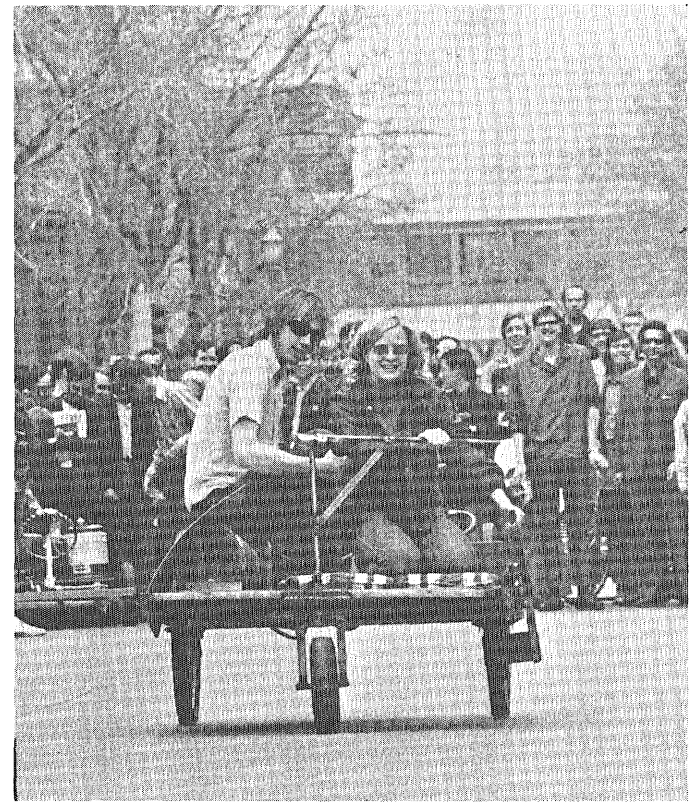
the railroads: the Great Northern, the Union Pacific, the Santa Fe, the Southern Pacific—all controlled by Ben Bowman in the pressbox high above.

In later years, he commissioned engineers and geologists to work on the layout, and was able to pay university professors—historians, topographers, anthropologists—to advise him, though they would gladly have done it for nothing. Within the limitations of the layout, he wanted the greatest degree of accuracy and authenticity—real granite and sandstone, real water, and, if he could have had it, real trees





# E-Day



## 6000 from page 25

This system is specially suited to Batch processing of several jobs at once, rather than loading in and executing a single job at a time. Although the 6400 KRONOS operating system must meet similar demands there is the added problem of servicing and communicating dozens of on-line teletypes which may, at some point in the program, cause the operating system to request additional information from the programmer sitting at the teletype. With a maximum capacity of 128 teletypes, the system must also insure that no programmer waits too long or that no program ties up the system too long.

### Remote Stations

Room 131 Experimental Engineering is a remote station driven by a CDC 8090 computer with a CDC 405 card reader, a 501 line printer, an on-line communications typewriter, plus controllers and telephone devices. Jobs submitted at Experimental Engineering are read by the card reader and stored in the 8090's buffer, and then transmitted via telephone lines to PPU's at Lauderdale. Because Experimental Engineering and Lauderdale are much further apart than the critical 80 foot limit, (the maximum distance a PPU and a peripheral device can be separated) data must first be buffered and then transmitted. Communication devices at Lauderdale must in turn acknowledge the transmission of data before the next buffered image of a card can be transmitted. To human operators, this occurs very rapidly, but because some computer circuits operate near the speed of light, this transmission rate is very slow compared to the CPU and so must proceed in this seemingly complicated fashion.

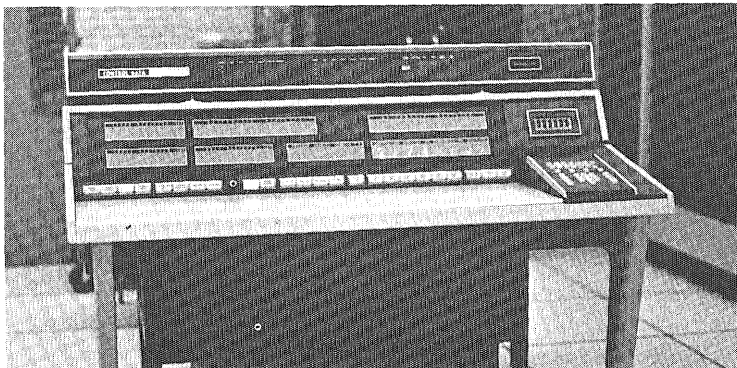
### West Bank

At West Bank a CDC 3200 com-

puter is also a remote for the 6600. Some jobs are read in at West Bank and transmitted via a similar method to the 6500 where they are compiled and executed. The OUTPUT file, however, is printed at West Bank. The 3200 can also operate completely independent of the 6600 system.

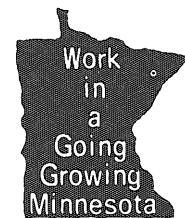
The 3200 is a medium size third generation computer with 32K central memory. Each of the 32,768 words are 24-bits long. Four 854 disk drives, a controller, a 501 line printer, a 405 card reader, ten CDC 211 cathode ray terminals, and a CDC 3275 data communicator comprise the peripheral equipment of the 3200 computer system at West Bank. Shortly, three 601 tape units will be added. Characteristic of small and medium size computers, the 3200 has no Peripheral Processor Units and peripheral equipment is connected on-line to the CPU (through controllers), utilizing a "channel" concept for input/output. The CPU stores output on disk, then later directs the appropriate device in output operations. The programming community is composed mostly of business majors and social science majors who find the 3200 adequate for the majority of their programming problems. ■

Students who wish to rent computer time should contact James Foster at the University Computer Center. After filling out the appropriate forms, the student must find a faculty member to sponsor his project. The completed forms should be returned to 227 Experimental Engineering for processing. Upon approval, an account number will be assigned to the project. Some student projects are subsidized by the Computer Grants Committee. Such projects include Ph.D. and Master theses and class projects assigned by an instructor.



Console for the CDC 3200 computer at West Bank. Compare with 6612 console display units of 6600 level computers in previous pictures.

# "The Upper Midwest grows on us"



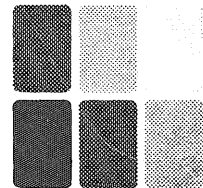
During the last ten years the population of this great land NSP serves grew by close to 21%.

The Dakotas, Minnesota and Wisconsin also rank high nationally in terms of economic growth.

It's a great place to live and work.

And we at NSP are dedicated to keeping it that way . . . and at the same time fulfilling our responsibility to supply your power needs.

## NSP



*a brighter life for you*

## Grade Review

According to Leroy Ponto of the I.T. administration and John Clausen of the I.T. Undergraduate Scholastic Committee, the Institute of Technology will eliminate "F" grades effective Fall 1972. Although I.T. intends to comply with the decisions of the Twin City Campus Assembly, they are not sure what will be the new criteria for student probation. Several suggestions were made, among them are: a comprehensive exam at the end of year to test a student's progress and to determine if he should advance; continued calculation of GPA (to be used only for determining probation cases). The faculty committee of I.T. will study the problem and will reach a decision in late summer.

## BECC Takes Off

The Built Environment Communications Center, (BECC), was established at the University of Minnesota School of Architecture and Landscape Architecture during the fall quarter of 1971. Its general purpose is to explore the television media as a resource for architectural/environmental design education, research and decision making. Activities include production and exchange of videotapes, putting together a video library, and organizing as part of a newly forming

communications network.

The BECC is an experiment to demonstrate that half-inch VTR (video-tape recording) together with closed circuit and cable television systems, can be applied in a variety of ways to meet the informational needs of environmental design students and the complex metagroup of architects, urban designers, city and regional planners, ecologists, resource conservationists, psychologists . . . and others whose efforts lead to environmental change and organization.

Initially, energy at the BECC is directed towards two overlapping goals:

- 1) To give students and faculty at the school access to half-inch video media as tools for documentation, experimentation, project conceptualization and presentation, production of programming for continued educational use and viewing of videotaped information from other sources.
- 2) To encourage the development of a videotape exchange network



among schools, professionals, industries, etc. progressively to a state, regional, national, and international scale.

The first four months of operation have been: planning, organizing and proposal writing; identifying BECC to the rest of the University, related community people and other schools on a state-wide basis; seminars and workshops with students; carrying out a range of production experiments with equipment borrowed from other departments. Funds pending from University grant programs will provide for basic equipment and operating costs for one year. The initial facility will consist of (2) battery operated camera/recorder/playback units (portapaks); (2) decks for editing, viewing, dubbing and studio recording, several monitors, microphones and accessories. Future plans call for a specially designed areas for comfortable viewing, editing and easy access to the videotape library. At present, everything is done in one small office.

Equipment will be available to all students/faculty in the school. Student teams have already visited a number of sites in the Minneapolis area to survey progress of building projects, congregating places, freeway construction, etc. A tape is being produced about the philosophy and experience of the Urban Education Center (community advocacy design). Tapes have been made of jury sessions for self analysis. The Cedar/Riverside development project is well documented and visiting lecturers have been taped and viewed several times.

In addition to student-faculty initiated uses of video the Center's staff will produce videotaped learning packages requiring more time and commitment. Examples of tapes produced in this manner thus far are: 30 minute documentary on the School of Architecture for orientation and network distribution to area schools; a 15 minute tape about

Continued on page 35

MINNESOTA TECHNOLOG



Continued from page 7

If the above picture has any validity, the keynotes will be flexibility and breadth. In education we are moving, albeit more slowly than we would like, toward an appropriate model for the future. The standard approaches which encompass the tradition B.S., M.S., and Ph.D degrees need to be supplemented by programs that will educate more broadly. Highly talented men and women who desire leadership positions at the interface between technology, economics, and politics should, upon entrance to college, plan on about eight years of education. The first four years, up to the B.S. degree, should be devoted to education in the liberal arts, science, and engineering sciences. The next four years could be devoted to an education that is more professional and broader based than the present Ph.D. degree. Briefly, this could involve upper level study of economics, business, political science, and an "engineering" design problem as a thesis.

I.T. is moving toward these objectives. Several examples of this

are the development of new flexible undergraduate programs in engineering and the introduction of a Master of Engineering program as an alternative to the traditional M.S. program. A study committee is investigating the desirability of creating an alternative to the traditional Ph.D. program, while faculty from civil engineering, mechanical engineering, and aerospace engineering are involved in solving broad transportation problems. Some I.T. and CLA faculty members are working together on research programs which relate to design of social systems. Faculty and students in chemical engineering and College of Biological Sciences are designing new ecology courses, while some I.T. faculty and students and Medical School faculty are working on joint programs which relate to "medical engineering."

I have only been able to touch on some developments which appear to be on the horizon. Why don't you play your own thought game and see if you can sketch out a desirable educational career path? ■

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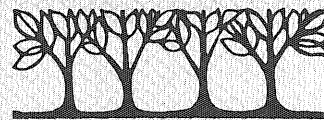


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May 18, 1918

1 stone crushed - 178 lbs. \$8.04

total \$8.04

Bill to : M.W. Johnson  
Dept. of Metallurgy  
University of Minnesota  
Minneapolis, Minn.



by R. I. Pirro

Ed. Note.—Robert Ian Pirro, better known by his byline, R.I.P., is internationally known. Since he has been a longtime observer of the political scene, Mr. Pirro has impressive credentials for the reporting of this scandal. In the past he has been a familiar figure in such famous addresses as 10 Downing Street (Boston), 60 Carlton Street (Toronto), and the 31st Street Promenade in New York City.

The Blarney stone is indeed blarney. This fraudulent symbol of E-Day is being perpetuated by certain groups whose existence depends on the public's acceptance of the Stone. The fact that will be brought out here is that the actual Blarney Stone was destroyed by subversives in 1918, and that the stone which unwitting engineers

groveled to on May 5th is a bogus.

The facts concerning the arrival of the Rock to Minnesota have been lost in myth, but there is documented proof that the true stone was present at the 1914 E-Day celebration as Mr. George Priester (the 1914 St. Patrick) can attest to. The powers of the stone as explained by Lester Roswell, St. Patrick of 1929, are; "The powers of that stone, (are) namely the gifting (of) its users with eloquent and persuasive speech . . . The stone is endowed with property of communicating to the happy tongue that comes in contact with its polished surface the gift of gentle speech".

Apparently the implied powers of the rock did exist, for the stone immediately became a target for subversives (such as the **Technolog**

staff of 1970) and the demented (such as the foresters of any year). In the spring of 1918 a plot was hatched by an oppressed minority group who was being systematically excluded from any effective E-Day participation; the mining students. Viewing the Stone as the symbol of their second-class citizenship, they worked in secrecy to perfect their scheme. So well did they maintain their veil of secrecy that I was unable to uncover any names, or even the actual number of conspirators involved. One thing is certain. On the date of May 7, 1918, the conspiracy began.

**FACT:** At approximately 7:00 P.M. on the evening of May 7, 1918, four mining students seized the Blarney Stone from its resting place, the shed of Professor Frank Rowley,

and loaded it onto a horse-drawn wagon.

**PROOF.** The above photograph was discovered by this reporter after hours of research and illegal entry into forbidden files. Although clouded by time, it unmistakably shows the four students in question carrying the Blarney Stone off to its ultimate destruction. The name of the photographer is unknown, but the message scrawled on the back of the photo tells us all we need to know about its authenticity; "5/7/18. A blow struck for miners of the world! Long live the shaft! Long live the Industrial Workers of the World!"

**FACT.** On the next morning the Stone was delivered to the Minneapolis Stone Company, and on that day—May 8, 1918, the stone was put through a rock crusher and destroyed.

**PROOF.** This letter, which was lifted from company files, shows unmistakable evidence that the Stone was indeed received and crushed on that very day. Posterity can thank the Minneapolis Stone Company for keeping such clear records of all of their business dealings.

**FACT.** Later that same day, the remnants of the Stone were placed in a sack and delivered to the Engineers by a postal carrier.

**PROOF.** I have located the postal employee who made the delivery from the Stone Company to the University. He is now retired, and for his own protection he shall remain anonymous, but his interview is preserved on recording tape for anyone to examine. An excerpt from that interview reads;

**TECHNOLOG** Did you, on the afternoon of May 8, 1918, pick up a sack from the Minneapolis Stone Company for delivery?

**POSTMAN** Yes I did. I recall the exact date because I went back to the records to get the exact date.

**TECHNOLOG** What did that sack contain?

**POSTMAN** While being employed by the postal service we are not allowed to examine the contents of any package entrusted to our care. I can tell you now though that I'm certain that it was broken rock.

**TECHNOLOG** How could you be sure?

**POSTMAN** Because it was so darn heavy and I remember that there

was some dust and sand leaking from a small rip. It was a coarse green sand, like smashed emerald.

**TECHNOLOG** Where did you deliver this sack?

**POSTMAN** To the Engineering Building at the University. It was addressed to the E-Day Chairman, so I found his office and delivered it there.

**FACT.** A hasty excuse was desperately contrived by the notorious organization later to be known as Plumb Bob. They stated that the miners had "made a mistake" and "took the wrong rock," and that the real blarney stone was safe all the time. This was a lame, desperate excuse.

**PROOF.** The entire E-Day celebration, the coronation of St. Patrick, and the organization of Plumb Bob, depends solely on the existence of the Blarney Stone. They had to make this excuse and claim that the real Stone still existed or else there would be no reason for THEM to exist. Their own survival dictated that they continue E-Day with A blarney stone, so they substituted a forgery for the destroyed rock.

Plumb Bob will of course deny the truth of this article. They will probably claim that false evidence was used to undermine their organization. Let me state here that all of the evidence I have gathered, the photograph, the letter from the Minneapolis Stone Company, and the taped interview, are all fully documented and may be examined by anyone at anytime for purposes of verification. The rantings of Plumb Bob, an impotent vigilante group, will not keep **Technolog** from printing the truth.

There is also a probability that the bogus stone used to replace the authentic Blarney Stone in 1918 was also successfully stolen. While I have not uncovered sufficient proof at this time, I do have the very words of Lester J. Rowell, St. Patrick of 1929, in describing the rock of that time; "... something more than an ordinary green rock, ... I surmised that this emerald stone ...". Look closely at the color of this years blarney stone. Its as green as Colgates toothpaste. What a bizarre history surrounds this rock! Has it been destroyed more than once? ■



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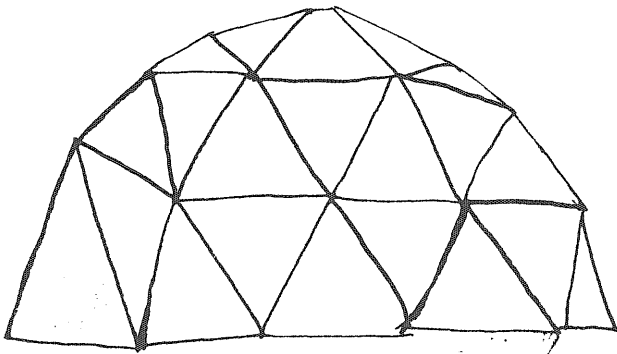


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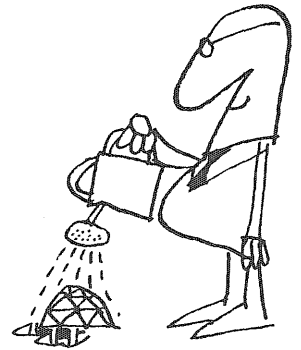
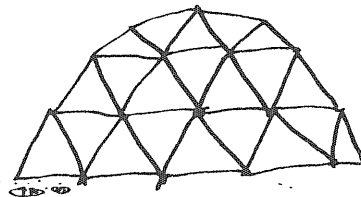
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*The Gardner*



BJ



"My son," said the clergyman, "you'll have five minutes of grace before you go the chair."

"That's not very long," replied the convict, "but bring her in anyway."

\* \* \*

A husband answering the phone: "How do I know?" Why don't you call the weather bureau?"

"Who was that?" asked his wife.

"Some fool wanted to know if the coast was clear."

\* \* \*

"Mommy, mommy why can't I go out and jump rope with the rest of the kids on the block."

"Janie, you know it makes your stumps bleed."

\* \* \*

Small mistake at a local hospital. An intern sawed the arm off a patient. "What kind of operation do you call that?" asked his supervisor. "Operation!" gasped the intern. "Hell, I thought it was an autopsy!"

\* \* \*

Some think that I'm tiring of a bachelors life, but what's good enough for my father is good enough for me.

\* \* \*

A local preacher recently announced that there are 776 sins. He is currently besieged with requests for the list by college students who think that they might be missing something.

\* \* \*

Prof: "A fool can ask more questions than a wise man can answer." Student: "No wonder so many students fail your exams."

\* \* \*

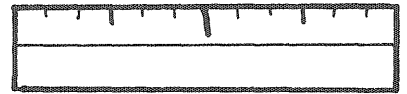
Three famous doctors were boasting among themselves one day. The first said, "I grafted an arm on a fellow and now he is a star quarterback." The second said, "I grafted a leg on a man and now he runs on the Olympic track team." The third doctor took the cake with, "I once grafted a smile on a jackass and now he is a Congressman."

\* \* \*

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### What's New from page 30

Architecture and video for the Minnesota Design Seminar with Paulo Soleri and David Brower; documenting of the 1971 International Design Conference at Aspen, Colorado (with the California Institute of Arts).

BECC's resources will eventually permit students to go on to study/documentation expeditions to other cities and other countries. To a degree, the tape exchange network will bring geographically dislocated resources to each terminal.

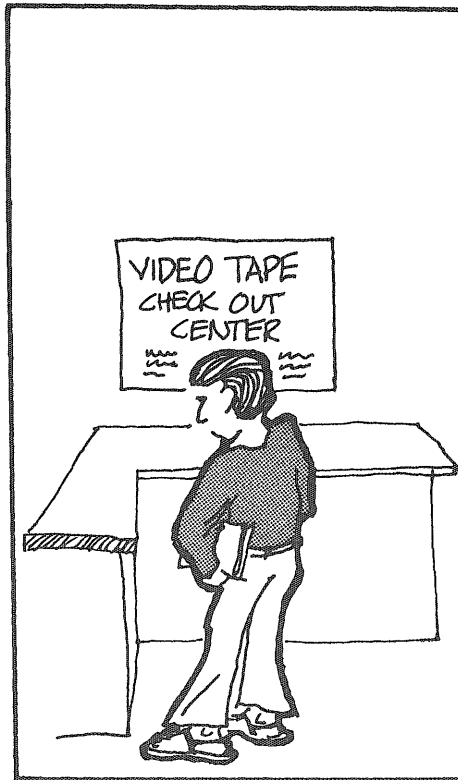
Eventually a student will be able to check out a video cassette and view it in private or with a group of friends. It might be a lecture by Soleri, Fuller, or Frie Otto taped at some other school, a computer generated tape of urban transportation patterns, interviews with dome builders or perhaps a community group in a soon to be destroyed neighborhood. Guidance, as to the use of equipment, will be provided in group workshops.

It is first of all important to note that the general concept of a decentralized television network has already been made operational.

Briefly, the idea is that the present form of broadcast television is unresponsive to the comprehensive information needs of people and that popular access to new media encouraging participation rather than passivity is needed. Access, and a reversal of the traditional role of the T.V. viewer are possible through community originated video programming on local cable television systems and through the "alternative video network" idea of simply exchanging tapes through the mail. Both the network and the cable exist now, but their potentials have been largely untapped by established educational structures.

With reference to the advantages of a videotape exchange network, the BECC is concentrating energy on a specialized subnetwork of interest within the larger alternative television network, i.e., the people involved in the field of built environment education, research, and implementation. This subnetwork can be identified and approached as three groups.

(1) The first group is composed of the full spectrum of educational institutions at the area, state, national, and global levels who are



concerned with aspects of the built environment. Such institutions will each have a communication terminal (hopefully).

(2) The second target group in the sub-network is the associated Metropolitan area organizations, agencies, and individuals whose interests and charges focus on the built environment, and their State and Federal counterparts.

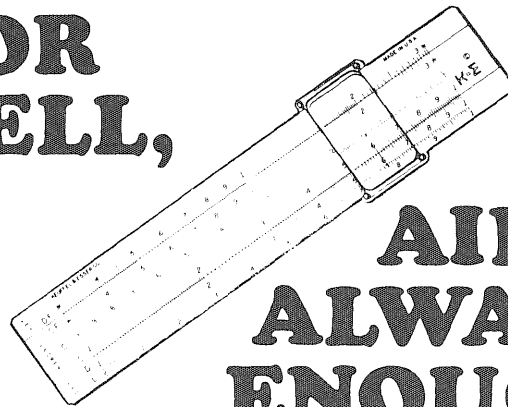
Architects, city planning commissions, housing authorities, city councils, environmental citizen's committees, tenants unions, universities, transportation-highway departments, state and regional planning enclaves, agricultural and industrial interests and many others are all participant decision makers in the evolution of environmental form and quality.

(3) The third group, which at many points intersects the first two, comprises individuals and groups doing basic scientific research applicable or directly related to man/environment problems and relationships.

The BECC then, is working towards an environmental design education video communications network and an open in-depth dialogue on how this might effectively come about. ■

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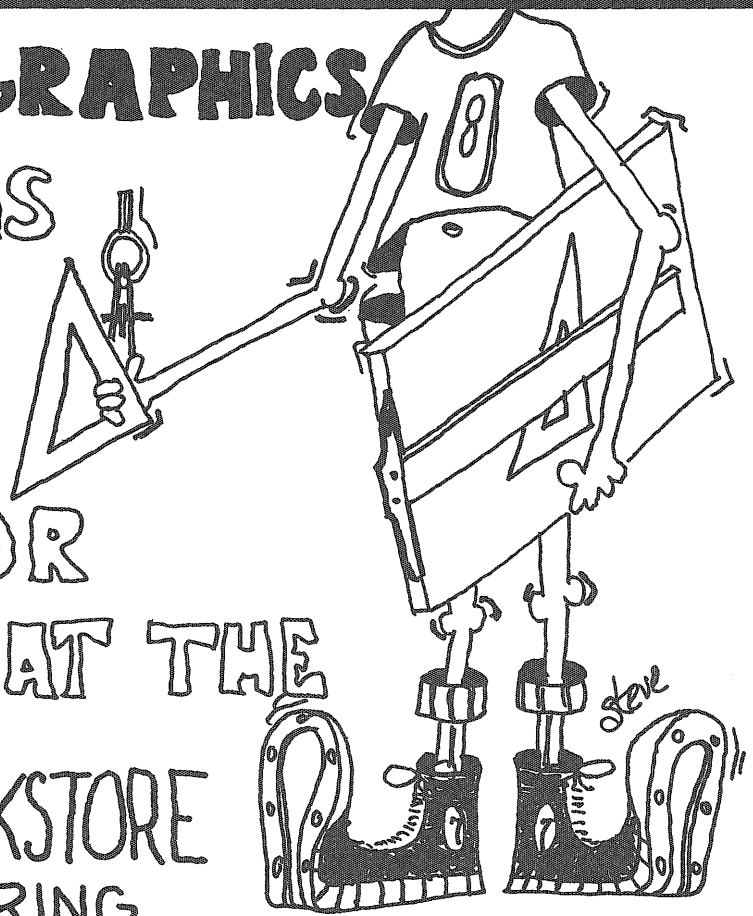
\*But we sure don't knock it. Limited opportunities are available in Research and Development. Contact the Placement Office for specifics.



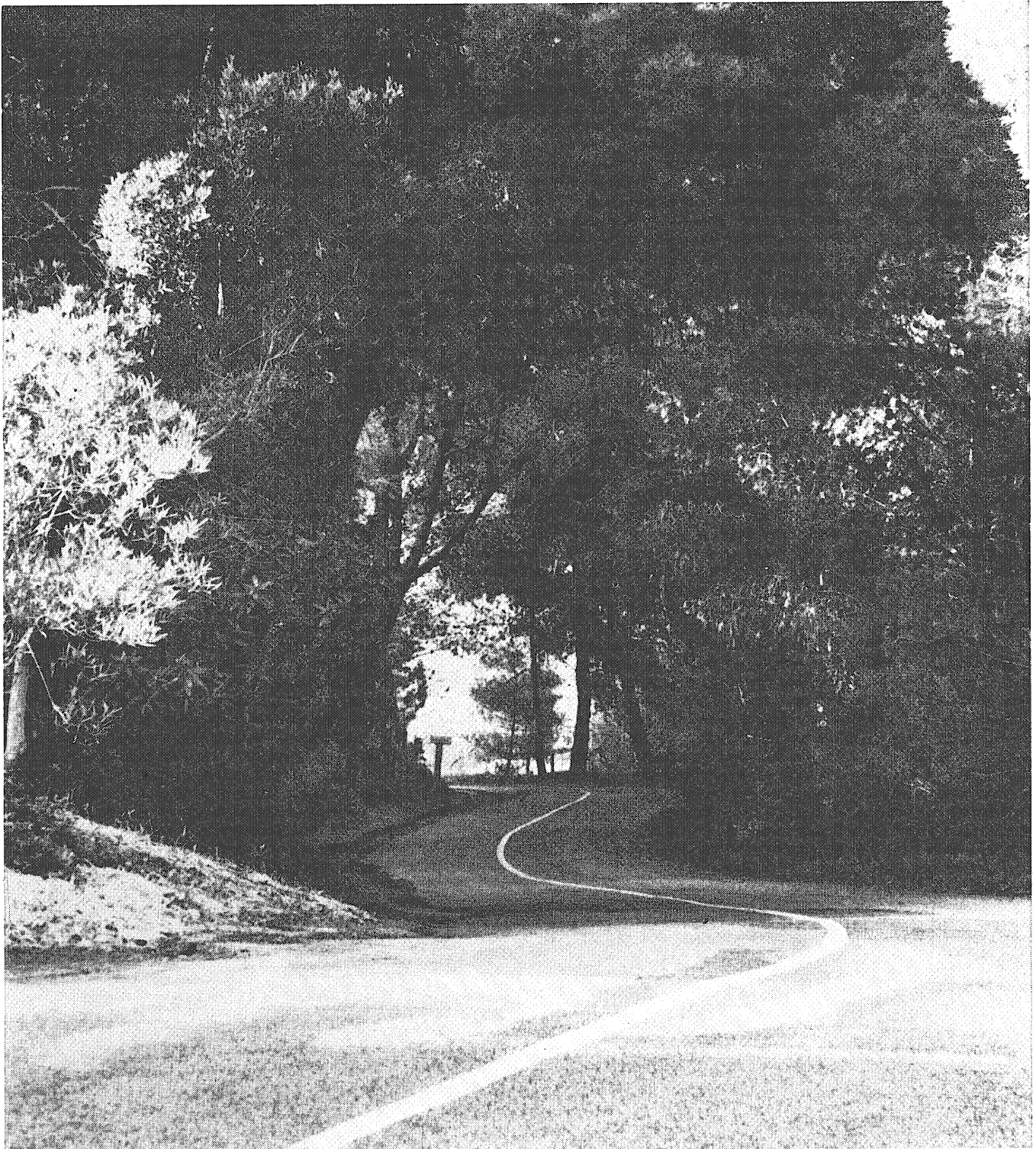
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