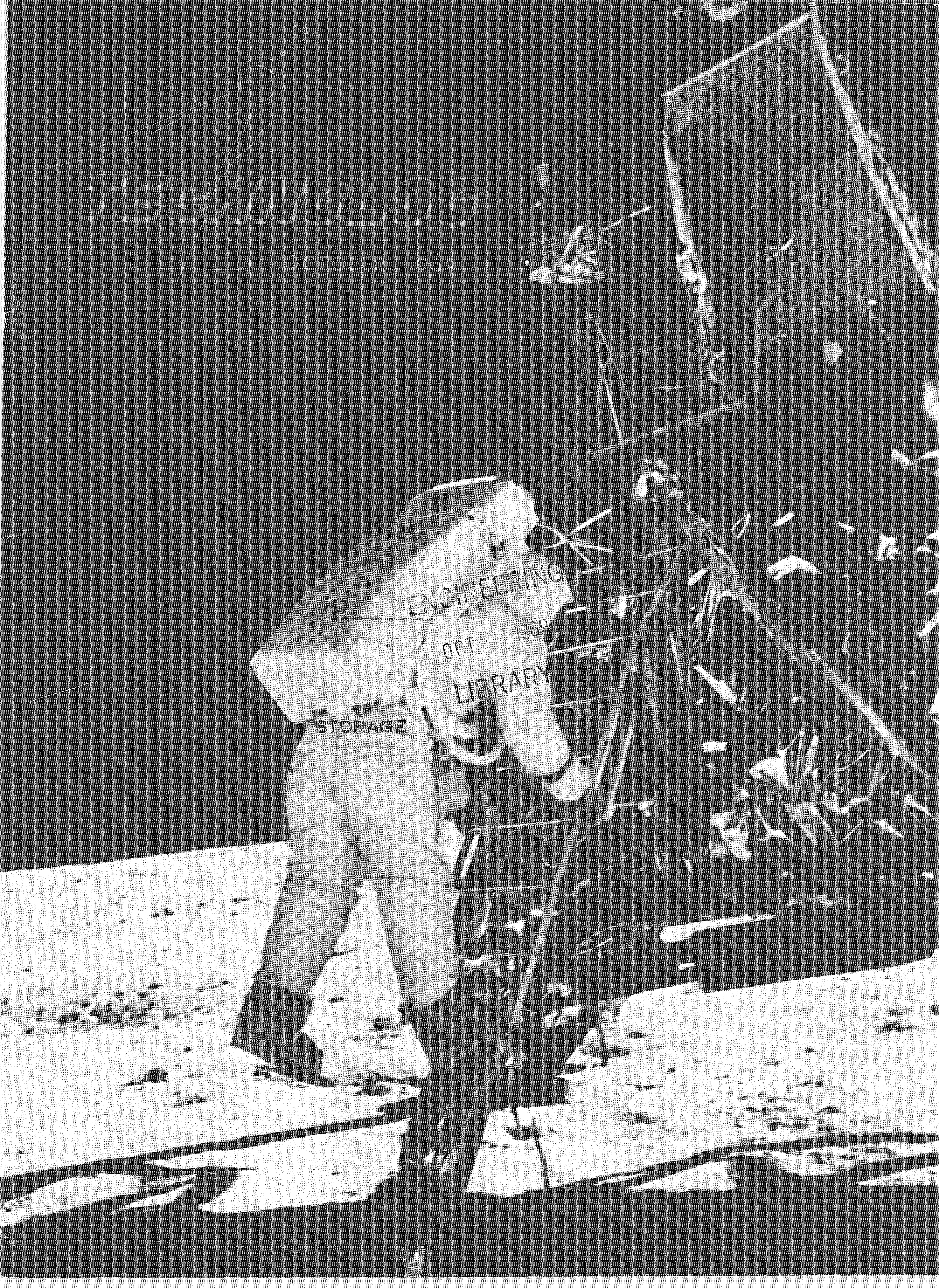
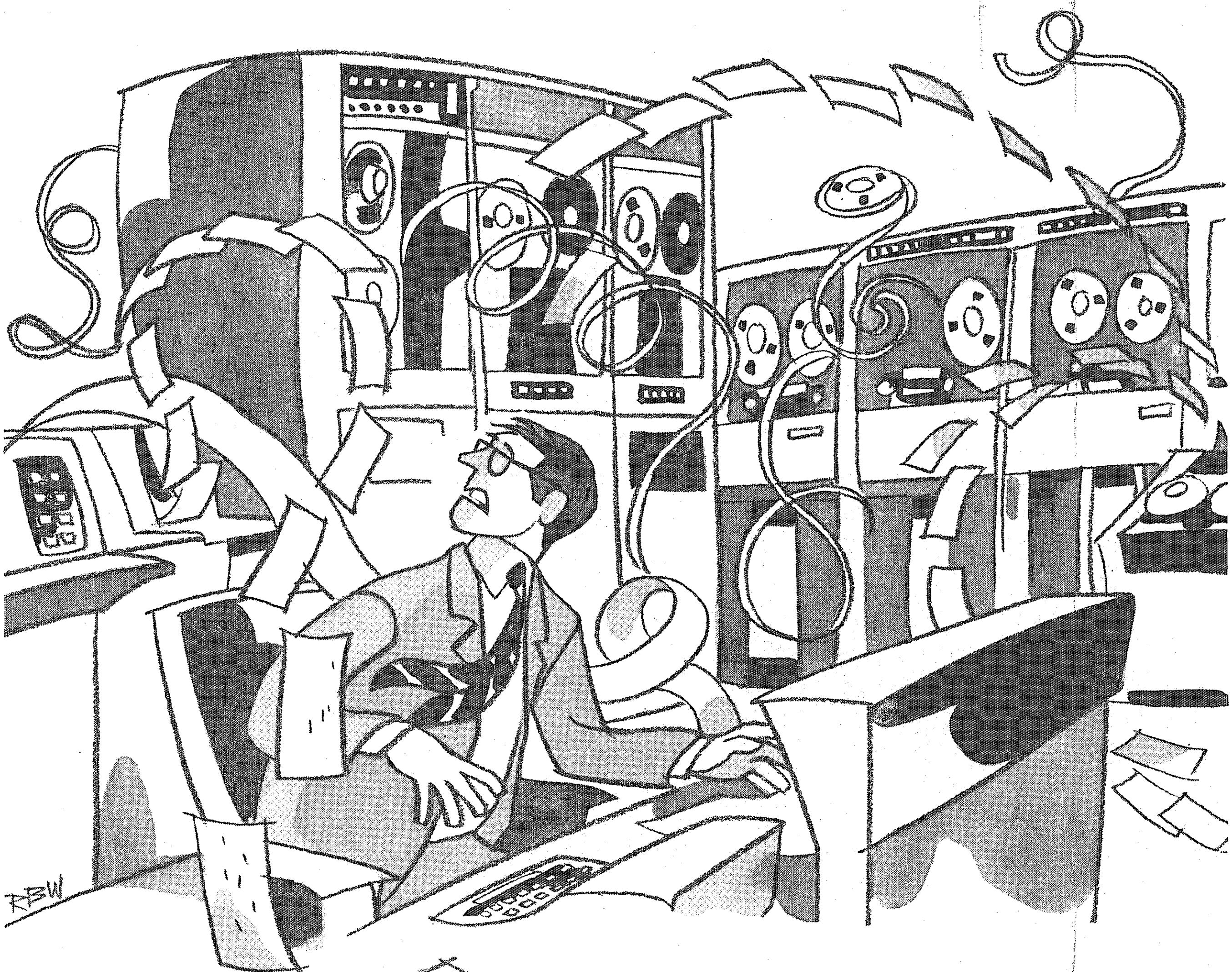
TECHNOLOG

OCTOBER, 1969

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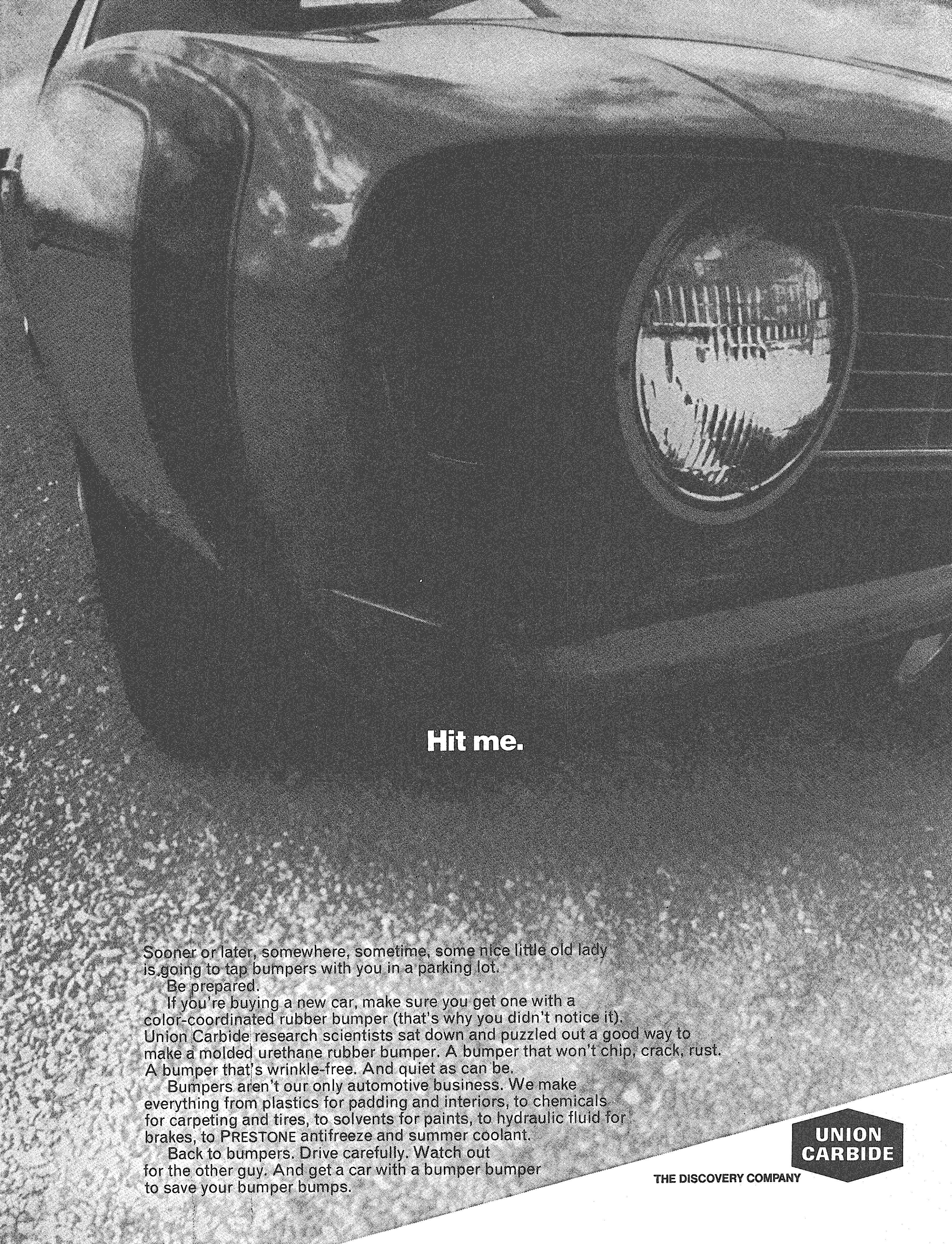

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TECHNOLOG

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

COVER: Astronaut Edwin E. Aldrin, Jr., lunar module pilot, descends the steps of the lunar module ladder as he prepares to walk on the moon. The picture was taken by Astronaut Neil A. Armstrong and is compliments of WCCO radio and NASA.

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Speaking with the Dean about • • •

SPACE

At the invitation of the editor of the Technolog, I am continuing the tradition begun last year of contributing a short article to each issue of the magazine. The articles last year concerned diverse subjects which either reflected my interests at the moment or were meant to be informative concerning the affairs of the Institute of Technology. Two of the articles occasioned responses and, insofar as they motivated individuals to react, they may be deemed to have been the most successful of last year's series.

One of the aforementioned articles was critical of the political motivation of the Apollo program and lack of scientific goals of the manned space program. My view has not been altered in the intervening months by the successful landing of the first man on the moon even though with millions of others I experienced vicarious pleasure in the event. The courage of the astronauts themselves and the expertise of all who contributed to the technical aspects of the program command admiration. However, this admiration is bounded by my quarrel with those in government who in the Apollo program use, and therefore abuse, science and technology for their own political ends. A contemporary British writer, C. P. Snow, has written: ". . . It is singulary difficult to spend really big sums on entirely benevolent practical projects: either the projects can't absorb the money or they have no political sex appeal. It isn't in the nature of politics for people to make themselves think ten years ahead . . . the space project is probably—apart from military things—the only spender of big money that could have collected majority support from politicians and public. . . ."

The round trip to the moon, with its accompanying circus paraphernalia, proved beyond a doubt that it is possible to divert the concern of a major section of the public from the realities with which we must eventually (why not now?) grapple. Unfortunately the diversion was short-lived and our domestic troubles and the war in Viet Nam uncooperatively refuse to disappear. It was possible to ignore these problems for a few days but that is a very different thing from finding solutions to these problems.

During the early summer, Representative Joseph Karth spoke at the dedication of the University's Space Science Center building and argued forcefully that this country needs something like the Apollo program to give us the stimulus to solve our serious problems. Representative Karth is one of the most knowledgeable members of Congress in the effect of technology on our lives. He may be correct that it is necessary to mount a space circus so that we might proceed with the valuable aspects of our space program. If so, it is not a very flattering assessment of the mentality or morality of our Congress or the public which they represent. In Representative Karth's remarks, he rightly stressed the immense technological and economic benefits which will accrue from NASA's programs. He alluded to meteorological satellites, remote sensing of the environment, etc., as activities which will have profound effects on agriculture, fisheries, the world economy. He also pointed to the vast opportunities afforded scientists to explore those regions and aspects of space which would be permanently denied us if we remained earthbound. It is easy to agree with Representative Karth that these aspects of the space program are worthy of our support.

However, I view with utter dismay the claim of those who assert that if we can successfully complete a manned round trip to the moon, we can successfully attain any other goal we set for ourselves. This attitude is indicative of a naivete which has survived from the turn of the century when writers such as H. G. Wells saw in science and the scientific method the salvation of mankind. World War I disillusioned Mr. Wells and succeeding world conflicts have shattered this notion, although now and again the doctrine of blind faith in science and technology experiences a renaissance. Those in whom the success of the Apollo program has instilled an optimism concerning the future of mankind are merely sixty years behind the time. We must all learn to accept technological achievements for what they are and not impart to them attributes which they do not possess.

Warren B Cheston

Log Line

Welcome back to the books, exams, stuffy rooms, over-abundant problem sets, and late labs. Not much has changed here except, of course, there's less money to borrow, tuition is higher, and there is even less parking space.

The *Log* this year is staging an all-out campaign to cheer up the student — we're trying everything — EVEN new jokes!

Since the *Log* is a student publication, it should reflect the student's interests. Sorry, center-spread, full-color, *Playboy* pin-ups are out! "Log's Line" is an open forum for student opinion. What in IT would you like to have changed? Would you rather have the curriculum extended to five years instead of the present four? What about the still non-existent student lounges? Are the engineering, math-physics, and/or chemistry libraries adequate? If you have any suggestions or gripes, please give them to us. Maybe we can help initiate some changes!

Freshmen

This year, on an experimental basis, the Institute of Technology is sponsoring a tutor program primarily designed to aid the commuter students. This plan includes placing a tutor in a geographical location which would make him accessible to these students.

This year, IT will have Mr. Wayne Heuer located in Edina High School, 5701 Normandale Road, Edina. This location should be central enough so that students in the south and west Minneapolis areas plus the Lake Conference suburbs can take advantage of the program.

Mr. Heuer's tutoring hours will be from 7:00 p.m. to 9:00 p.m. on Tuesdays and Thursdays in Room 213 of Edina High School. He will conduct discussion and problem solving periods plus supervised study. The subject matter will be primarily that of Math 21A for fall quarter 1969.

The tutoring will be informal with students able to attend those hours and nights that fit their program and needs. Therefore, prior enrollment is not required.

Students are encouraged to take advantage of this program since past experience indicates that the reception of tutoring help has a positive effect on academic success. If this program is successful, it may be expanded to other locations in the Twin City area.

Students are also reminded that tutoring help is available from 3:00 p.m.-5:00 p.m., in 136 Main Engineering each week, from Monday through Thursday.

Encouragement

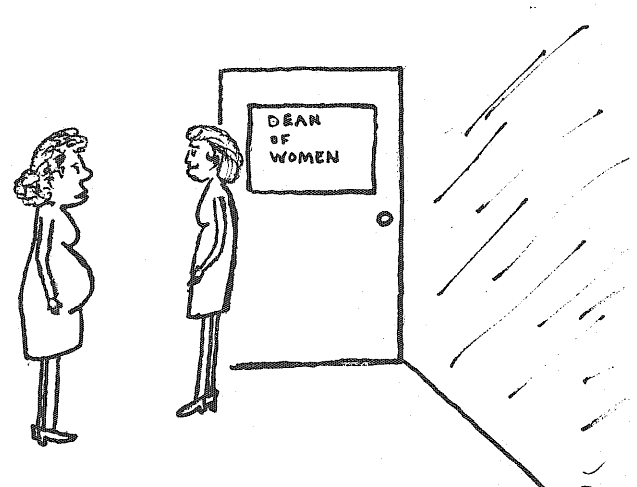
This letter was originally printed in the October 1966 issue of the **Technolog.** We decided to reprint it this year as a word of encouragement.

"You frosh have all been orientated.

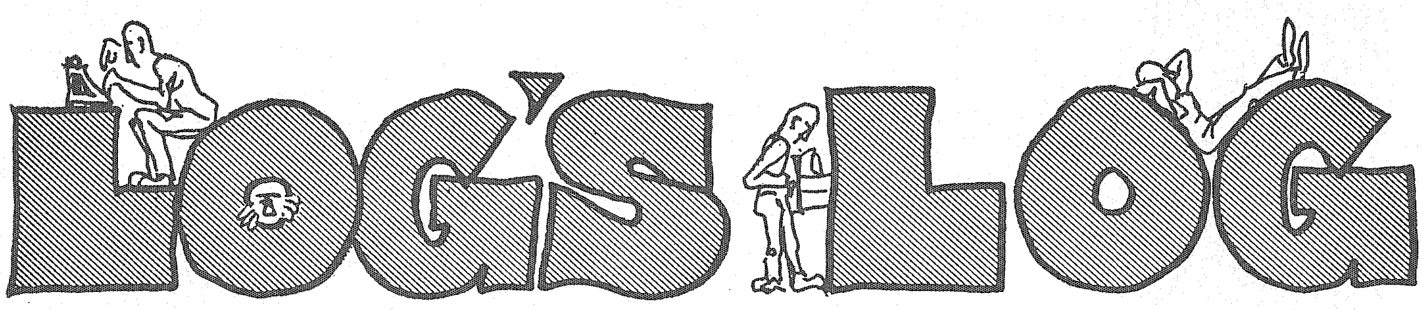
"You have been told about the benefits of IT. You have been shown the dilapidated buildings. You have seen the distinguished professors. You have seen the clean IT lunch room. You have been told of the glory of IT and you have been told that hard work is good. In short, you have been brainwashed. IT stinks. Believe it. It is hell. Up to now you have gotten a good night's sleep. Forget about that from now on. Up to now you have gotten good grades in the sciences. Forget that. Up to now you have felt that you have been accomplishing something. You can forget that too. You work and work and work in IT and you never see the end. The assignments keep on coming; you fall weeks behind. You get a continual headache. You develop mono. This is IT.

"You may now ask, 'What the Hell do I need it for?' The answer is you don't. Get out of IT while you are still sane. Get out of CLA. Become a History major. You will lose that tired, ache-all-over feeling. You will go to sleep at a respectable hour. You will lose the extra edge you have over the other fella. You will become average, run-of-the-mill, nothing special. You will be able to say that you are perfectly healthy but you won't be able to say, 'I am an Engineer at General Electric who enjoys his job.' That's right fella: You don't need it but if you want it and love it with your entire being and stick with it, you're miles ahead of whatever comes in second place."

Paul Goldberg, E.E. '67



I HAVE AN ADVISOR WHO CARES.



by DAVE ENGEN *and* DAN KEHRBERG

Introduction: Let us turn back the pages to those thrilling days of yesteryear (1966-67) when the team of Dave Engen and Dan Kehrberg wrote rampant for the Log's Log. There was a team to set the Pulitzer prize committee to retching. As we last left Dan, he was trying to do an end-around play to fake out his draft board. He was doing all right until he tripped on an anchor (of Anchors-Aweigh fame). Dave left school (with diploma) to seek his fortune but all they had at the newsstand was the Ladies Home Journal. **Undaunted and remembering the old axiom about death and taxes, he took a job with the army (thereby becoming involved with the execution of the former and the spending of the latter). For a yet unexplained reason the Log's Log has obtained the literary talents of these modern-day F. Scott Fitzgeralds for the entire year, which brought forth this comment from Dean Cheston: "With them and 300 recipes you could write a cook-book."**

Sort of by way of introduction we are offering the Engen-Kehrberg Dirty Mind Test. Question #1: What do you call two men who engage in sexual relations? Answer #1: Homosexuals. Question #2: What do you call two women who engage in sexual relations? Answer #2: Lesbians. Question #3 What do you call a man who puts his tool into a woman's mouth? Answer #3: a dentist. If you answered Question #3 any differently, consider yourself to have passed the E-K Dirty Mind Test.

This Space For Rent

space: what is between your math prof's ears.
space: a non-existent in the Main Engineering study room at almost anytime.
space: what comes in the top half of a corn flakes box.
space: what men used to give up to women on the bus.
space: that which puts the honor in the honor system.
space: the difference between an A or a B in a bluebook.
space: where all the money goes.

As an engineering student you probably were in some small or great way attracted to IT by the space program. Many of you will be working for companies with space contracts. But we're sure you're also aware of the debate which is going on today concerning the amount of money NASA is going to spend in the future. Quite possibly there could be a dramatic cutback of expenditures. And while not taking any side, we'd like to add one more definition to those listed above.

space: that which is at the end of the unemployment line.

Underground Press

The E-K Report, having absolutely no good sense when it comes to our own personal safety, trods fearlessly into any open door, dark alley, or house of ill repute. One evening we happened to wander across a small print shop where we, after presenting our credentials (highly respected by the renegade press), were shown several publications not normally found, for example, at Perines. After a heated discussion we finally gained exclusive rights to review the following books.

The first book we would like to comment upon is *Calling A Spade A Spade* by George Wallace. This is a bitter diatribe of current racial fictions written by the foremost American segregationist. The arguments presented are the same tired and unimaginative formulations stated by Mr. Wallace in his recent presidential campaign. No more need be said except that the book will probably be retitled *Calling an Afro-American an Afro-American* for northern consumption. (UnTrue Grits Publications, $4.95).

Life Among The Savages by Jacques Bordeau, the former French Ambassador to the United States, relates his experiences when stationed in this country. While not agreeing with M. Bordeau, he does present some unique analyses of our society. For example, he was once a victim of a botulistic gutbomb and that's something we can all sympathize with. (The Wine Press, $6.50).

Why The Lone Ranger Never Married by Tonto is a startling exposé of the daring and resourceful masked rider of the Old West. The original manuscript by the faithful Indian companion was recently discovered on a back shelf in the National Indian Museum. In this book Tonto relates, in his own inimitable style, the deep psychological problems that come with wearing a mask. This remarkable first-hand case study of one of America's most popular folk legends goes a long way toward explaining the early Hollywood practice of kissing one's horse. Tonto goes on to make a strong symbolic connection between "silver bullets" and the Lone Ranger's horse. (Kemosabe Publications, $7.95).

The last book we had to review was *The Problems of Old Age Creeping Up On You* by Jacqueline Onassis. This is a book of helpful hints and tips by one of the world's most famous women. In it, Mrs. Onassis describes the problems that come with advancing age and how she has coped with them. Her recommendations are original and demonstrate good old American ingenuity (Geriatric Press, $10.95).

After School

There aren't as many people actually working as you may have thought. At least, not according to this survey conducted recently by the E-K Report.

The population of the country is 240 million, but there are 90 million over 60 years of age, leaving 150 million to do the work. People under 21 total another 90 million which leaves 60 million to do the work.

Then there are 35 million who are employed by the federal government and that leaves 25 million to do the work. Five million are in the armed forces, leaving 20 million to do the work. Deduct 18,800,000, the number in state and city offices, and that leaves 200 thousand to do the work. There are 126 thousand in hospitals, insane asylums and so forth, and that leaves 74 thousand to do the work.

But 62 thousand of those are bums or others who will not work so that leaves 12 thousand to do the work.

Now it may interest you to know that there are 11,998 people in jail, so that leaves just two people to do all the work. And that is an AgE and me, and brother I'm getting tired of doing everything by myself.

GO-pher, GO-pher, Gone

Very soon after our return to campus the E-K Report discovered that gophers no longer inhabit the Gopher Hole. Yes!! That's right!! We can remember with fondness our freshman year when those cute, brown, furry little creatures inhabited the Gopher Hole. They made nests, raised their young and generally lived a serene existence. Then *they* came. First it was those fiends from University Construction who poured concrete all over everything. Then the coin-eaters were put in. Chairs and tables appeared, taking over most of the open ground.

Then, as if attracted by the new motif of early Howard Johnson, the preditors set about carving claims to the new territory. The leaders in this rape of nature came from Edina high school. They established themselves in one corner of the Gopher Hole and brought in (gasp) a record player (a known irritant to gopher ears) and only one record. That record, and try to remember, was the "Surfin' Bird". This they played continuously driving even some of the other preditors away. The poor gophers. Their lot was now a brutal contest for survival among chairs, tables, feet and the din of the preditors. The cries of our mascots went unnoticed. Slowly the gophers began to appear feet-up behind the coin-eaters. A few managed to escape. Then the situation went from bad to worse. The Union Cafeteria in a desperate attempt to lower operating costs began to lay traps. This was the coup de grace. Gopherburgers claimed the last of the U's namesakes. Alas and alack.

But don't despair. The Log's Log has a plan. We are inaugurating a drive to restock the Gopher Hole. With this in mind we have contacted Gophers Unlimited of Bemidji and they have promised us full assistance and cooperation in this crusade.

But we know what you're thinking. "But what can I do? I'm only one person." Here's what you can do. As an individual you can write your state representative, the Governor, the *Daily*, and in this desperate situation, even the *Tower*. Get out there and picket, sit-in, riot but most importantly stop eating gopherburgers. For remember if *they* can force the gophers out of their Hole how long will engineers have their lounge?

Official Daily Bull

Lest our readers miss any event of the U of M IT fall quarter, Log's Log has again made great efforts to obtain the social highlights and present them to our swinging readers and also to you guys in EE.

As sort of a special bonus that involves going back on our word to Admissions and Records (after all what can they do to us?), we are pleased to announce that Raquel Welch's ugly sister, Brunhilde, has just become an IT co-ed. And lest any of you guys think that you could get into the living room thru the back door, we should announce that Brunhilde is currently going steady with a hog caller from Muscatine, Iowa. Them hog callers really go for IT co-eds.

Oct. 16-31

16—Bill Bailey calls and says he won't be home

21—Anniversary of man first using fire (12,000 B.C.), four T-bone steaks overcooked

28—Go all the way and get a Ph.D. Day

31—Get a job with Hamm's. Lose your draft case day

Nov. 1-15

1—Give a peach to your local fuzz Day

5—Samson brings down the house at Beersheba Day

11—4-D Day

15—First Laundromat opens (1926). Many wash dirty linen in public

Conclusion: If you guys think you've got it bad what with IT Co-eds and their renowned lack of va-va-voom, just remember things could be worse. For as Dan found out about the navy the only difference between WAVES and pigs is that pigs don't get acne.

So all you smarties who think you could have done a better job writing the Log's Log this month, pleased to be informed that the E-K Report knows where it's at. And that we go there and get it.

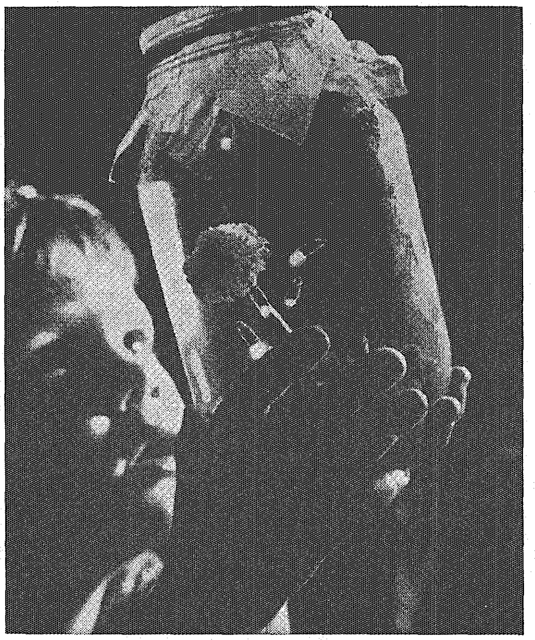
The *lampyridae* beetle family. Delight of small boys. Biological light bulb. And prime source of raw material for another Du Pont innovation.

Luciferase, an enzymatic protein with intriguing properties, obtainable only from fireflies. *Luciferin,* an organic molecule also found in fireflies, but synthesizable. *Adenosine triphosphate* (ATP), a common energy-yielding substance found in all living cells.

Those are the three main ingredients in *lampyridae's* love light. And because ATP is common to all living cells, university researchers discovered they could produce an artificial glow by mixing luciferin and luciferase wherever life is present.

Noting that phenomenon, Du Pont scientists and engineers went on to develop it into a practical analytical system. Correlating the intensity of the artificial "glow" with the amount of ATP present in bacteria, they designed a means of measuring the reaction.

The result is the luminescence biometer—the first really basic improvement in bacteria-counting methods since the days of Louis Pasteur. Rather than waiting days for a culture to demonstrate growth density, a doctor or technician can now get a digital readout of bacteria concentration in a matter of minutes.



Other potentially lifesaving uses for the biometer are being suggested every day—such as diagnosing metabolic rates, enzyme deficiencies and nerve damage.

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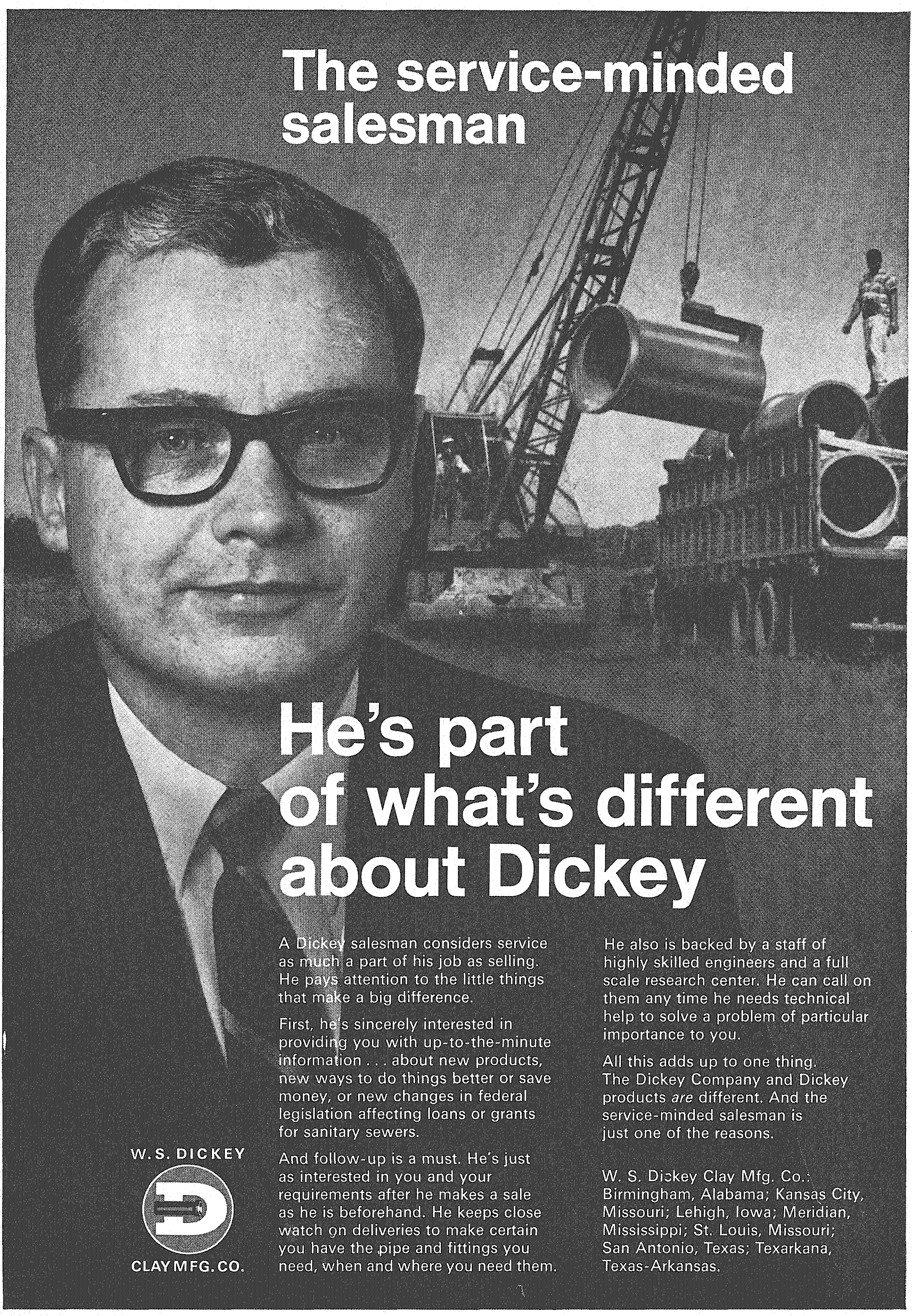
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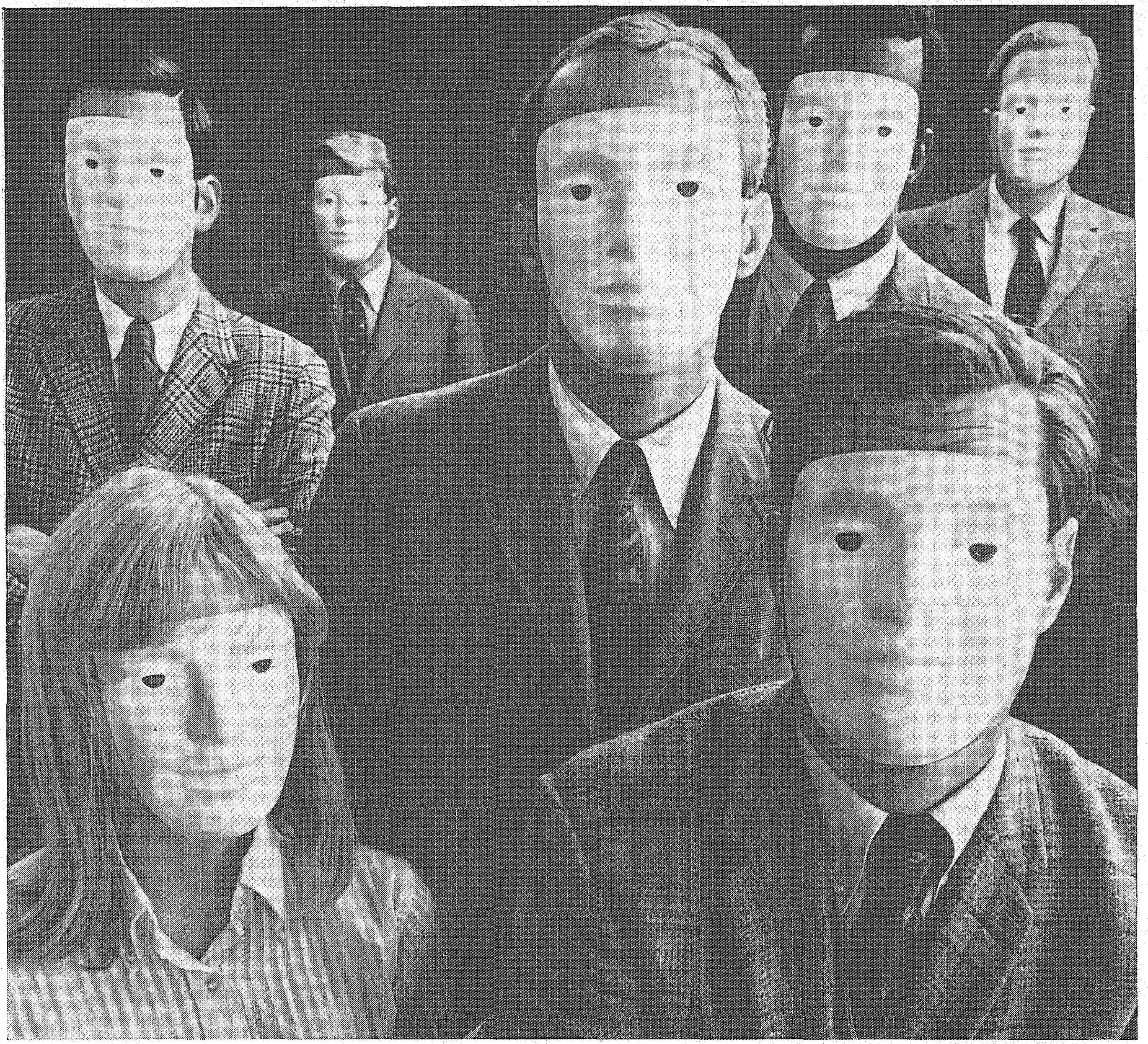

Do you have to give up your identity to make it in a big corporation?

You've heard the stories:

One big corporation forbids you to wear anything but white shirts.

Another says it wants you to be "creative"—and gives you a 4-pound rule book telling you exactly how to do it.

Yet another doesn't want you to buy a more expensive car than your boss because "it wouldn't look right".

Is this really happening in American business?

Have companies become so rigid and fossilized that they're scared of people who don't fit the "norm"?

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Work in a Going Growing Minnesota

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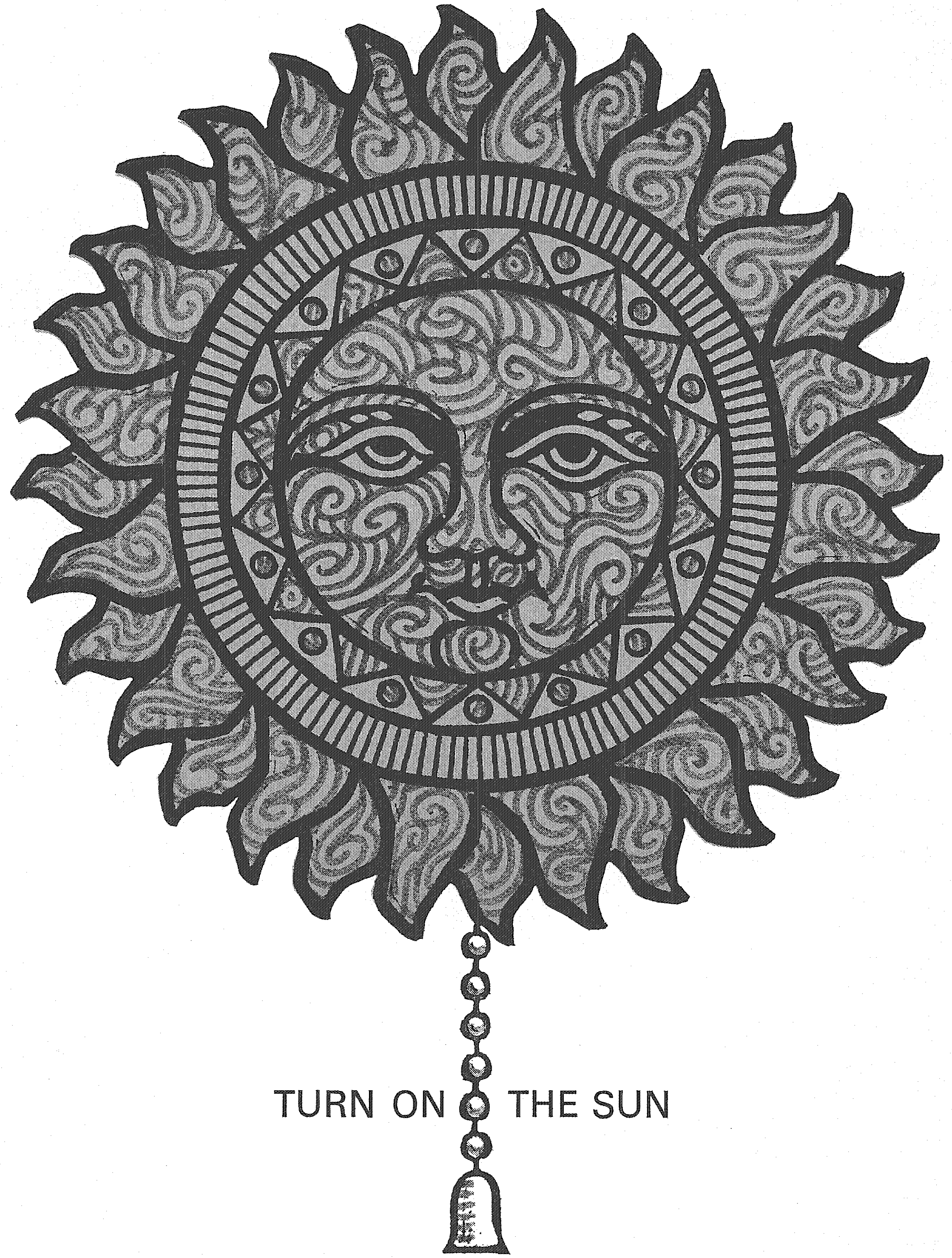
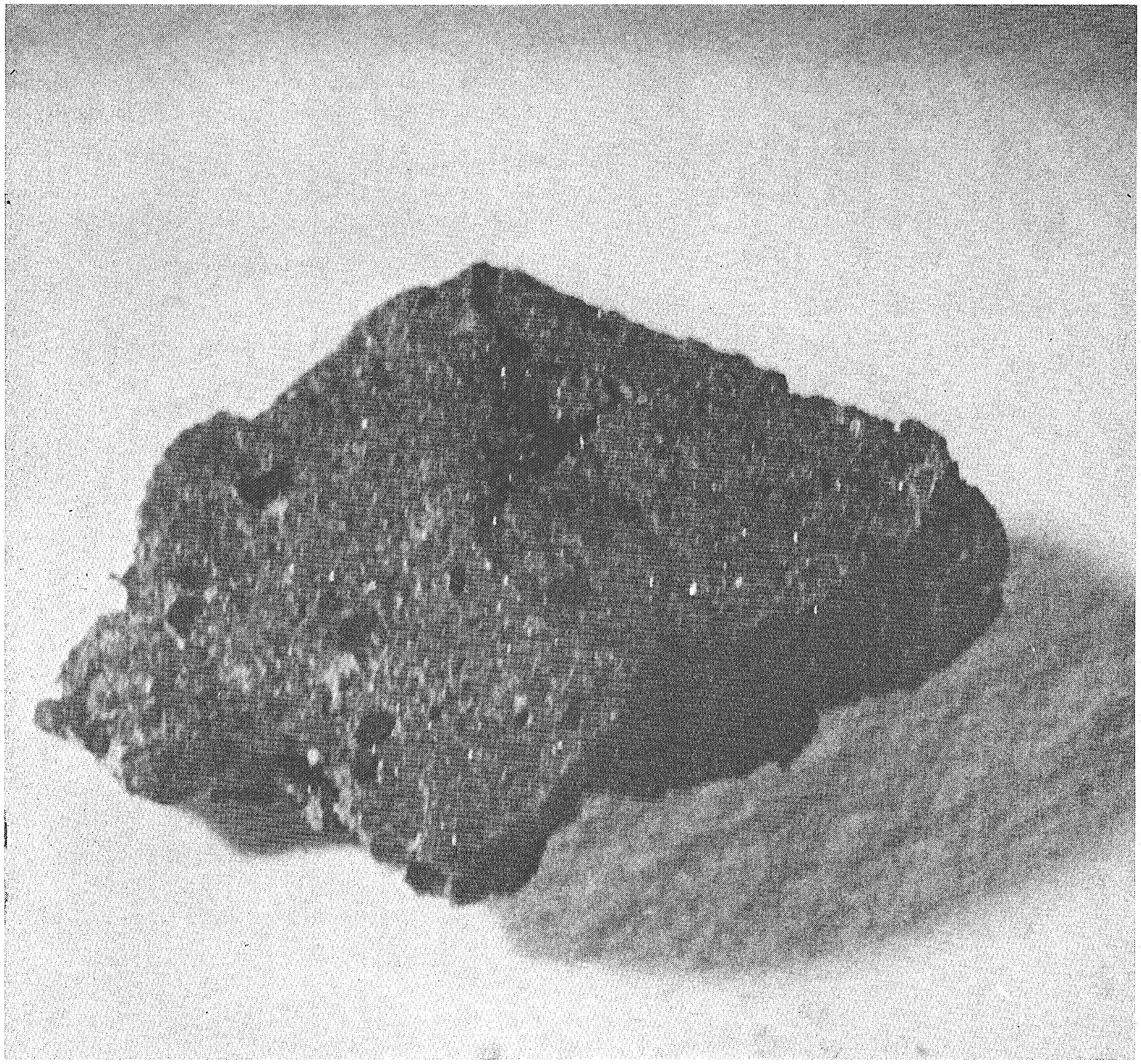
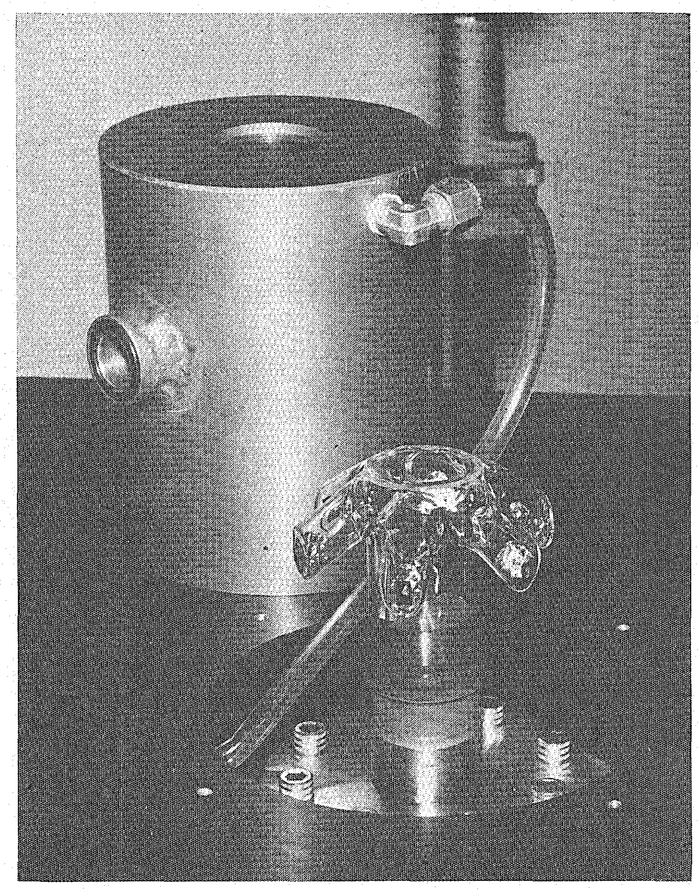


The Dawning of

The Age of the Moon

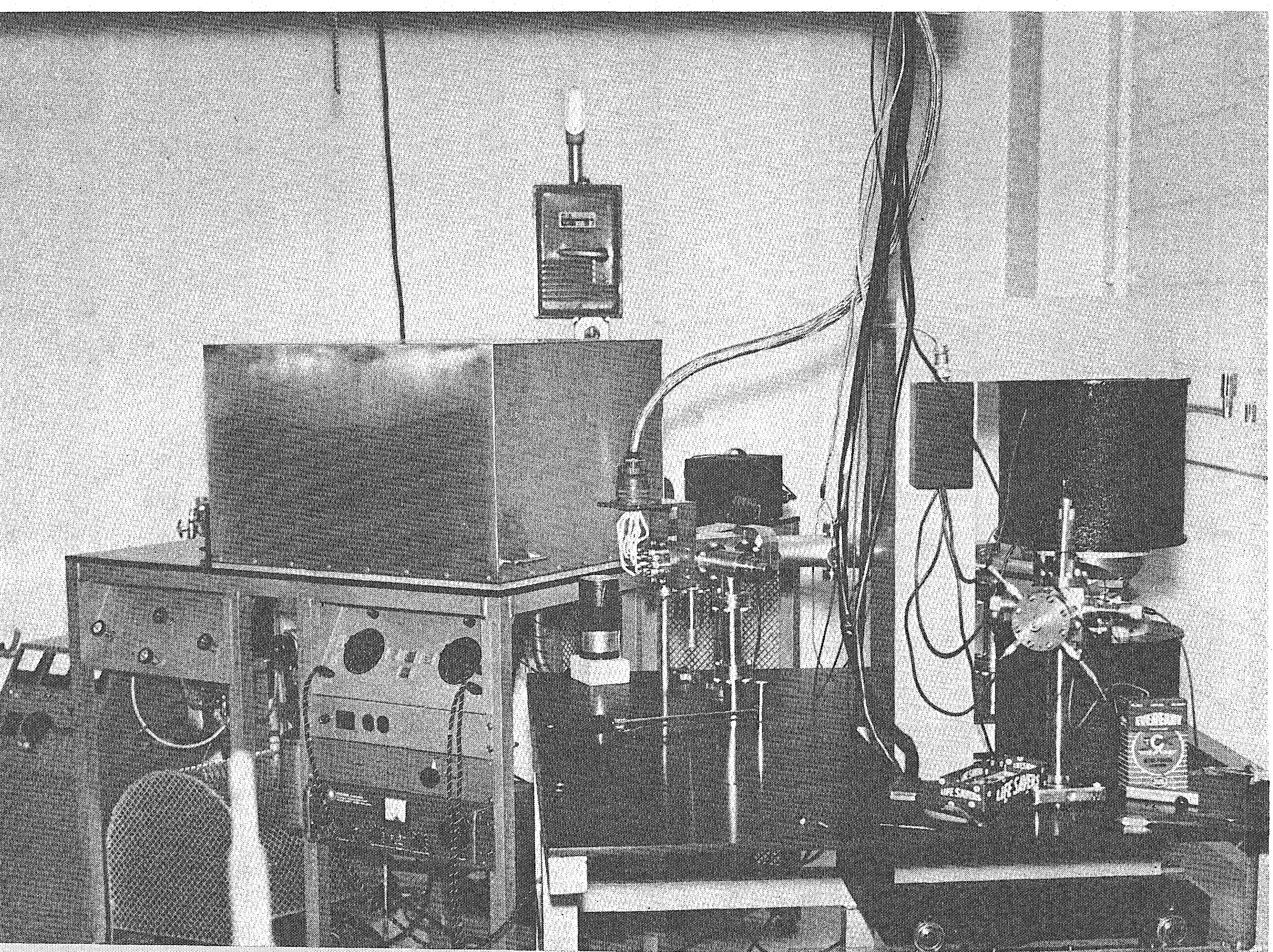


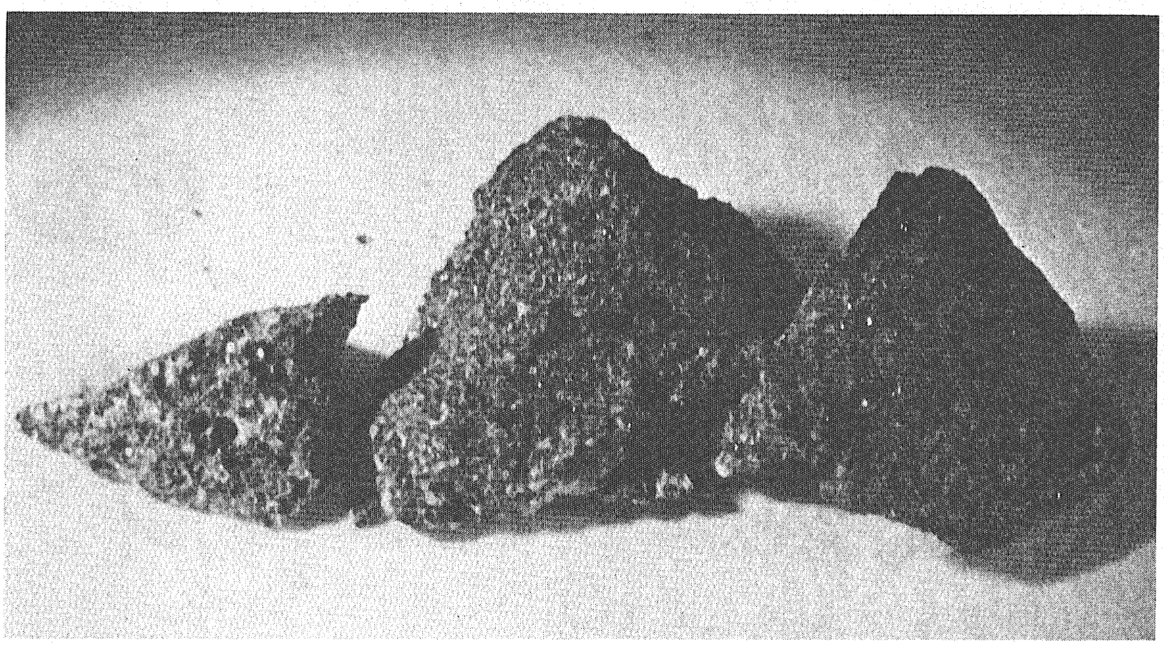
For More Moon Material ☞



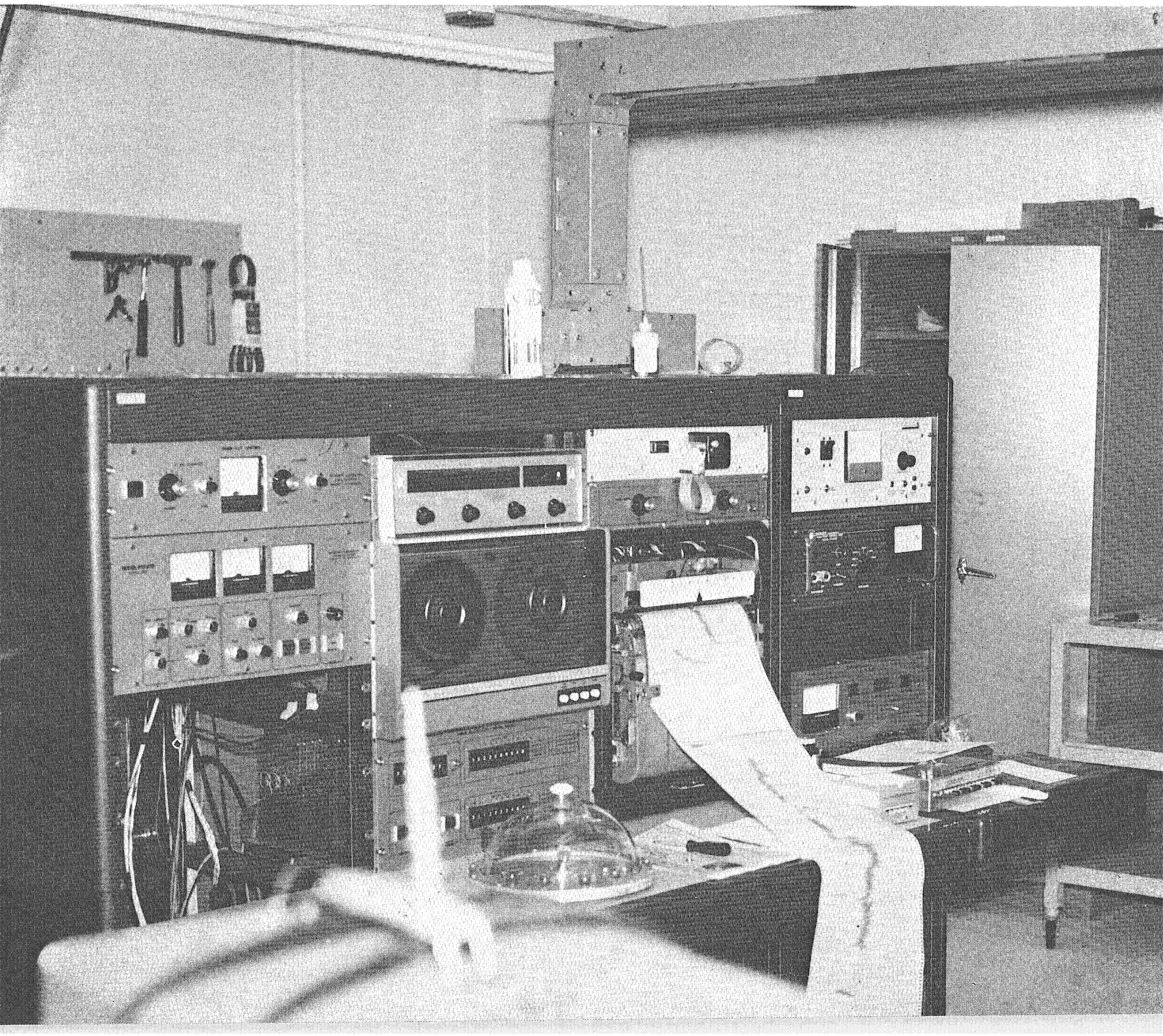
Dr. Pepin will analyze his lunar samples by

first wrapping them in nickel foil and placing them in the glass tube (left). After the cover is put in place, the samples are moved to the center of the tube by a magnet where they are dropped into the vacuum chamber. Here, in a vacuum, the samples are heated and vaporized. The freed gases go into a black box (shiny metal box on table, below) where the "gaseous sludge" is passed over hot titanium metal, which has the property of reacting with every thing except the inert gases. The pure inert gases then are analyzed by the spectroscope (on right of bottom picture). The data from the spectroscope then is sent over to the analyzer and graph (right). The graph of the analyzed data tells Dr. Pepin the relative abundance of the various isotopes thus giving him the information needed to calculate the age of the samples.





photos by BARRY BRIDGES



Dr. V. Rama Murthy (left) and Dr. Robert Pepin talk about their recent acquisitions (in glass hemisphere, lower right).

by RODGER WHIPPLE

A little piece of the moon belongs to Minnesota.

It is here on Earth, at the University, in the form of a 25 gram sample that will be divided between Dr. V. Rama Murthy of Geology and Dr. Robert Pepin of Physics. Actually, the sample is larger than was expected; the proposal accepted by NASA in 1967 called for only five grams.

Drs. Murthy and Pepin are working on separate proposals, which means that two of the 142 proposals accepted are at the University. In order to find out more about the work that will be done on the samples and the reasons for the scientists' interest, we interviewed Dr. Pepin in the Space Science Center.

Dr. Pepin will be doing rare gas studies on the moon samples by boiling the gases out of the rocks by vaporizing them at high temperature and running the gaseous sludge over hot titanium metal which reacts with everything except rare gases. The gases will then be put into a mass spectrometer and analyzed. It's not quite as easy as it may sound though.

Analyzing lunar samples involves the same sort of testing as in analyzing meteorites. However, there are problems facing the investigators that are not solvable in the laboratories including problems in theoretical astrophysics that deal with the creation of the elements, stellar-nucleo synthesis, and how the elements got into the pre-solar dust cloud. Meteorites and lunar samples can help the investigators form the boundary conditions for the formation of the solar system.

Meteorites are useful because their age is comparable to the age of the solar system—four and one-half billion years. After cooling, the meteorites essentially are in thermal isolation, but it is not understood where they come from. It is thought that they come from the region of the asteroid belt, but it now seems apparent that material could be kicked off the moon and perturbed by the Earth in such a way that they seem to have come from a region of the asteroid belt.

Not only is the point of origin not known, but neither is the time of origin. If the meteorites originate in the asteroid belt, it is possible that they result from the collision of two asteroids. The objection to this theory is that it would take so much energy to change the velocity vector that there should be evidence of heating and shock, but many meteorites are found without any such evidence. So some scientists suggest that the meteorites may come from the restricted band of asteroids that cross the orbit of Mars and lies between Earth and Mars.

Scientists are unsure of the size of the parent body, its location, and how the meteorites get kicked into an Earth intersect orbit; scientists do, however, have an idea of when meteorites are kicked off the parent body. By radioactive dating techniques, the meteors are found to be between four and four and one-half billion years old. By determining what elements are formed by high energy cosmic ray bombardment interacting with the material, scientists can tell how long the meteorites have been exposed to space. Generally the ages vary from 10 million to 75,000 years. The question is: where were they before they were exposed?

A high energy proton flux of five protons per square centimeter per second through any one square centimeter in space with an average energy of three billion electrons will penetrate about a meter of terrestrial rock, which is a good approximation of meteorite material. In the penetration, it will produce high energy nuclear reactions by spallation reactions producing some rare gases such as helium, neon, argon, and some krypton and xenon, in very typical abundance patterns. By calculations and theoretical knowledge, the age of the exposed sample can be calculated.

The investigators have both meteorites and the Earth to study, but they do not know how or when the meteorites were formed and the Earth is too young in the accessible regions and the core and mantle are too inaccessible.

The moon samples provide an advantage, if lunar dirt is being studied and not meteorites. It is not probable that the samples picked up were foreign because they would have hit the surface hard enough to be vaporized or buried. In addition, the rocks on the surface are probably those thrown out of the interior due to the explosion of meteor impacts. If it is moon rock that is being studied, the scientists have an unparalleled advantage in knowing where in space the material came from at the moment of sampling, where the parent body has been for at least three billion years, and exactly where the body was when samples were taken.

It is not really known whether the

moon was orbiting Earth before three billion years ago, which leaves one and one-half billion years unaccounted for. There are three current theories dealing with the formation of the moon.

The first theory is that some dynamic instability in the rotating gas and dust cloud that became the Earth caused it to fission and there was then a double planet formation. The objections to this are that the chemical density of the bodies should be the same, but it has been known for some time that the moon is about one percent of the mass of the Earth. We apparently have no right to a moon as large as our moon. It is actually comparable to Mercury in size, although our moon is not the largest moon in the solar system. Jupiter has larger moons but they are small in comparison to the size of the planet and are distributed in the same pattern as the planets are in relation to the Sun.

The second theory was first suggested by Darwin. He saw the big hole in the Earth that is the Pacific Ocean basin. He theorized that at some point in history there might have been some rotational instability and a glob of material was torn off and became the moon. It was not until the science of oceanography developed that this idea was refuted; it was found that the basin is probably only a few hundred million years old.

However, the idea is current again in a slightly different form. The Earth as a glob of hot material could have been spinning quite rapidly. Then the iron, nickel, cobalt, and some sulfur may have sunk toward the center as the glob cooled, changing the moment of inertia. Then, to conserve angular momentum, the Earth began spinning faster as the weight shifted to the center. If the initial conditions included a fast spin, a condition of rotational instability might have been reached where material of lighter density was thrown off from the region of the equator, accounting for the lighter density of the moon. However, once material is thrown off, it is more likely to cause a condition like Saturns rings, or the material will be lost in space. A long distance from Earth, material will not pull itself together. The mutual attraction of particles will cause the particles to move together but if they are near a third body, a gravitational shear is formed across which the particles cannot join. No one has figured a way for dust rings to join and, theoretically, planets can be built in size only up to one-tenth millimeter in diameter. Obviously nature finds a way to create larger bodies, though. The answer probably lies in the area of magnetic and electromagnetic attraction. Scientists are just beginning to work on this problem.

The third theory is a "dues ex machina" theory. It is theorized that the moon is a completely independent body that was wandering through the solar system and was captured by Earth one afternoon and has been here ever since. This means that it might even have been formed before the Earth. It is known that some of the meteorites were formed a couple hundred million years before the Earth was formed. Therefore, it is hoped that the surface of the moon preserves a complete history of the body.

The preliminary data coming out of Houston dates the moon samples at 3.1, 3.3, and 3.5 billion years; these dates are older than anything that can be found on the Earth's surface. These dates cause a great deal of excitement among scientists because the samples are from the first samples that the astronauts picked up. Not only that, but the samples were obtained from a mare which is considered to be considerably younger than the mountain highlands. It seems certain that somewhere on the moon there are rocks four and one-half billion years old. If so, the moon becomes extremely exciting because it contains the whole history of the solar system.

This magnified view of the lunar dust shows the angular character of the material.

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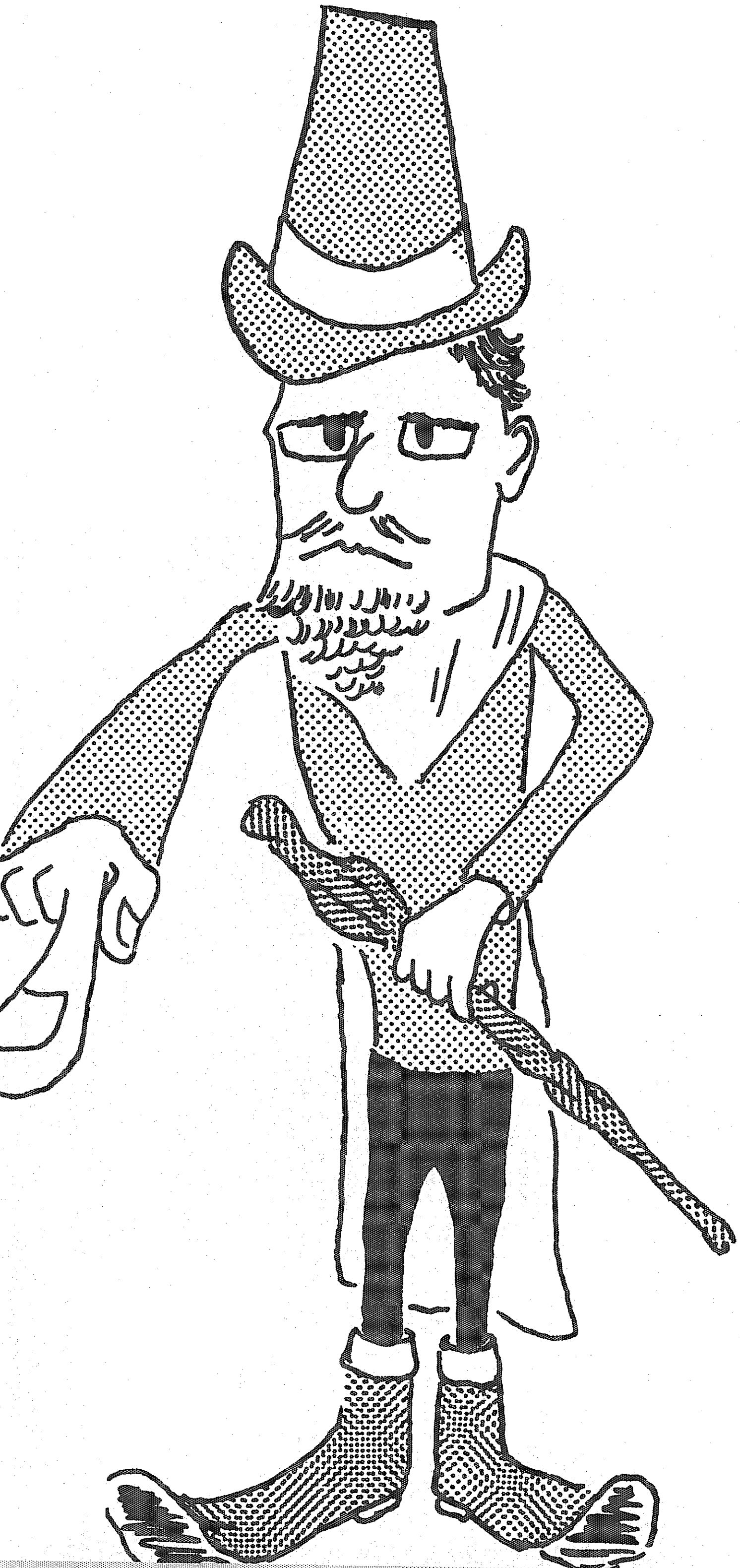

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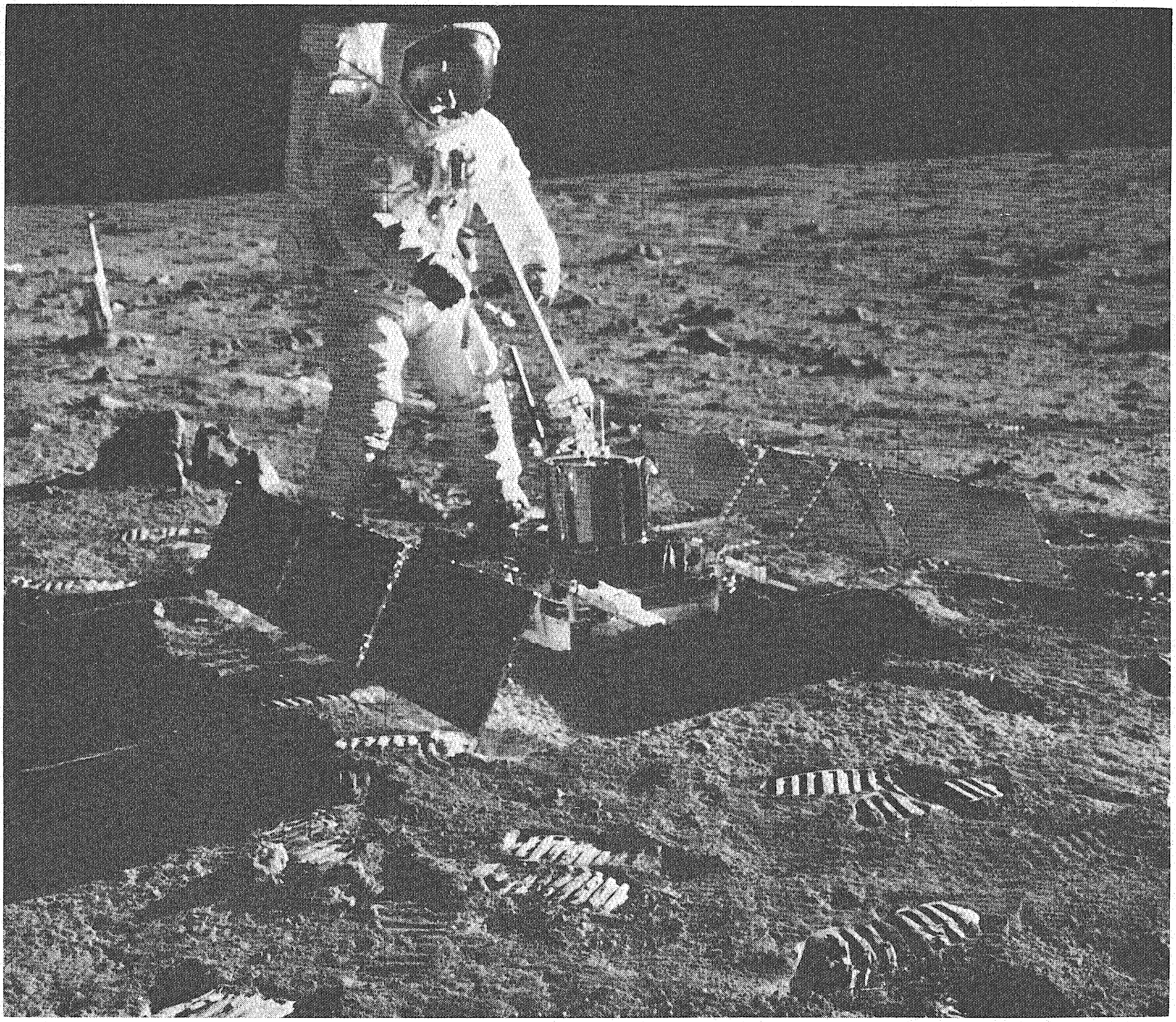
One Small Step . . .

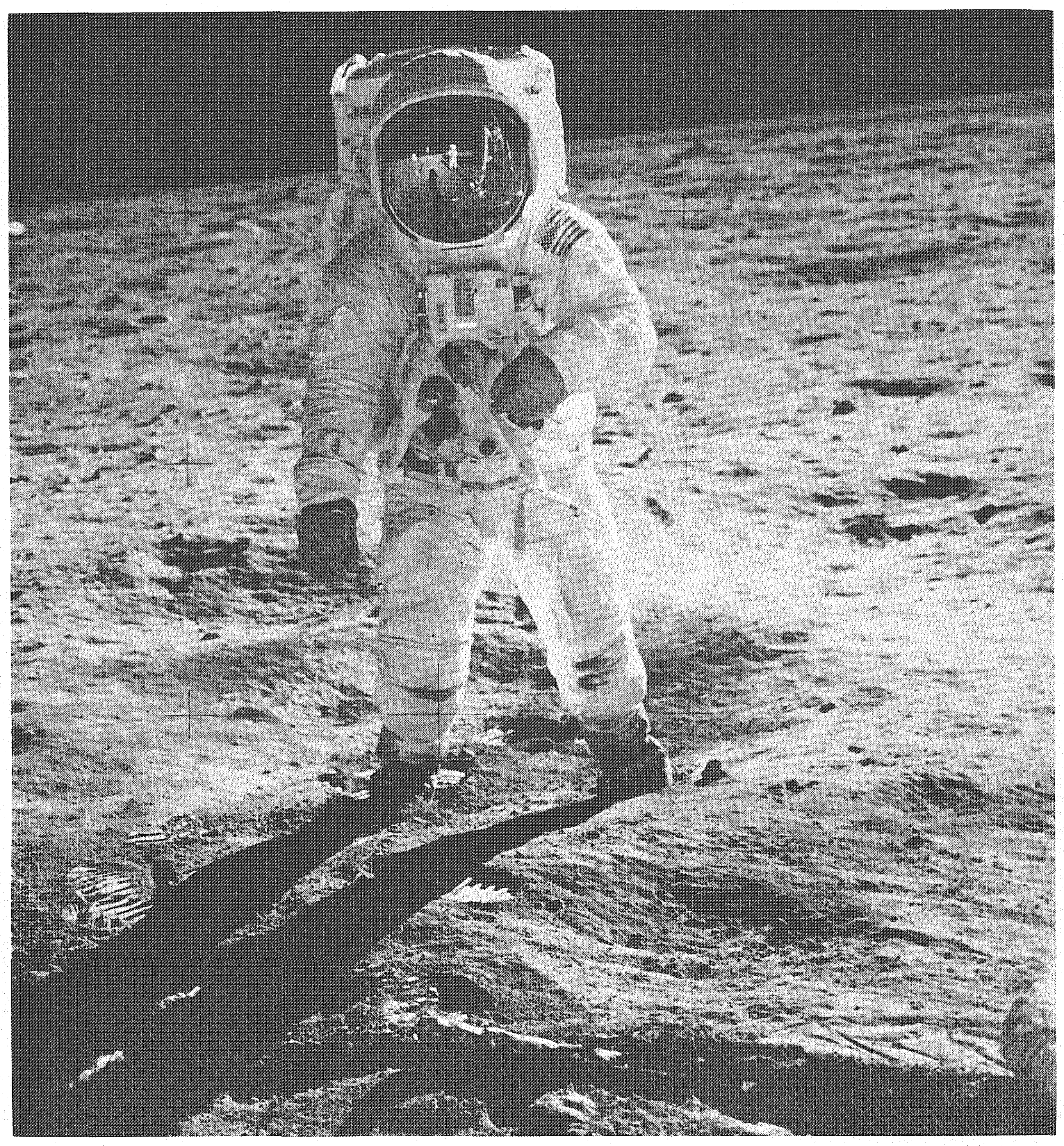
photos by NASA
edited by MARLIN REKOW



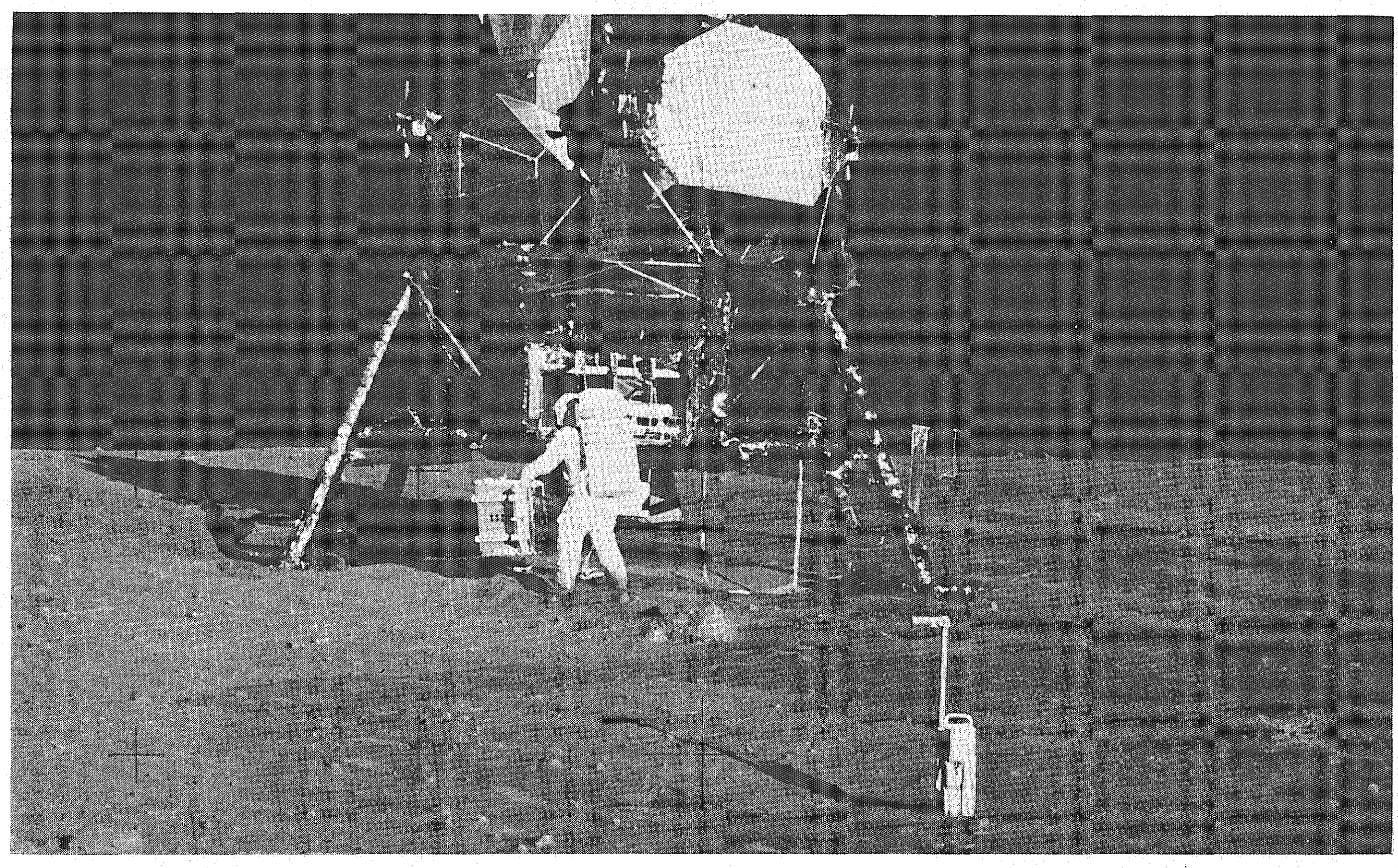
Astronaut Edwin E. Aldrin, Jr., lunar module pilot for the Apollo 11 mission, deploys the Passive Seismic Experiment Package component of the Early Apollo Scientific Experiments Package during extravehicular activity on the lunar surface. The photograph was made by Astronaut Neil A. Armstrong, commander. Note the astronauts' footprints in the foreground.

Photography was one of the skills that the astronauts had to acquire. They shot 16-mm motion-picture film, 35-mm film with a stereoscopic camera, and 70-mm film with a Hasselblad camera for snapshots.

The Apollo capsule has an environment like that of a modern airliner; it is pressurized and air-conditioned, giving the crew freedom of motion.



Aldrin walks on the surface of the moon.



Aldrin prepares to deploy the Early Apollo Scientific Experiments package on the lunar surface. In the foreground is the Apollo 11 35 mm stereo close-up camera.

One measure of the pace of progress in space is power: the thrust of the escape rocket engine in Apollo 11 was twice that of the original Redstone rocket that launched the first Mercury manned flights.

Saturn 5's rockets deliver more thrust than 100 jet airliners.

There are 24 instruments, 566 switches, and 71 lights on the panel of each command module.

There are more than two million functional parts in each Apollo command module; it uses about 2,000 watts of electricity. Over 587,500 inspection points have to be checked before each launch.

Mission commander of Apollo 11, Neil Armstrong, a civilian, was a pilot in NASA's X-15 research aircraft program, a Naval aviator, and flew combat missions in the Korean conflict. He has a degree in aeronautical engineering and was named an astronaut in 1962.

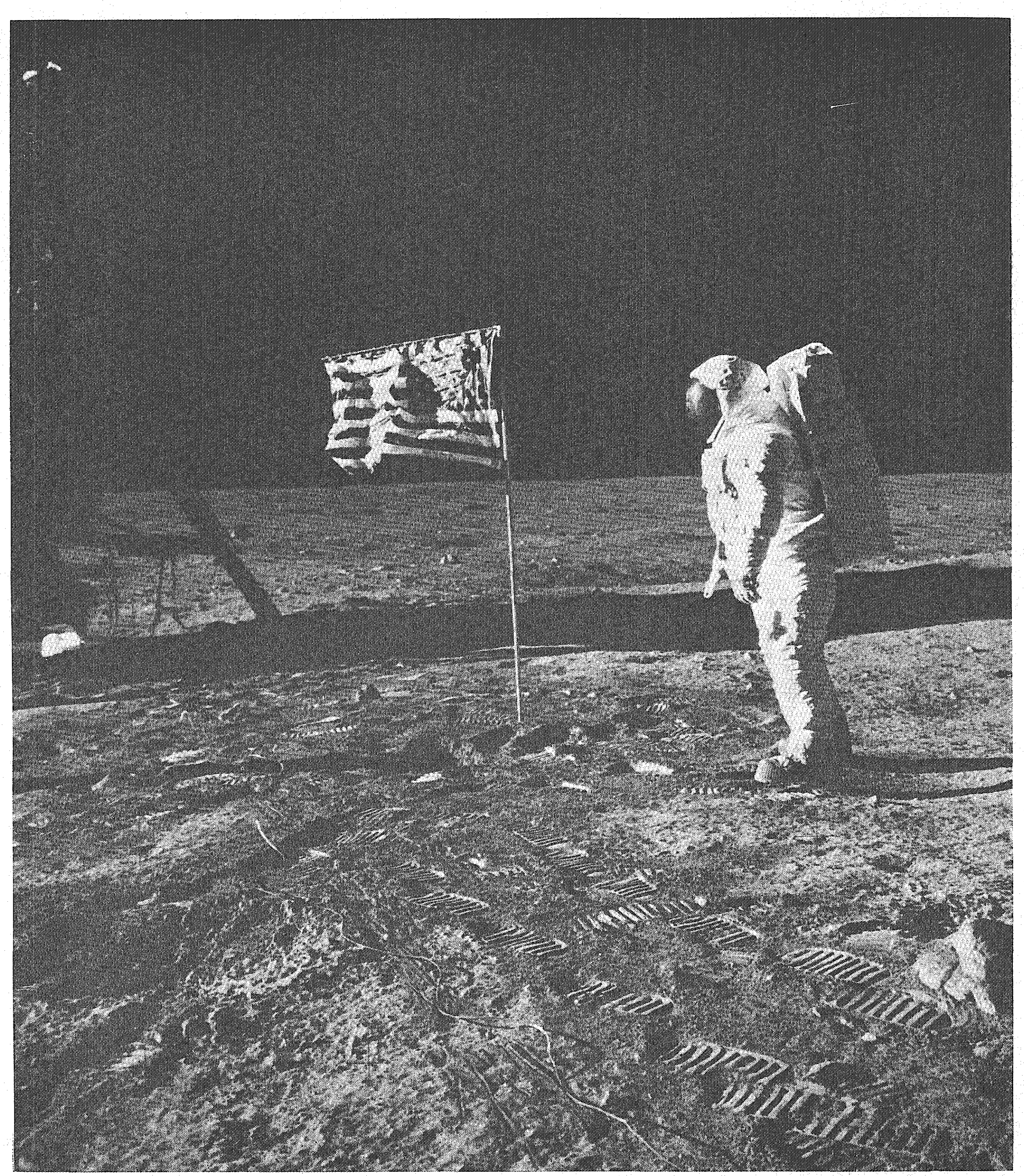
More than 300,000 men and women have been involved in the national space program; 23,000 of them are employed at the Kennedy Space Center. (Some sources say that the Russians have 2 million people involved in their program.)

According to the U. S. Dept. of Commerce, an average of $5 billion per year has been spent for space since 1960. In the same period of time, Americans spent on the average $12.3 billion a year for alcoholic beverages, $7.9 billion a year for tobacco, $5.5 billion for public-welfare programs, and $5.3 billion a year for radios, TV's and records. Each flight of Apollo costs the U. S. taxpayers about $400 million.

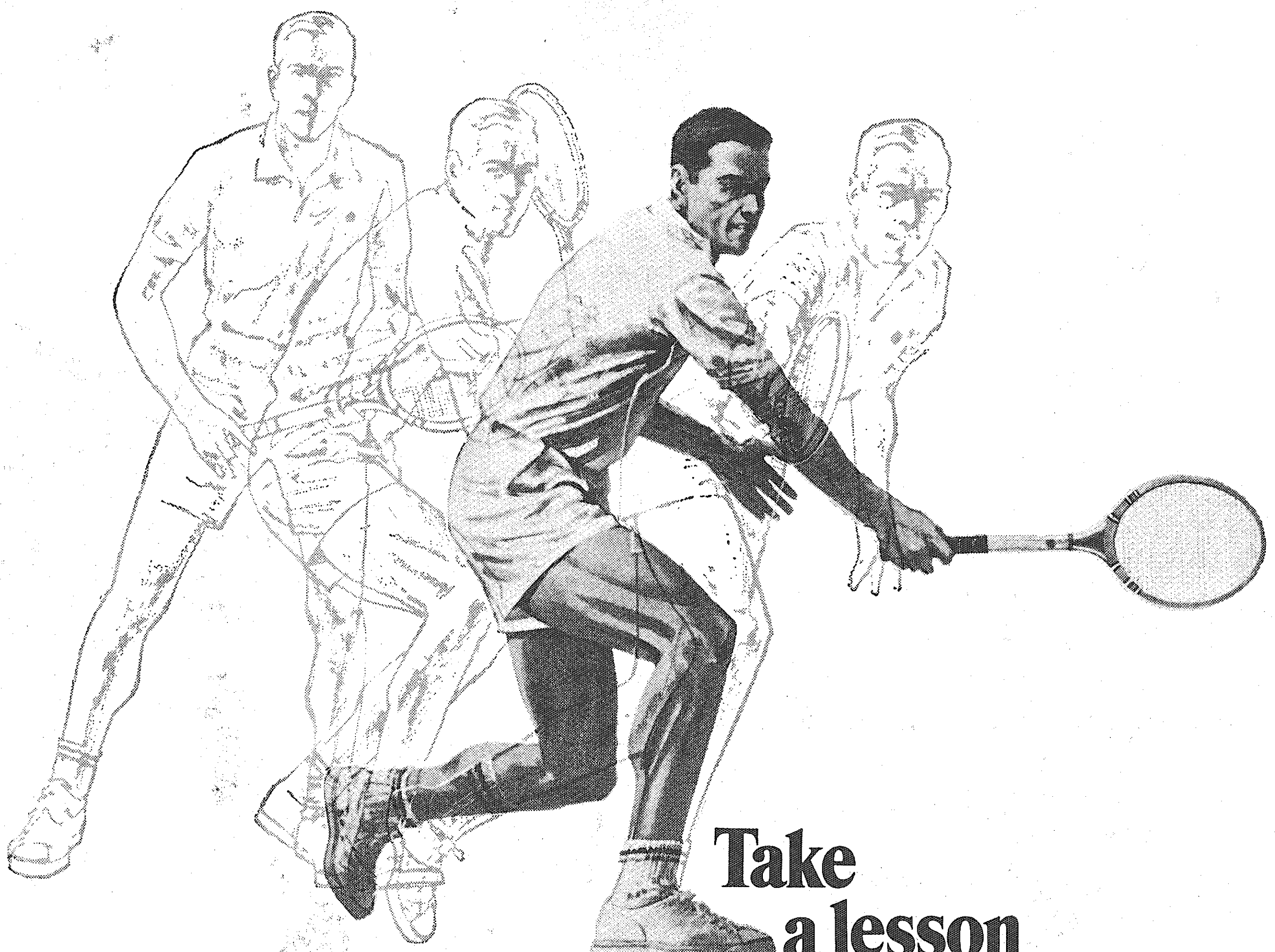
In 1966, the greatest number of spacecraft launches were attempted of any year. Seventy-four were launched but four of them were failures.

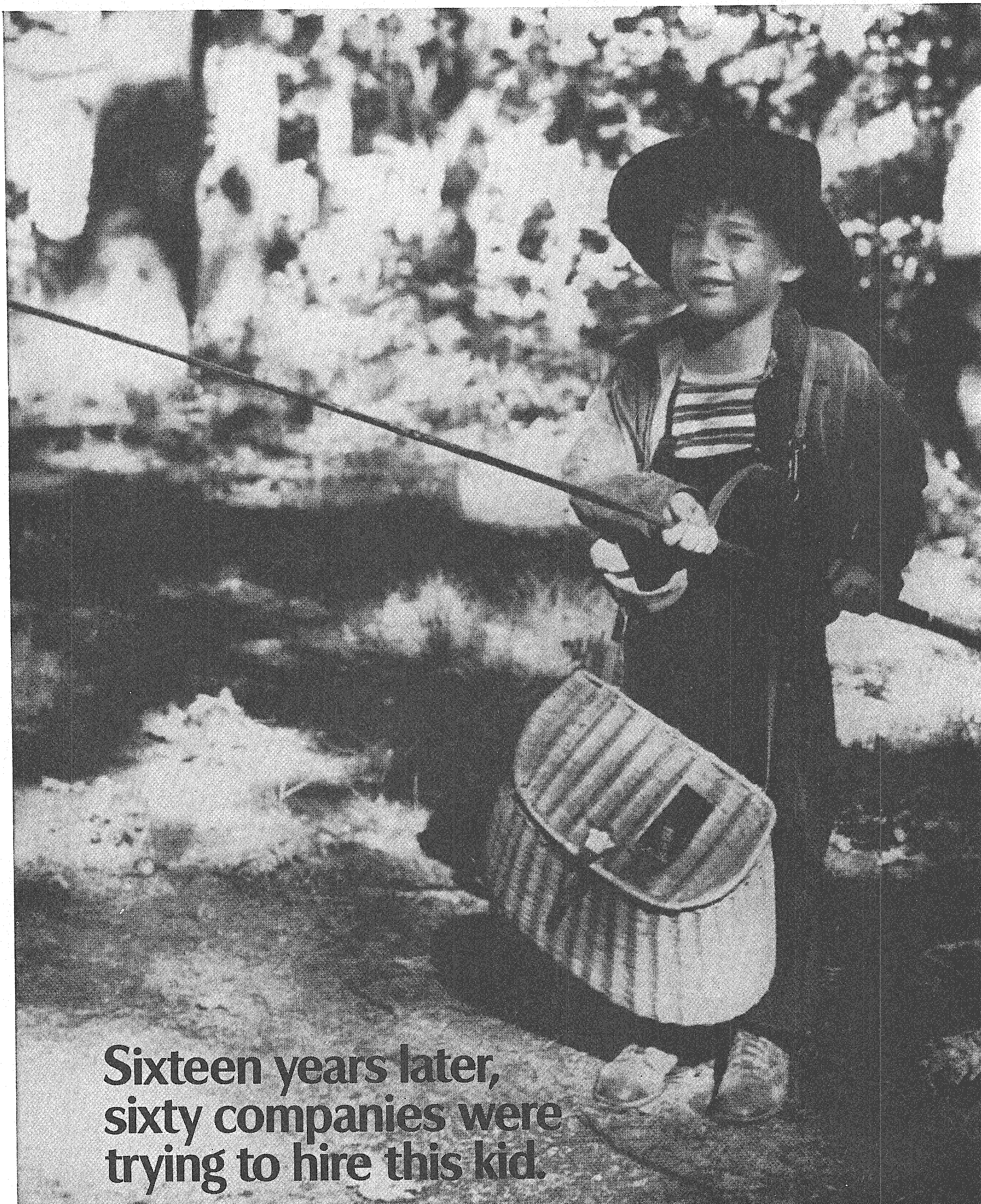
Eighty-five percent of the spacecraft launched from the United States were successes (as of March 31, 1969). The United States has, as of March 31, 1969, launched 592 space vehicles, with 80 classified as failures. There were 964 total launches made from all countries of the world, with 355 of them Russian. There were 391 spacecraft currently in orbit as of March 31, 1969.

Apollo 12, the next manned flight to the moon, is scheduled for November 14, and will be followed by seven planned lunar landings at four- and five-month intervals. Plans call for the next three lunar parties to stay on the moon about 28 to 32 hours per mission.



Aldrin poses beside the United States flag. The lunar module is on the left.




Sixteen years later,
sixty companies were
trying to hire this kid.

While still in kindergarten, science was already moving to make Dennis Twining a hot property.

"By the eleventh grade they launched Sputnik I. The science race was on and I was in it. I started cramming.

"After high school, I had a chance to go to the University of Michigan and work as a research assistant.

"Our project was in a cemetery in case of explosions. Great for dates.

"When I got my metallurgy degree there were sixty companies with jobs for six of us. I checked out the top ten and picked International Nickel. Why?

"Because they gave me the best chance to stay at the front edge of technology and also learn the other half of the equation—business.

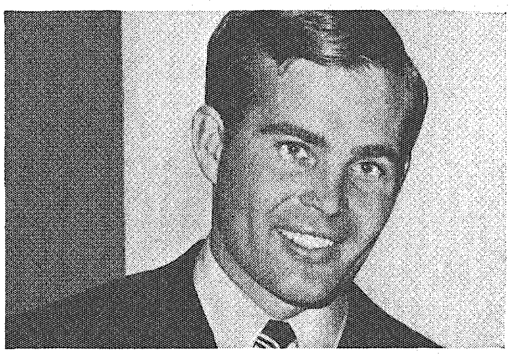
"It worked.

"I spent the first year in research. Then moved on to marketing—Chicago, Hartford, and now New York. Fantastic city.

"I'm responsible for development in mainstream markets—motor freight, containerization, construction equipment.

"Here I am on Wall Street, past halfway to my MBA at NYU with a thousand opportunities in front of me.

"Yes, Sputnik took me quite a way."



Nickel helps other metals resist heat, cold, impact, pressure, abrasion, corrosion...to advance engineering in vital fields—power, desalination, electronics, transportation, aerospace.

We're doing everything we can to produce more nickel. Searching around the world—Indonesia, Australia, Guatemala, Canada. We've found ways to extract nickel from ores thought too poor to mine a few years ago.

We count our blessings and respect our surroundings. From nickel ores, we recover platinum, palladium, twelve other commercially useful elements. Make iron pellets for steel. Convert smoke in our stacks to chemicals for other industries. On sand left from processing ore, we grow meadows of hay.

We are 33,000 people hard at work in 18 countries—miners, researchers, market builders. We bring opportunity to underdeveloped lands, new technologies, new payrolls, new tax income.

Nickel in the ground is useless. We put it to work.

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The International Nickel Company, Inc., New York, N.Y.
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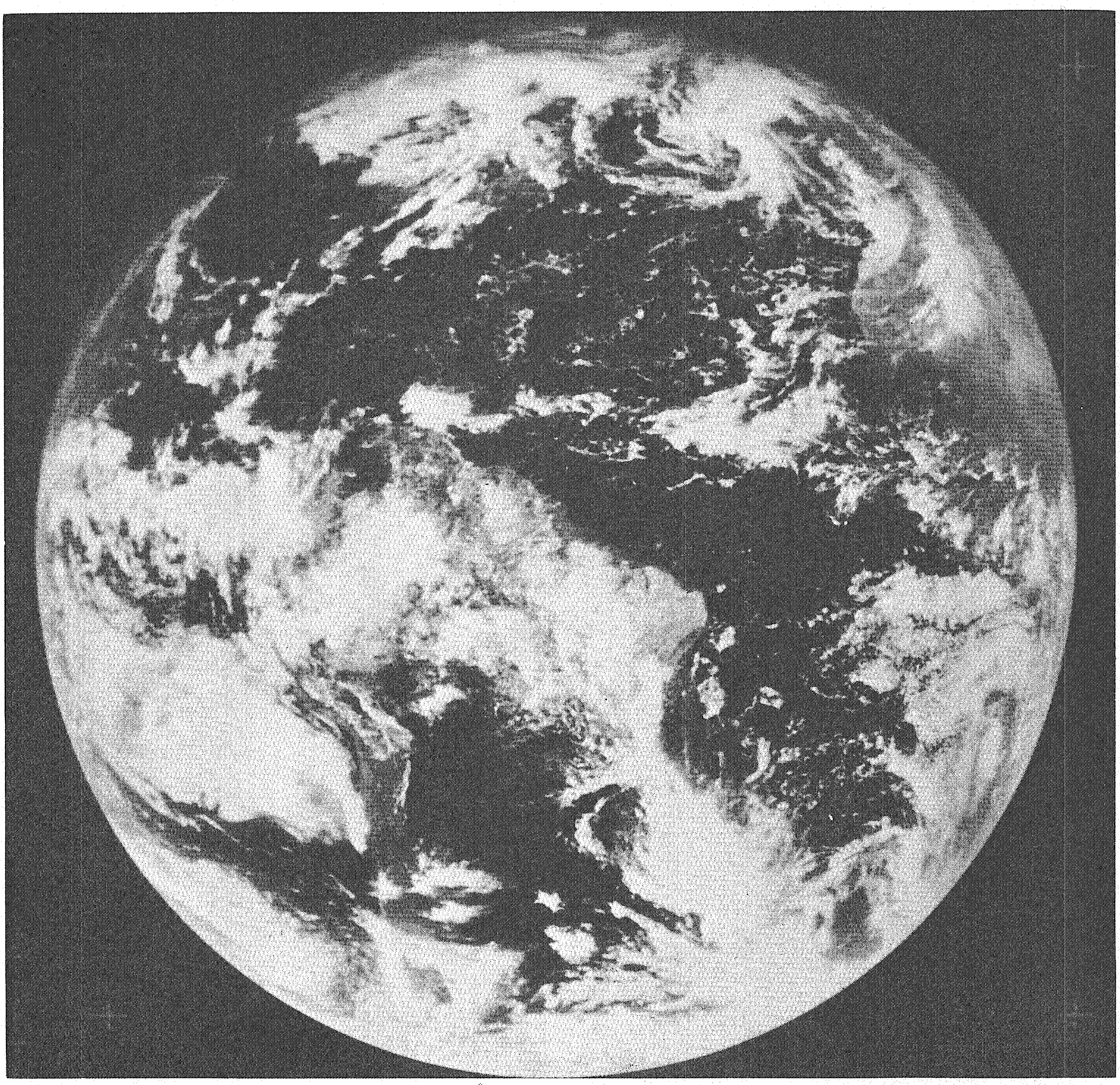
The Earth Orbiting Satellite



A view of the earth from 22,000 miles high. The Advanced Technology Satellite *from which this picture was taken was stationary over the mouth of the Amazon River. The outline of South America can be seen under the cloud cover.*

—A National Resource

by L. J. CAHILL, JR.
Director of Space Science Center

A world wide weather prediction system accurate enough to warn farmers in India as well as in the United States of a dry, hot June, to tell ski slope operators there will be heavy snow in December, to forecast the path of hurricanes; a global survey of pollution of our air and water, even of the major sources of pollution; a forest management operation that includes detailed photographic surveys every month to help in planning fire control, new planting, harvesting; a global navigation system that could tell even small boats and planes their exact locations; an iceberg patrol for the North Atlantic that could provide ship captains with the locations of icebergs near them—these few items could be extended infinitely as possible uses of a highly developed national resource, the earth orbiting satellite. The satellite is only part of a complex data gathering system that makes the plans mentioned above at least feasible. All these plans require data from a sizeable portion of the earth's surface and most of them would benefit from rapid collection of these data. Some similar plans are already in operation, others require further development of sensing devices. Perhaps the greatest need is to make people aware of the potential of the satellite data gathering system to solve their data acquisition problems. In the next few paragraphs I'll outline the system and give a few examples of its use in collecting large quantities of data.

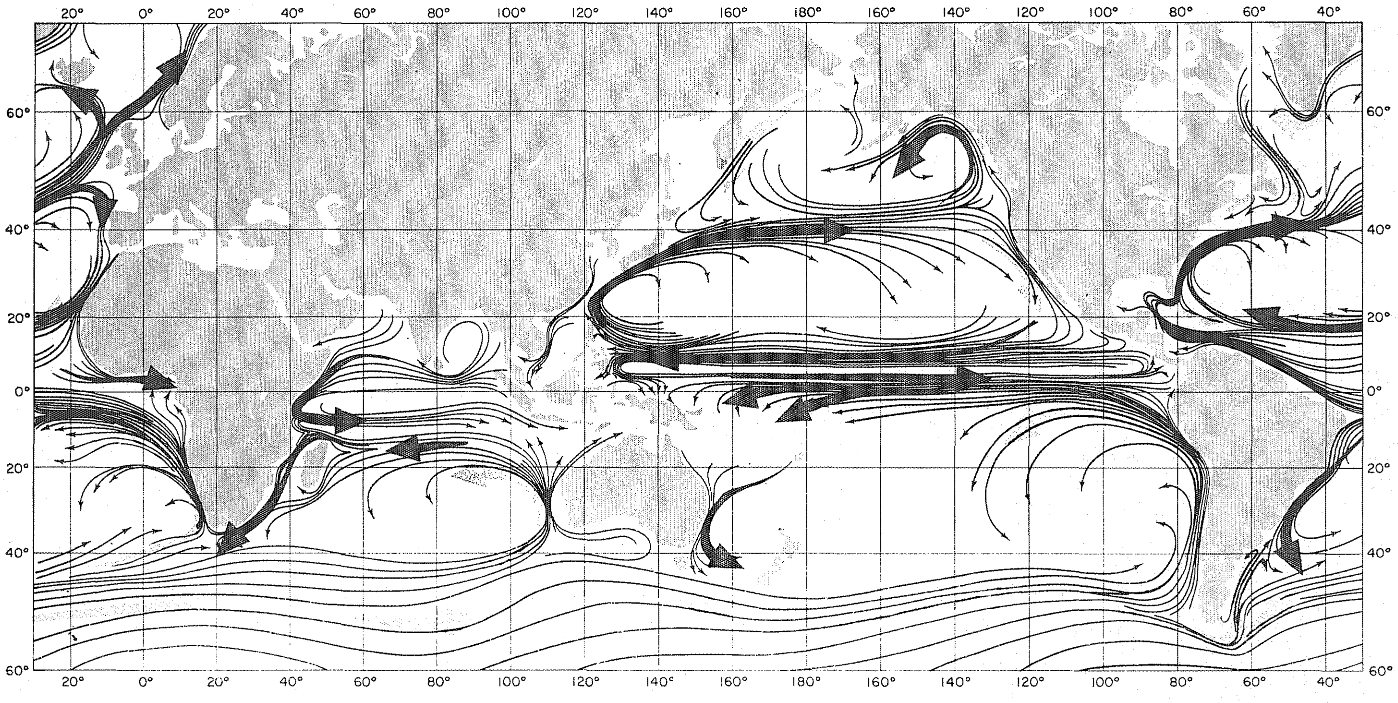
The system, developed principally by NASA during the past decade, starts with a capability to design and build light-weight, reliable satellites including sensors, transmitters, solar cell power systems and onboard data processing equipment. At present we expect one to two year lifetimes from satellites in orbit and many have exceeded expectations. The satellite launch capability is on hand, already developed and paid for. Cape Kennedy is the prime launch site with backup from sites on the coasts in California and Virginia. Satellite telemetry signals are received at a half dozen major sites around the world—in Australia, Africa, Alaska—as well as a score of small special purpose reception sites. The data is returned to the U. S. on magnetic tape, usually by commercial airlines, to be cleaned up, decoded, and edited by computer controlled data processing lines. One of the largest group of processing lines operates at Goddard Space Flight Center in Maryland. The user gets his data, typically on digital magnetic tape, ready for further processing. Here is the greatest bottleneck at present, the user. Some people are skillful at handling large amounts of data; others are overwhelmed. A sensor on a satellite performing one measurement each second, twenty-four hours a day for a year will produce 30 million measurements. Although the computer is adept at digesting large amounts of data, it can't cope with unexpected results, can't make decisions in situations not foreseen by the user. Processing and distributing data rapidly in a form that will be meaningful to the farmer, ski slope operator, city pollution control office, or forest ranger seems to be the key problem in utilization of this tool.

Suppose a sensor can be developed that can detect and help us follow the movement of blue whales, or a representative sample of all blue whales. The data might be of interest to conservationists and certainly to the whale harvesting industry. The sensing system might include a miniature radio beacon that pulsed out a signal when the whale surfaced. What kind of satellite orbit would be most suited for whale tracking? Possible orbits are limited by the rules of celestial mechanics but there are a few choices. A circular orbit near the equator at a few hundred miles altitude was very popular early in the first decade of satellite flight. It economically uses the earth's spin to get part of the needed orbital velocity but, if launched from Cape Kennedy, only travels over the lower altitudes. An elliptical orbit, with the high point out several earth radii, allows you to see most of one hemisphere but perhaps the sensing system must be closer to the whale. The circular "geostationary" orbit, with orbital period 24 hours, places the satellite fixed 20,000 miles over any chosen point on the earth's equator. If the whales were vacationing below Hawaii this would be good. A circular twenty-four hour orbit with the circle tilted 45° to the equator would result in a satellite surface trace moving 45° above and below the equator in latitude each day but at a fixed longitude. The geostationary orbits are particularly suited to communications, where a signal can be bounced from one hemisphere to another or where most of the hemisphere under the satellite could receive a radio or TV program. Considering the life of the blue whale, a low altitude circular polar orbit is probably best suited to his travels. Launched directly south, the satellite passes over both poles during each orbit. If it is launched at local noon it will cross the equator on the opposite side of the earth at local midnight. In the next orbit, an hour or two later, it will again cross the equator at local noon but at a location two hours, 30°, further west of the launch site. In about a week, it will have traced out a tight grid (spacing a few degrees in longitude) over the earth's surface. Any particular whale would be missed on some of the orbits. Two launches 90° apart in longitude would improve the survey. Of course the whale sensor could be one of a great many sensors on a large satellite.

Two examples may suggest the advantages of the satellite data gathering system. An infrared radiometer was one of many experiments on the NIMBUS II satellite in a polar orbit at 600 mile altitude in 1966. The sensor was a high resolution instrument with a lead selenide photoconductive cell sensitive to radiation in a band from 3.5 to 4.2 microns. It was designed to detect surfaces radiating at temperatures between 210°K and 330°K. The 0.5° field of view resulted in a scan spot on the earth about 6 miles square. The results of successive passes were plotted as isotherms with 5°K separation. The boundaries of the Gulf Stream were clearly seen as a sharp 10°K change over a 6 mile distance. The Gulf Stream was near 300°K while the cooler surrounding water was below 290°K. All of the warm and cold surface currents in the oceans were easily plotted in a few weeks with data from this experiment. Utilization of regularly prepared maps of the currents could produce financial benefits. Slow cargo vessels could shorten transit times by hitching a ride on the currents. The fishing industry could benefit in searching for schools of fish; they generally follow the colder currents that are more rich in food.

The second example is a dramatic increase in the accuracy and speed of making magnetic surveys of the earth. Such surveys started back at the time of Gauss, when intrepid geomagneticians carried delicate magnetometers over the earth by foot, pony, and dog sled. The motivation then was pure science, how does the geomagnetic field work, as well as practical benefits to shipping—the magnetic compass was a central feature in the navigation process. Setting up to take a magnetic measurement could take several hours and surveys operated on a time scale of decades. Even then large gaps in data coverage existed over the north and south poles and much of the oceans. Recently magnetometers have been towed by airplanes over some parts of the earth, improving the speed with which mining companies search for ore deposits. The POGO (Polar Orbiting Geophysical Observatory) II and IV satellites carried precise magnetometers into polar orbits starting in 1965. In the initial 10 day period POGO II collected more data, more precisely and with complete worldwide coverage, than had been collected in the past 100 years. The data collection continues and has permitted studies that were beyond the reach of geophysicists of past decades. For example, it appears that the earth's magnetic dipole moment is presently decreasing by about 10% in fifty years. This is probably the first direct observation of the process that has changed the geomagnetic field direction several times in geological time. Accurate knowledge of the earth's magnetic field is important to geologists studying the earth's history, to the mining industry, and the magnetic field is still quite useful as a navigational aid.

There are many benefits (to the public) of the national space program; some are indirect, subtle, and long range. I believe that one of the greatest benefits is the role of space exploration as a great human adventure. Such adventure stimulates creativity, encourages rapid technical growth, fosters cooperation as well as competition between individuals and perhaps between nations. More immediate, practical benefits may also be expected. Exploitation of the satellite as a data gathering tool is only beginning. This tool, developed at great expense, has a high potential for practical benefit to the public. COMSAT was formed, in the private sector, a few years ago to develop commercial use of satellites to relay messages. Working with second generation communications satellites, launched by NASA for a fee, the corporation is already offering serious competition to the long established ocean cable communications network. NASA is now planning a series of Earth Resources Satellites. New sensors will be developed, new uses will be attempted of the satellite as a tool for solving problems on the earth's surface.



Ocean currents of the world, indicated by the arrows, can be detected by infrared detectors such as those found on the Nimbus *satellites.*

Engineers in Industry at . . .

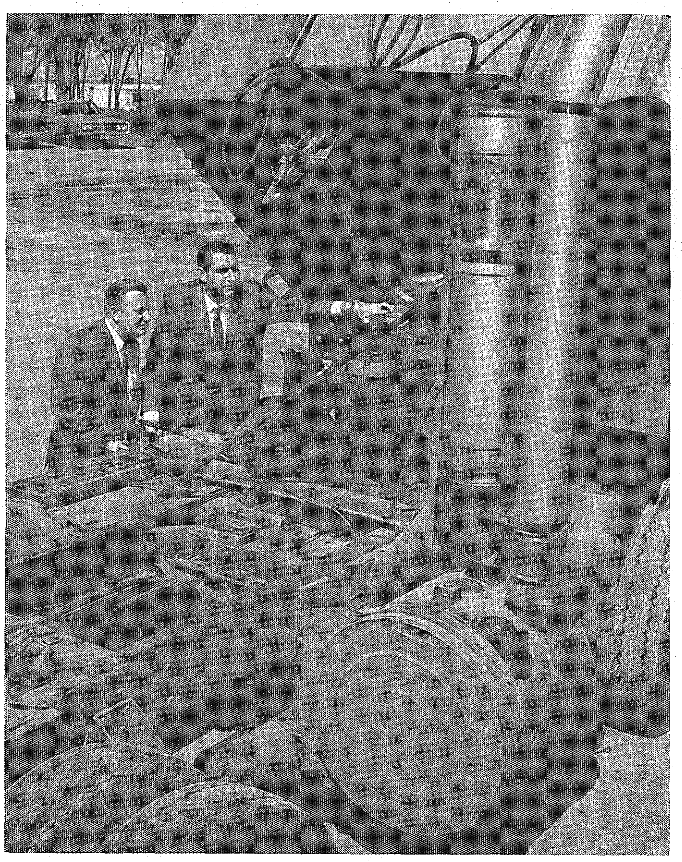
Donaldson Company, Inc.

by WARD T. BELL

One question frequently asked by graduating IT students at recruitment sessions is—"what will I be expected to do at your company?" Obviously, the answer to this question varies with the industry, the company within a given industry, and the particular engineering or scientific discipline within that company. Indeed, a variety of tasks are open to IT graduates at Donaldson Company, Inc.

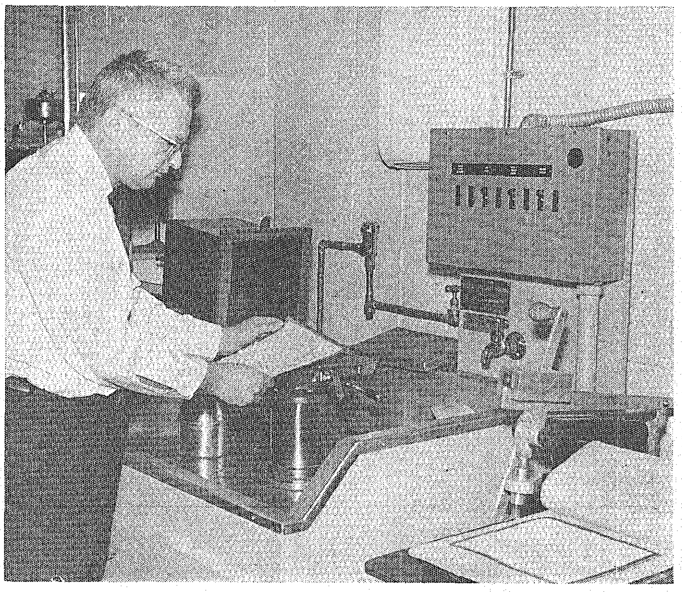
Donaldson Company is the world's largest manufacturer of heavy-duty engine air cleaners and a principal manufacturer of heavy-duty mufflers and silencers, metallic seals and bellows, and other filtration devices. No fewer than 7 scientific and engineering disciplines are represented by our 75 technically-trained employees.

Basically, Donaldson Company operates its scientific and engineering programs by a "project team" approach: i.e., each engineer is responsible for those aspects of a given project that falls within his assigned scientific discipline. The project team may be composed of members of one department, or it may cross departmental lines.



Sales engineers discussing air cleaner installation.

A typical project at Donaldson Company might begin with a *sales engineer* returning from a customer with the bad news that we've been underbid on an engine air cleaner. It seems that a competitor is marketing a new device that is cheaper, lasts longer, and operates better than the air cleaner we are selling to that market. Management must quickly reach a decision: either give up this market, sell to this market at a loss, or develop a competitive product.



Research chemist examining filter material formation.

The decision has been made. Donaldson Company will embark on a crash program to develop a new air cleaner that will win back this important customer.

Research Department *chemists* have not been caught totally unaware of the advances made by our competitor. They have been studying the mechanics of filtration and their effects on filtering materials. They are, fortunately, wrapping up a project that promises to be a breakthrough in the state-of-the-art of filtering.

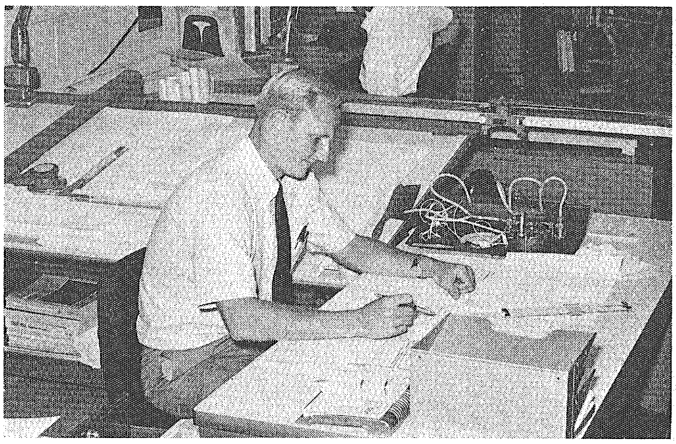
The results of Research Department studies are turned over to Development Department *chemists* who are responsible for applying the laboratory results to actual products. Within this department, *development engineers* work on the air cleaner package. *Materials engineers* suggest a new alloy that would reduce the size and weight of the air cleaner; *design engineers* suggest new body configurations that would increase capacity. The *development chemist,* meanwhile, supervises the first trial run of the new filter material, orders prototype filter elements made of this material, and schedules, with a *testing engineer,* the necessary laboratory tests to prove the performance of the new air cleaner.

The tests conclusively prove that the new air cleaner exceeds all predicted performance requirements. Finalized specifications are prepared, with the assistance of a *quality assurance engineer,* and the air cleaner project is turned over to Production where a *production engineer* is assigned as honcho of the air cleaner project. He assembles a team of *value, quality assurance, reliability, human factors,* and *maintenance engineers* to quickly analyze the new design from a production standpoint. Each engineering discipline contributes input regarding the final production design of the new air cleaner.

After the final design is established, *tool and die engineers* design the necessary tooling, *machine design engineers* establish special machine requirements, *industrial engineers* integrate this new product line with existing production, *time and methods engineers* establish production schedules, and *packaging engineers* design and test packaging materials.

At the same time, *sales engineers* take prototype models out to the customer for his evaluation. *Field test engineers* might accompany them to assist in any special interfacing modifications.

The foregoing discussion illustrates the variety of engineering functions employed during a product development cycle at the Donaldson Company. While the case



Designer laying out schematic for automatic control system.

presented might be extreme in its rigid progression, essentially all products currently marketed have gone through this process. It is readily seen that, in answer to that often-asked question—the engineer/scientist does a variety of things at the Donaldson Company.

What's New in

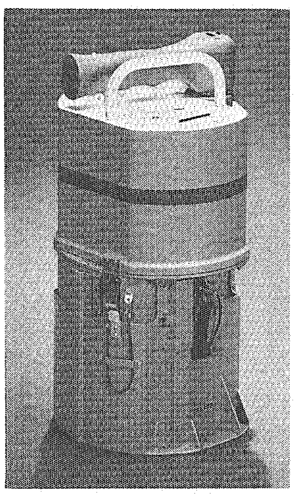
Science and

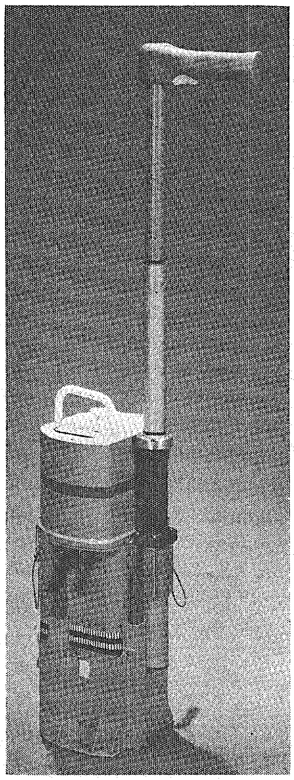
Moon Shots . . .

The experiments that U. S. astronauts performed on the moon in July of this year included taking close-up photographs of "moon dirt" in stereo and in color for scientific study. The astronauts photographed the fine structure of lunar soil before they dug samples to bring back to earth, along with photographing parts of larger rocks, fissures, and the junction of interesting formations. By studying the structure of moon dirt as well as the color, size, shape, and variety of individual particles shown in these photos, scientists back on earth expect to learn much more about the lunar surface than they might learn solely from the actual samples, or other photos brought back from the moon. It is hoped that the close-up, stereo, color photographs taken by a camera similar to the one shown here will provide more information on questions such as: What are lunar rocks made of? How were craters formed on the moon? Where did the moon come from?

For their lunar picture-taking assignment, the astronauts used a special camera designed by the Eastman Kodak Company. The device, known as "Apollo Lunar Surface Close-up Camera" is slightly larger than a cigar box when collapsed, and has a handle that resembles a walking stick. The astronaut-photographer, without bending over, simply rested the camera on a lunar rock and pressed a trigger on the handle to take a picture. The camera, whose twin lens enables stereo pictures, holds the film slightly less than 10 inches away from the surface, taking a photograph which is detailed enough to allow scientists to see particles smaller than 2/1000ths of an inch and to identify the shape of particles as small as 1/1000ths of an inch. The camera has a fixed shutter speed of 1/100th of a second and a fixed effective aperture of f/22.6, giving an acceptable depth of field of two inches in either direction. A built-in electronic flash, lasting only 200 millionths of a second, enabled sharp pictures even if the astronaut photographer should accidentally move the camera during exposure. The camera and flash system were designed especially for use with Kodak Ektachrome MS film, a color slide film with an ASA of 64, similar to the film used back here on earth by us and known to us as Kodak Ektachrome-X.

After completing all lunar surface photography, the astronaut removed the special film cassette from the camera and left the camera itself on the moon.

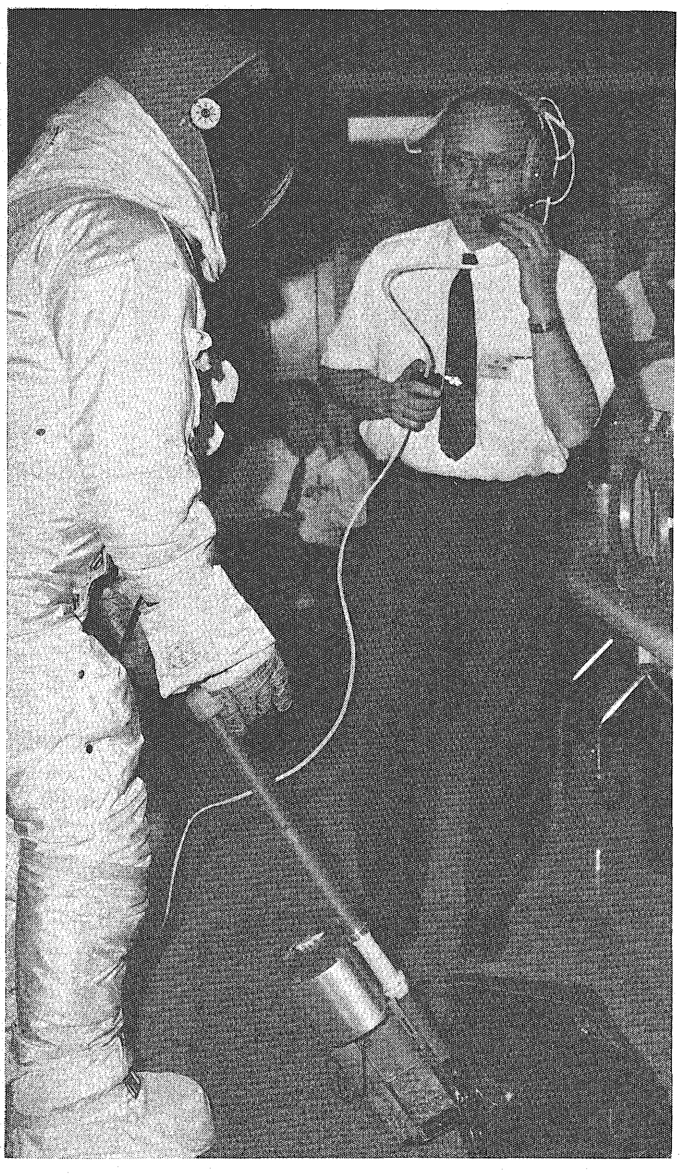




Left: The Apollo lunar surface close-up camera in the position it was stowed in the lunar module during the flight to the moon.

Right: The Apollo lunar surface close-up camera as it looked when extended for use by astronauts on the moon.

Engineering



A technician of the Grumman Aircraft Engineering Corporation, dressed in pressurized space suit, checks the handling of the Apollo lunar surface close-up camera.

Pictures by Starlight . . .

Pictures of constellation Sagittarius shows fine detail obtainable by using ultraviolet light, an example of the kind of exploration of the entire sky which is taking place through use of the Orbiting Astronomical Observatory A-2. General Electric designed and built the satellite's stabilization and control subsystems. The orbiting observatory, built by the Grumman Aircraft Engineering Corporation, is equipped with 11 telescopes designed to gather stellar data which is impossible to obtain from observatories on earth.

The GE stabilization and control subsystem is designed to provide a stable telescope platform that can be pointed accurately at any celestial target during sky mapping and related work. Stability provided is the equivalent of observing the eye of a person 500 feet away, and studying it for color and brightness without moving your own eyes for as long as an hour.

Darker and Darker . . .

New kinds of computer components may stem from glasses that get dark in ultraviolet light but regain their original transparency when the light is removed. Two scientists employed by Corning glass, Miss Janice Stiles and Dr. R. J. Araujo, report that the photochromic glasses fulfill the basic requirements for information storage and display. The functions of writing, reading, and erasing information on the glasses are all feasible. Writing is done in the form of spots on the glass caused by UV light beams. Erasing is done with a different wavelength of light. Meanwhile, the glass being used keeps its spots long enough to be read without fading naturally. The spots resemble pencil marks on paper.

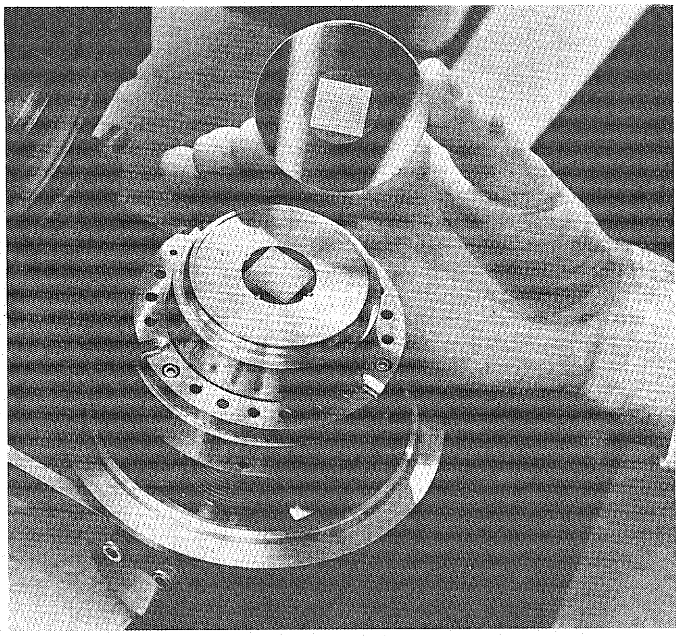
The reversible darkening and clearing action of the photochromic glass composition stems from tiny crystallites of silver halides in their formulae. A commercial photochromic glass is used for prescription eyeglasses trademarked Photogray Lenses. Corning said that they turn dark in the ultraviolet of sunlight but clear again indoors and at night (when the UV stimulus is removed).

Micro-Micro-Circuitry . . .

A new technique, which can squeeze some 4,000,000 three-element electronic devices onto an area slightly larger than a postage stamp, has been developed by scientists of Westinghouse Electric Corporation. This technique achieves its ultra-small results by using electron beams—similar to the beam that "paints" the picture on a television picture tube—to replace the light beam normally employed in the photographic processes that fabricate miniaturized devices and entire circuits.

This project could pave the way for the next generation of integrated circuits, or large scale integration, where components of the circuits could be 100 times smaller than these available today. Integrated circuits are arrays of interconnected components; large-scale integration will produce arrays of such integrated circuits all interconnected to form complete subsystems for complex electronic systems such as computers. One application foreseen for large scale integration is the sought-after "computer on a wafer" in which all of the circuitry of a fairly elaborate computer would be placed on a single slice of silicone perhaps two inches in diameter.

Electrons are used in this new process because they are smaller than the wavelengths of light and can be projected on targets as small as a few millionths of an inch on a side. This is done by means of an image tube that projects electrons in patterns with finer detail than such tubes have achieved in the past. The tube, about three inches long and three inches in diameter, is surrounded by electromagnets which focus the electrons in essentially perfectly parallel lines inside the tube.



Resembling a photographic negative and the picture made from it is this mask (top) and its exposed counterpart in a new experimental method for fabricating high density integrated circuits. This process crowds millions of tiny electronic devices onto the area the size of a postage stamp by using beams of electrons, rather than light, in their fabrication.

In operation, a series of stencil-like light-sensitive masks, which have been previously made by a computer, are placed one after the other at the negative electrode of the image tube. These masks are the source of the electrons that will form the final circuitry, with each mask contributing one aspect of the circuit. The electrons are released by shining ultraviolet light upon the masks, which eject electrons along the parallel magnetic lines toward the positive electrode of the tube.

The anode holds a silicon wafer upon which the electrons land in a pattern identical to the pattern of each mask. The wafer has a sensitive coating which records the patterns of the circuitry. Each pattern is etched into the wafer by an engraving process and chemicals are then diffused into the etched pattern to create the elements of the circuitry. These steps are repeated for each mask until the wafer is covered with complete, interconnected circuitry.

Accuracy Plus . . .

A new technique for monitoring specific gravity in a continuous process system has been developed by the Exactel Instrument Company, a Division of Statham Instruments, Inc. The system employs a Precision U-Tube Series Servomanometer, using distilled water as the manometer liquid in 1½ inch bore tubes. With this system it is possible to measure specific gravity continuously with an accuracy to the least count of five digits, i.e., 1.0000. The technique is based on the dual purge bubble principle, i.e., the pressure in each of two piezometer lines at their orifices is equal to the head pressures of the liquid in which the bubbles are emitted. The difference in pressure in the two lines having their orifices a finite vertical distance apart, becomes a direct measure of specific gravity.

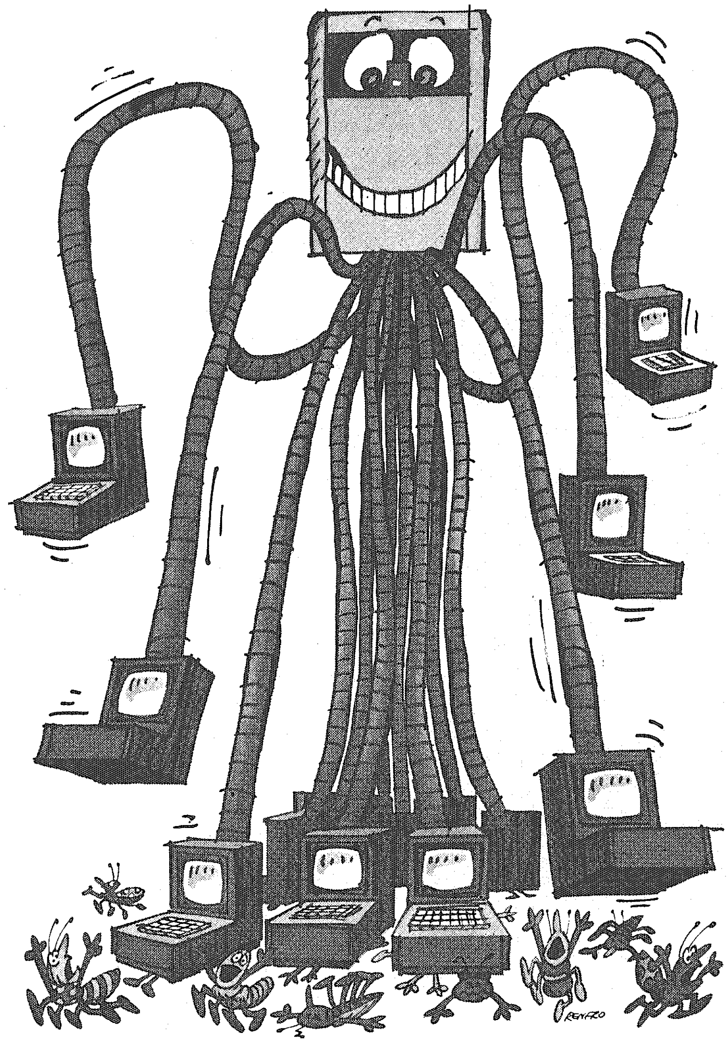
The measurements are presented in digital form on a mechanical counter and on a strip-chart recorder. Net deviation is shown on an expanded scale. The system is fully temperature compensated for ambient temperature variations at the Servomanometer and in the monitored liquid. Calibration features in the system may include comparison calibration of specific gravity using a specimen with a known specific gravity, such as distilled water; switching out the temperature compensation of the process liquid to verify difference in readings; similar verification of Analog Temperature Compensator of the Servomanometer; or use of machinists gauge blocks and other techniques to verify Servomanometer accuracy. A companion Servoblender for blending liquids to controlled specific gravity is being developed. The blending will occur within an enclosed pipeline system or in combination with tanks.

The Bug Slayer

No computer stamps out program bugs like RCA's Octoputer. It boosts programming efficiency up to 40%.

Programming is already one-third of computer costs, and going up faster than any other cost in the industry.
A lot of that money is eaten up by bugs—mistakes in programs.
With usual methods, programmers don't know of mistakes until long after a program is written. They may have to wait days for a test run.
RCA's Spectra 70/46, the Octoputer, takes a whole new approach based on time sharing.
It substitutes a computer terminal for pencil and paper and talks to the programmer as he writes the program, pointing out mistakes as they are made.
The Octoputer is the only computer available today that has this capability. It's as much as 40% faster. And it works on IBM 360 and other computer programs as well as our own.
Costs go down. Programs get done faster. And you need fewer programmers—who are scarce and getting scarcer.
Of course, Octoputer does more than just slay bugs.
It's a completely new kind of creature that does time sharing and regular computing together.
The Octoputer concentrates on remote computing because that's where the industry is going. We got there first, because communications is what RCA is famous for. It puts Octoputer a generation ahead of its major competitor. It can put you ahead of yours.

RCA COMPUTERS



For career information visit your College Placement Office.

Introducing . . .

TECHNICAL FRATERNITIES

by PETE HOVDE

It has been said that from fifty to seventy-five percent of all the knowledge and undergraduate gains results from extracurricular activities. Obviously you will not learn heat transfer theory, practical technology, or even calculus by joining a particular organization, although members of technical fraternities and societies often meet to study together. You will learn to work with people, to lead, brotherhood, and, simply, how to go out and have a good time with your fellow engineers. Fortunately IT has a wide variety of extracurricular activities for its students. There are four professional engineering and one architecture fraternities where the members live together in their own house and promote their own activities. Each department in IT has an engineering society associated with it through which the students are exposed to some of the practical aspects of their major field. In addition, these societies promote an esprit de corps among the students within their respective departments. As in every other college within the University, IT has its own student governing board which offers advice to the Dean, is responsible for publishing the *Technolog*, and sponsors Engineer's Day. Finally, there are a number of honorary organizations which select their members on a basis of scholarship and leadership in IT.

Triangle Fraternity

Technical Fraternities

The five technical fraternities (Alpha Rho Chi, Alpha Chi Sigma, Kappa Eta Kappa, Theta Tau, and Triangle) are responsible for most of the activities which occur in IT. Fraternity members provide much of the leadership in other IT organizations.

Alpha Rho Chi is for architecture students, Alpha Chi Sigma for chemistry majors and chemical engineers, Kappa Eta Kappa for physics majors and electrical engineers. Both Triangle and Theta Tau are for all IT students.

Professional fraternities offer the IT student a unique opportunity to both enhance his education by drawing on the experiences of and studying with other men in IT and to form strong and lasting friendships with men not only from Minnesota but also from several other engineering schools at which the fraternity has chapters.

For further general information and/or particular details, contact the following:

Ken Perizzo at Triangle: 331-7969
Jim DeBenedet at Theta Tau: 331-7931
Lee Sigford at Kappa Eta Kappa: 331-2133
Paul Jarosh at Alpha Chi Sigma: 331-5951
John Olson at Alpha Rho Chi: 331-7961

Professional Societies

With each major in IT is associated a professional society to promote that particular field. These societies are generally student branches of a nation-wide society with which the student usually becomes associated upon graduation. These societies include the American Institute of Metallurgical Engineers (AIME), American Institute of Physics (AIP), the American Society of Mechanical Engineers (ASME), American Institute of Aeronautics and Astronautics (AIAA), and the Institute of Electrical and Electronic Engineers (IEEE). This list is by no means complete and new societies are still forming. In fact,

AND SOCIETIES

there is presently an attempt to organize a student post of the Society of American Military Engineers which is concerned with what the engineer and the armed services can offer each other.

Societies generally meet once a month to sponsor a speaker, a tour (there is at least one brewery tour each year), a social function, or just an informal gathering. A professional society gives the IT student an opportunity for closer association with other students in his major. Although societies are oriented toward the junior and senior student, freshmen and sophomores are encouraged to participate.

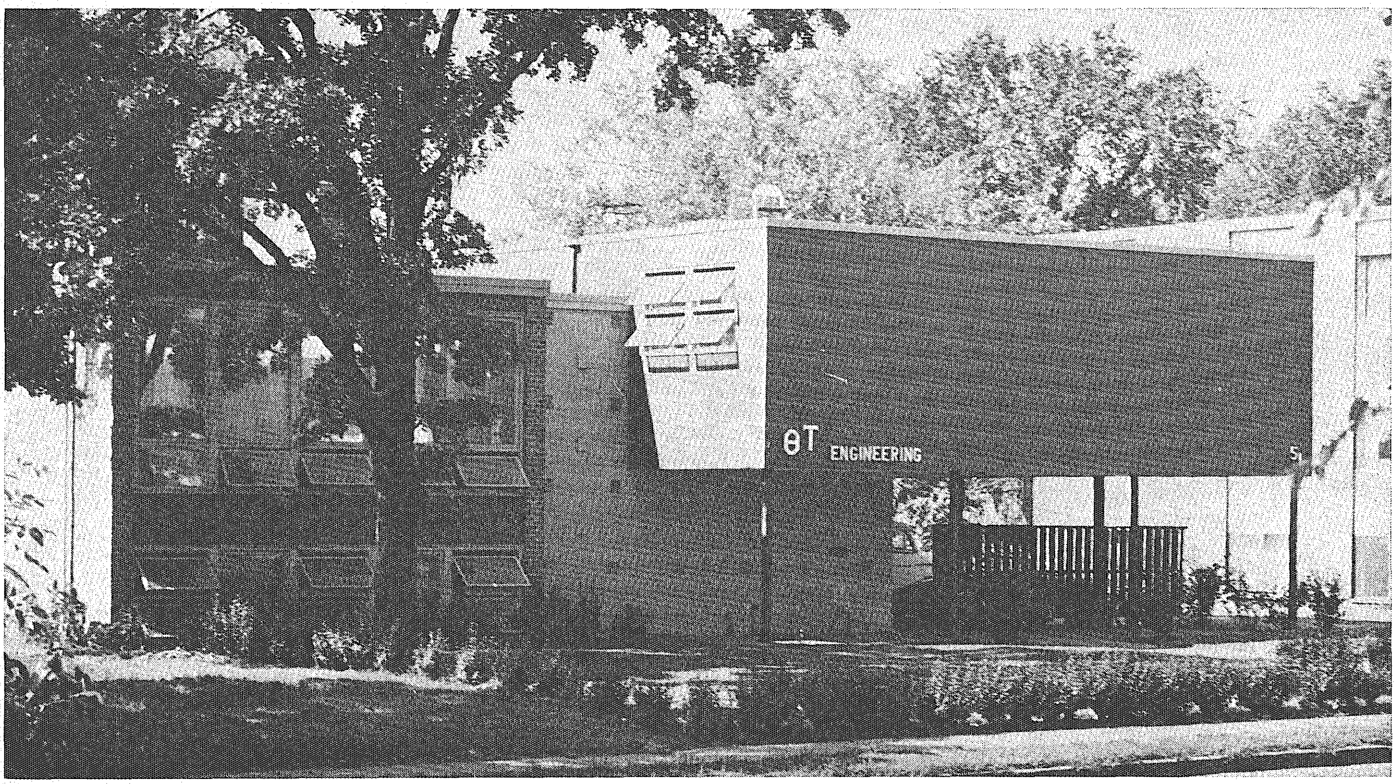
One society in particular should interest all IT students. The University of Minnesota Student Chapter of the Minnesota Society of Professional Engineers (MSPE), which is generally referred to as Engineers Club, sponsors speakers of general interest and is somewhat socially oriented. In fact, Engineers Club has been known to invite girls to its meetings and hold informal dances.

Since there is such a wide variety of societies it is impossible to list them all here. Each society has an office for its members. Interested students are encouraged to obtain more information from either their department office or the appropriate society office.

Honoraries

Each department or major in it has an honorary organization associated with it to recognize those seniors, and occasionally juniors, who have maintained superior grades (generally over 3.0). In addition to departmental honoraries, Tau Beta Pi recognizes all of IT and is equivalent to Phi Beta Kappa (which engineers are not eligible to join). If you become eligible for one of these organizations you will be contacted at that time.

There is one honorary fraternity which does not recognize grades, but rather participation in and support of IT organizations. Plumb Bob is composed of between 12

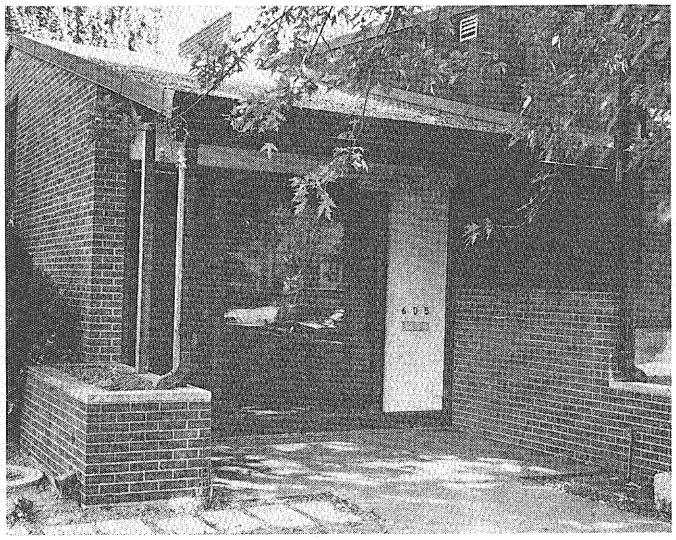


Theta Tau Fraternity

and 14 anonymous IT seniors and is charged with maintaining student spirit. It promotes the legend of St. Patrick and is custodian of the Blarney Stone. Over the years Plumb Bob has led the engineers to defeat the lawyers, medics, miners (before they became part of IT), and the foresters. Plumb Bob organizes and pulls-off a number of pranks annually and holds the all-University beer drinking record of 33 pitchers of beer drunk by 5 men in 3 hours (that's 2.2 pitchers/man-hour).

Student Governing Boards

All students in IT are members of the IT Student Association which is governed by the IT Technical Commission. The Tech Commission is composed of one freshman, two lower classmen, six upper classmen, and one representative from each society and technical fraternity. Meetings are held every two weeks and are open to any



Alpha Rho Chi Fraternity

interested student or faculty member. The Tech Commission serves largely as a student advisory board to Dean Cheston and Dean Cartwright; it also appoints student representatives to the IT Scholastic Standard and Curriculum Committees, the Engineers Day chairman and vice-chairmen, and the Technolog Board. Any interested student can become active in a wide range of IT and University Councils, organizations, and advisory groups through Tech Commission. The Tech Commission office is in Room 4, Main Engineering. For further information either drop in at the office or call 373-7729.

Engineer's Day is a celebration held every spring to honor St. Patrick, the first engineer. Among other things, St. Pat is credited with blessing engineers with calculus, faculty, stress and strains, and the monkey wrench. St. Pat earned his fame by establishing the first worm drive in Ireland. The E-Day celebration is held in the first week of May since Minnesota weather is generally inclement on March 17 (St. Patrick's Day). In honor of St. Pat, IT classes are generally excused after second hour so that the student can participate in the folly. The E-Day Chairman appoints a number of committee chairmen to organize the parade, picnic, queen coronation, E-Day Brawl, and a number of other activities. Each of the committees has a number of positions available; they are made up entirely of students. In these positions the individual is given a considerable amount of responsibility and freedom to do his job the way he feels is best, and has the opportunity to meet and work with faculty

Last year's Plumb Bob members on E-Day

and administration. Students interested in the vice-chairmanship should contact Tech Commission early in the fall (committee chairmanships are filled by E-Day Chairman during Winter Quarter). For further information contact the E-Day Chairman in Room 2, Main Engineering or call him at 373-7729.

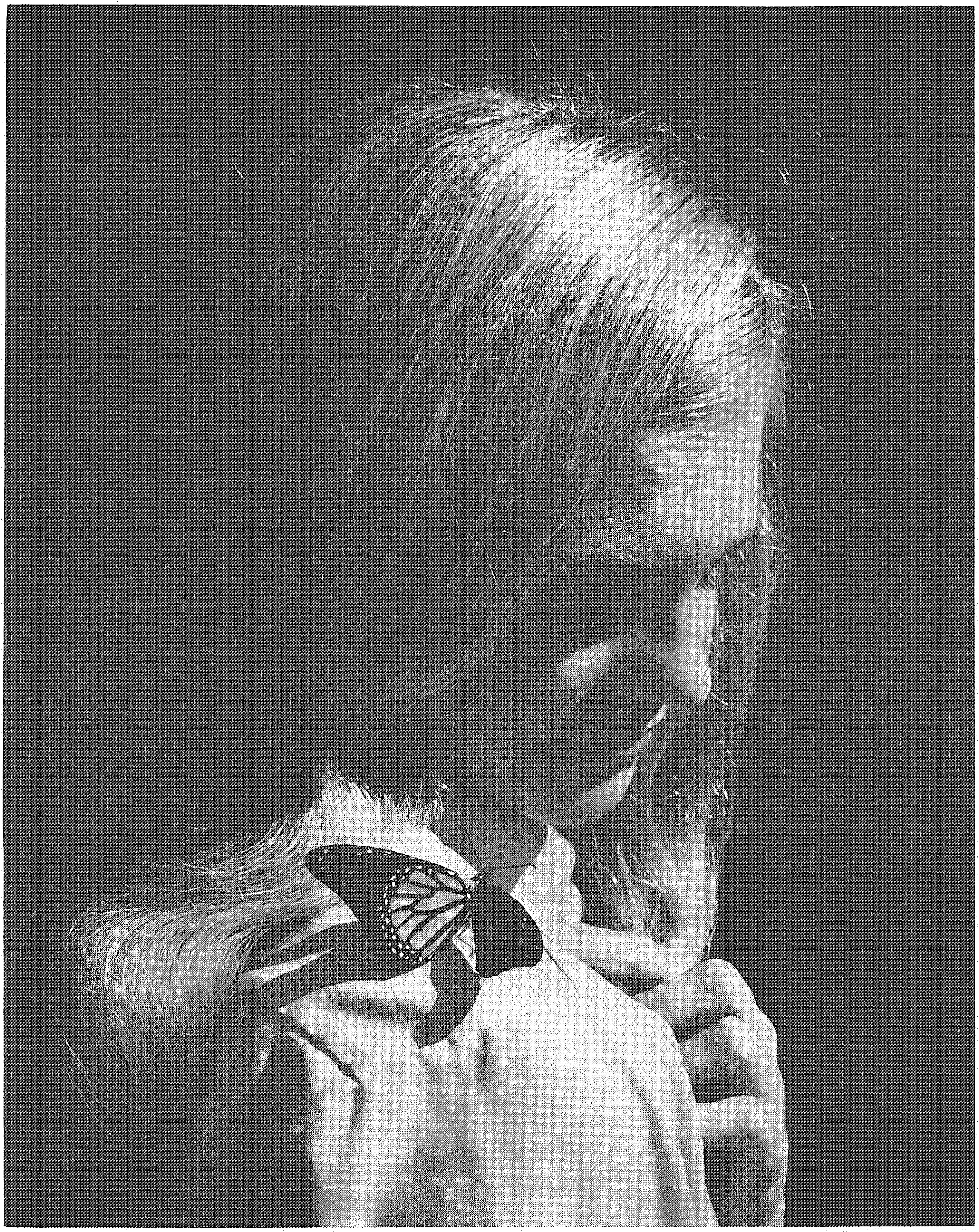
The Technolog Board is the publisher of the *Technolog*. It has four student, one faculty, and two administration members and is responsible for the editorial content and financial stability of the *Technolog*. The Tech Board appoints the editor and business manager for the *Technolog* who, in turn, fill the various positions on the staff.

The *Technolog* staff is open to any University student who is interested in working on a magazine. The student is encouraged to come down to the "Log" office regularly to get to know the rest of the staff and to learn the ropes. He is included in all social functions of the staff and, with time, is given more work to do. In addition to earning some spending money, a staff member is exposed to a wide circle of people with diverse interests; he has a place on campus to call "home," where he can hang his coat, eat lunch, study in his spare time, and have one helluva good time. If you're interested in joining the staff, call the office at 373-3298. Or better yet, come down to Room 2, Mechanical Engineering and ask for the editor.

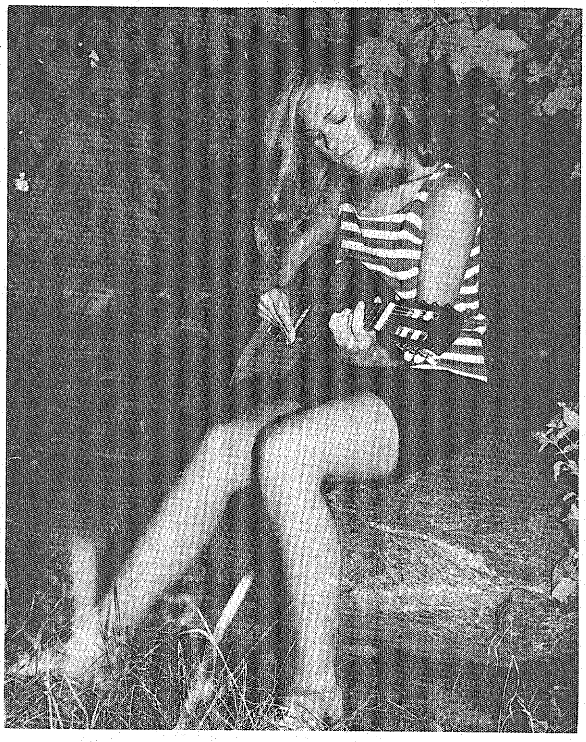
Conclusion

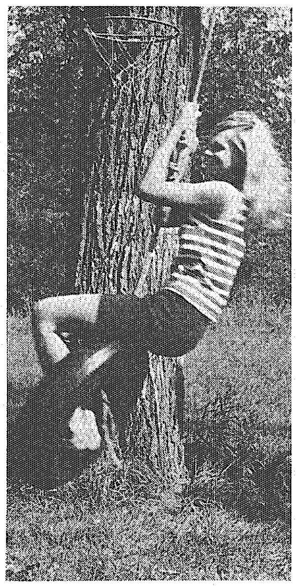
All of these organizations (except the honoraries) are open to all IT students. Each student is encouraged to contact them for further information and to join at least one of them.

MISS OCTOBER . . .



Kris Deeds

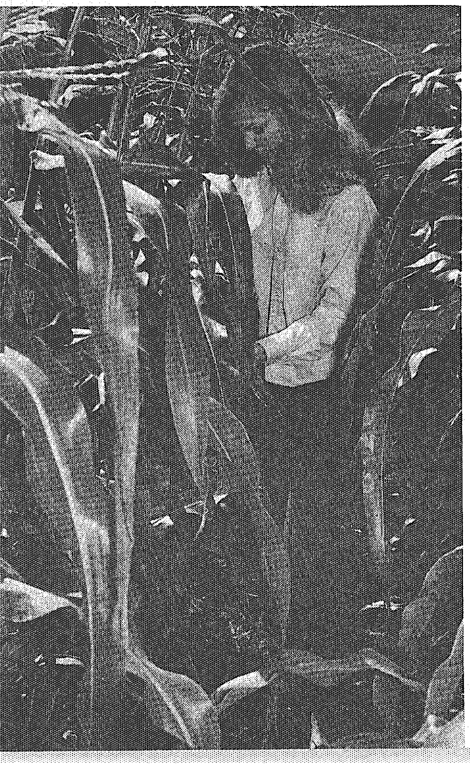




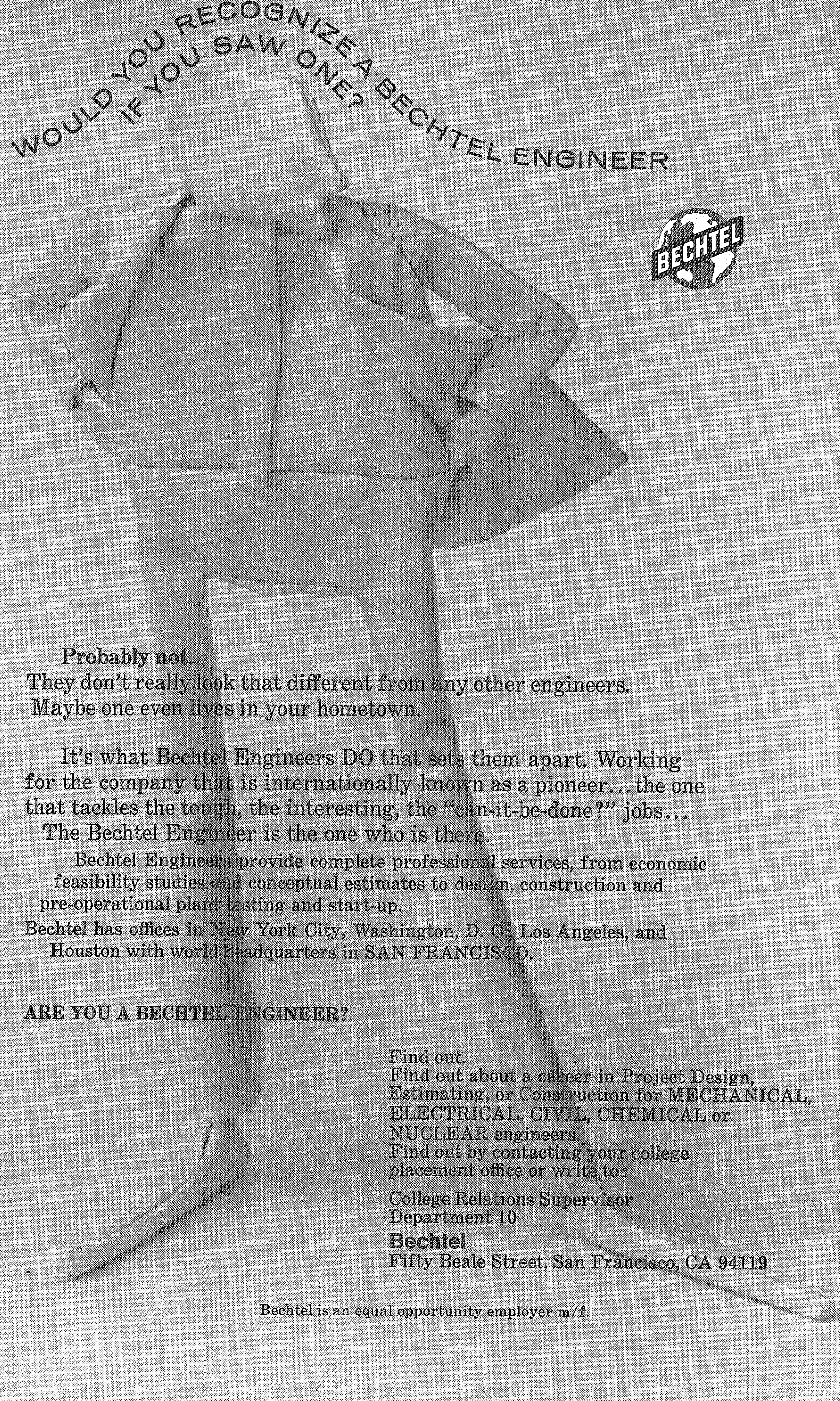
Our blonde, blue-eyed Queen Colleen is hardly an apathetic University student. Kris, who is in her third year of IT, takes her studying seriously. She thinks that her math major with a computer science option will give her a broad enough background to assure her of a job in research—the kind in which she can use computers to find the answers. She hopes to use her recent appointment to MSA's Student-Faculty Committee for Computer Facilities as a means of applying her knowledge; her goal here is to ease the quarterly registration process by using computers.

Familiar with many aspects of the University (Pioneer Dorm, Alpha Gamma Delta Sorority—her campus home, UBOG, MSPE, Physics Club, Dean's Retreat, etc.), Kris has an active social life. Her fun time is spent with baseball, swimming, skiing, gymnastic routines, or a guitar.

Kris' summer home is with her parents and two sisters who reside in a beautiful home on five acres in Minnetriska. Here she adds a more peaceful touch to her life.



Photos by MARLIN REKOW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IF YOU SAW ONE?
BECHTEL
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Maybe one even lives in your hometown.
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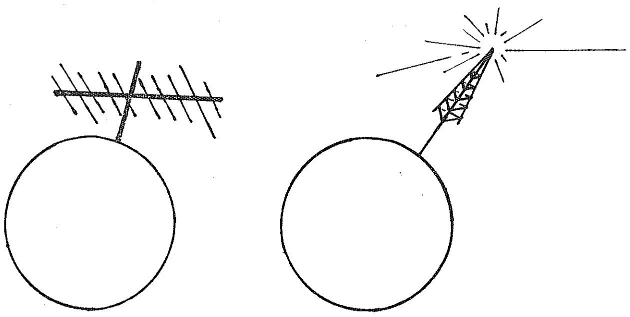
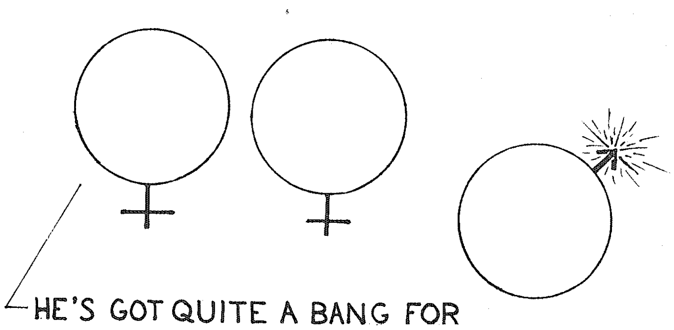


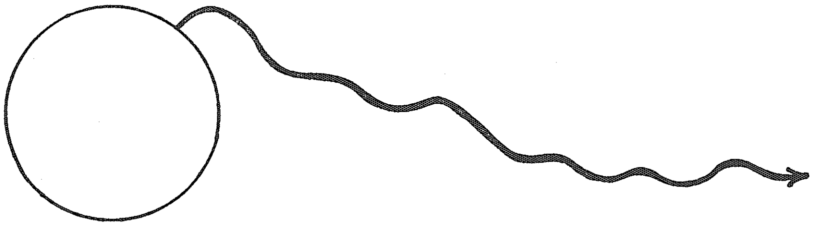
YOU KNOW, MY DEAR, YOU'RE VERY RECEPTIVE



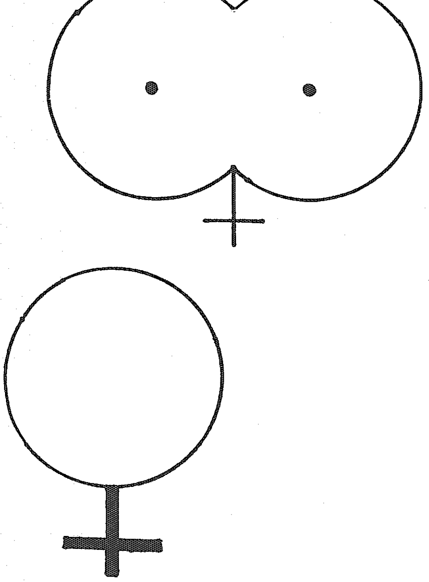
HE'S GOT QUITE A BANG FOR SUCH A SHORT FUSE

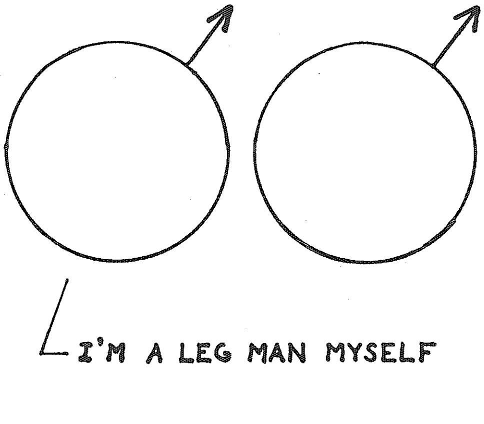
THE SYMBOL THINGS IN LIFE

by CLIF OLLILA

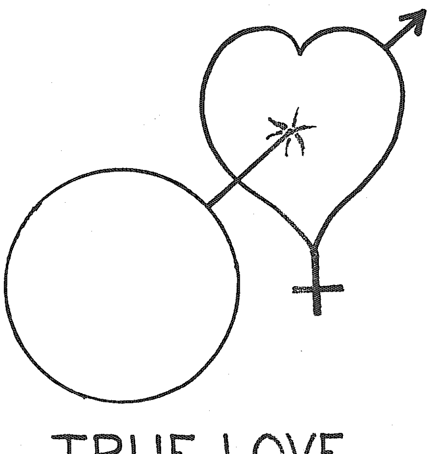


LONG HOT SUMMER





I'M A LEG MAN MYSELF



TRUE LOVE

SPLINTERS From the Log

by CLIFF OLLILA

—vilitas et crudus semper eternam

The cannibal king was irritated when the boiled missionary he asked for turned out to be a friar.

• • •

I took in the noon-hour lingerie fashion show at the Scotch Mist last week. Those outfits were so sheer I kept praying for the fog to lift.

• • •

I'll never forget the time I was a brush salesman and this woman opened the door in her negligee—which was an odd place to have a door.

• • •

Summertime is great—that's when there's nothing much on radio, TV or women.

• • •

Two secretaries were talking by the water cooler, one was saying: "I tell you, Ethel, this time it's the real thing—SEX!"

• • •

With the long, hard winter ahead, I suggest buying a heavier muffler for your car.

• • •

There is a new cosmetic cream on the market for those women "thirty-nine and holding" who want to look 18 again—it gives them acne.

• • •

Do you know how to tell a male chromosome from a female chromosome? Pull down its genes.

• • •

From a restroom at the San Francisco airport:

MICKEY MOUSE WEARS A SPIRO AGNEW WRISTWATCH

• • •

Those tobacco companies are really thinking. First, they had King-Size cigarettes, then filter tips, then 100's. Now they're putting out Queen-Size cigarettes—same as regulars only they have a bigger butt.

There's a very unusual story behind their marriage. They met in a summer resort and they had nothing in common — but they kept fooling around until they did.

• • •

An 80-year-old man married a high school girl recently, for a wedding gift he gave his bride a DO-IT-YOURSELF KIT.

• • •

It's not that I mind my mother-in-law living with us, but she could have at least waited until we got married.

• • •

Hollywood is making a new science-fiction movie. It's all about those monsters that invade Earth—first they destroy the Army, then the Navy, then the Air Force. Then they make their big mistake—they pick on the Mafia.

• • •

Las Vegas has many places known by the professionals for the crooked gambling and watered liquor—where the customer never get as loaded as the dice.

• • •

Some of the bars around the University are real holes; in the lavatory you can't tell if they have roller towels or loose wallpaper.

• • •

You know, of course, what name our vice-president uses when he's traveling incognito—Spiro T. Agnew.

• • •

I found out the other day what doctors do with all those urine samples—It comes in a square bottle and is called POLISH LEATHER.

• • •

Did you read about the new Broadway night-club that's run by Indians? And what a gimmick! They charge $24 for a Manhattan!

• • •

If it weren't for Thomas Edison we'd all be watching television by candlelight!

Overheard at the State Fair:

Gramma: How many times a day can this third place stud bull earn his hay?

Owner: Oh, three or four times. . .

Gramma: See that Grampa! And how many times can this second place bull keep the line going?

Owner: Five or six. . .

Gramma: Catch that, Grampa? How many rounds is this first place bull good for?

Owner: Seven or eight. . .

Gramma: Hear that, Grampa?

Grampa: With the same cow?

Owner: No, sir, with a different one each time!

Grampa: Hear that, Gramma?!!!!!

• • •

Then there was the politician who decided that he needed the Indian vote to win the election so he drove to the nearby reservation. He spoke to the Chief and arranged for a tribal meeting that afternoon. At the meeting, the politician was blithering on and on making wild promises. "I'll build you a new school!"

All the braves stood up and yelled, "Koiya!"

"I'll build you a new hospital!"

"KOIYA!"

"I'll build you new streets and roads!"

"Koiya!"

Finally, when all his promises had been made and the crowd left, the Chief invited the politician back to his tepee. Along the way the Chief cut through a corral in which stood a large bull. "Aren't you afraid of the bull?" asked the politician.

"No. Just be careful not to step in any koiya."

• • •

I'll bet I'm one of the few people in America who haven't read *Fanny Hill*. Not that I don't want to; I'm just waiting for the illustrated edition!

• • •

As my cousin always said, "St. Louis Park is the Garden City of America—there's a Rosenbloom on every corner."

• • •

The new cigarette filters are supposed to be so effective that they remove 100% of the harmful gasses and particles from the smoke. One fellow got a hernia trying to inhale through one.

In keeping with the old Southern proverb: "Any Yankee tourist is worth three bales of cotton—and they're a lot easier to pick!", a motel owner in Mobile named his establishment THE YANKEE CLIPPER.

• • •

A couple I know got married last month so I sent them a wedding present. This morning I got a thank-you note from the bride; she said it was just what she wanted and she'd use them every time she entertained friends. Now I'm a little worried; I gave them sheets.

• • •

Forty years ago President Hoover promised two cars for every garage, at the U we've already got three cars for every parking spot!

• • •

The hippies on West Bank beat the heat this summer by smoking iced tea.

• • •

Business was so bad at one of the downtown clubs that the doorman was arrested for loitering.

• • •

Two fathers-to-be were pacing the waiting room of a maternity hospital. Suddenly one grumbled, "Don't I have all the luck? This has to happen on my vacation!"

The other replied, "You're complaining? This is our honeymoon!"

• • •

ME: Did you hear about the guy who was arrested for sodomy?

EE: No, what happened?

ME: He got himself a real sharp lawyer; the lawyer had a brilliant day in court and got the guy off on a lesser charge.

EE: What was he convicted for?

ME: Following too close.

• • •

Q: When Wilt Chamberlin became the only sports figure to endorse the GOP candidate for president in 1968, do you know what he was?

A: Richard Nixon's athletic supporter.

• • •

Sign on Washington Island in Lake Michigan:

CAUTION: TRESPASSERS WILL BE VIOLATED.

• • •

Q: How does a male elephant find a female elephant in the tall grass?

A: Delightful!

Meanwhile, back at the oasis, the Arabs are eating their dates.

• • •

EE: I've got a wonderful idea! Why don't you come up to my apartment; we'll have a quiet little supper by candlelight, play a few records, then around midnight we'll open a bottle of champagne and toast the New Year!

Coed: But the New Year is three months away.

EE: You don't have to leave early, do you?

• • •

Did you hear about the baseball player who was in such a bad slump, he did a TV shaving commercial, took a swipe at his face—and missed!

• • •

One of the patients at the University Hospital had a birth defect which affected the nervous system in his urethra—he could never tell if he was coming or going.

• • •

Did you hear that the Highway Department is phasing out their "Slow—Children" signs and replacing them with "Caution—Nudist Colony Crossing!"

• • •

Notice outside a Toronto church:
"DO YOU KNOW WHAT HELL IS" COME AND HEAR OUR NEW ORGANIST

• • •

I saw a movie last night. It was a heart-rending story of a girl who didn't have any boy friends 'cause she was only 16 . . . where she should have been 38.

• • •

A woman's husband was late coming home from work so she decided to check at the local tavern. There she was told that he was to be found at the barber shop next door.

She walked to the barber shop, stuck her head in and asked, "Bob Peters here?"

"No, Ma'am, we only give haircuts."

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If you are looking for the opportunity that can only be offered by a large corporation . . . one that will offer you an interesting position now and not three to five years from now . . . investigate what Automatic Electric has to offer!

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Find out how you can take a dip in one of our exciting little "ponds" . . . have a talk with the man from Automatic Electric. He'll also tell you about our educational program, with tuition paid when you attend graduate classes at one of the many colleges in our area. Or, you may enroll at one of the courses we hold on our own premises to earn credit toward an advanced degree.

See your placement director to arrange a personal interview, or write to James G. Cobban, Manager, Professional Employment, Automatic Electric Company, Northlake, Illinois 60164.

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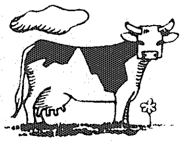
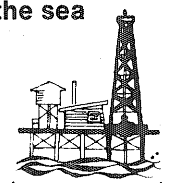
How to keep a cow's mind on milk. Instead of flies.

An informal report on a few current projects at Shell. Some of them might seem like offbeat work for an oil company. But this is a company that contributes broadly and significantly to society. A company of experts that brings out the best in its engineering, scientific and business people.



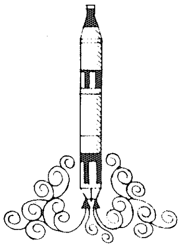
Shell scientists have come up with a vast improvement over even the most talented cow tail. It's called VAPONA® insecticide. A plastic strip impregnated with it will kill flies in a cow stall for up to three months. And VAPONA® insecticide combined with CIODRIN® insecticide keeps cows fly-free 24 hours a day—even out in pasture. Give you ideas for further applications?

Energy from under the sea



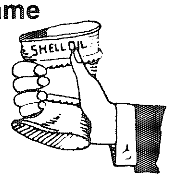
Shell is heading into ever-deeper water in the search for oil and natural gas. We have designed and installed permanent drilling/production platforms as tall as a 34-story building, with still bigger structures in the works. And we are researching other means for extending our operations even further into the sea. We are also searching on land in 16 states to help meet burgeoning energy needs.

Up, up and away



Space exploration puts us in orbit, too. And, vice versa, via our high-strength hydrogen peroxide monopropellant. Not to mention our 405* Catalyst, which decomposes hydrazine rocket fuel without heat. Once out there, our AEROSHELL® GREASE-15 lubricates the wheels of progress in a tape system and high-gain antenna used to transmit pictures down to earth. On terra firma, Shell epoxy resins protect launch pads, ground control equipment and missile control centers that put things in orbit.

The name of the game



More gasoline per barrel of crude oil delights engineers, scientists and conservationists alike. Our new hydrocrackers actually produce *more* than a gallon of refined product from a gallon of feed stock. And we are using sophisticated techniques to tailor-make products by reassembling hydrocarbon molecules.

Our most interesting development

When it comes to your own development—so essential to our pursuit of excellence—we're working constantly to recognize, utilize and help expand your knowledge and abilities. We plan work assignments accordingly. We hold "in-house" courses in advanced technology and business, run technical seminars, and 100%-reimburse career-related college courses. But we don't stop there—we're striving to enrich the mix for our professionals with activities like developing and teaching advanced courses, representing Shell on industry committees, and company-wide internal consulting assignments.

For information about openings throughout Shell, sign at the Placement Office for an interview with our Representative, or write to Dr. John Rae, Recruitment Representative, Dept. E, The Shell Companies, Box 2099, Houston, Texas 77001.

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What CHEMICAL ENGINEERS do at Kodak

Photographic coatings and processes must be designed to balance perhaps seven critical diffusion and reaction steps necessary to form a color image in "chemical reactors" as thin as 1/10,000-in.

In photography and beyond, we work with surface diffusion of chemisorbed species; rheology of non-Newtonian fluids; solid-phase polymerization; high-temperature vapor-phase pyrolysis; liquid-phase air oxidations; desalting by reverse osmosis; new fiber yarn configurations. More general: design of pilot plant and plant equipment from laboratory data through mathematical modeling; drying operations for fibers, plastics, and chemicals; viscous flow and heat transfer; waste disposal and pollution control; on-line manufacturing problems; liaison with customers.

That's the setup. Pretty challenging, isn't it?

If you're a smart senior, you'll sit down and write a letter about yourself and your interests to Eastman Kodak Company, Business and Technical Personnel Department, Rochester, N.Y. 14650.

If you're an even smarter senior, you might do exactly the same thing but enjoy it more because you understand the situation better. You focus on the parental generation's idea of what's challenging. You find the challenge they tell you to look for. That way you work yourself into position to decide for yourself what really needs doing in the world before you turn into an old-timer yourself. Present annual sales rate: approaching $3 billion; present work force: 110,000.

In Rochester, N.Y., we make photographic and non-photographic products. In Kingsport, Tenn., our Tennessee Eastman Company makes fibers, plastics, and industrial chemicals. In Longview, Tex., our Texas Eastman Company does petrochemistry, and in Columbia, S.C. our Carolina Eastman Company has a fibers plant. All in all, an equal-opportunity employer offering geographical stability for those who want it.

Why would any good engineer go to work in a factory?

That's sort of like asking why a banker goes to work in a bank.

A guy goes to work where the best work is. And some of the best engineering work around today is in and around factories.

What would you say to designing the numerical control system for an automated steel mill?

Or developing quality control procedures for the world's most powerful airplane engine?

Or managing a production team responsible for delivering power generation equipment to utility customers?

And what would you say to a General Electric program that puts you right to work on jobs like those?

We figure if you're ready for our Manufacturing Management Program, you're ready for that kind of responsibility. Right from the start.

So our program packs about ten years of manufacturing experience into about three years of work. And the work will take you all around the country.

Ask GE's top management people what they thought about starting out in a factory. Many will tell you it was the best decision they could have made.

And where will you find those managers today? Running our factories, of course.

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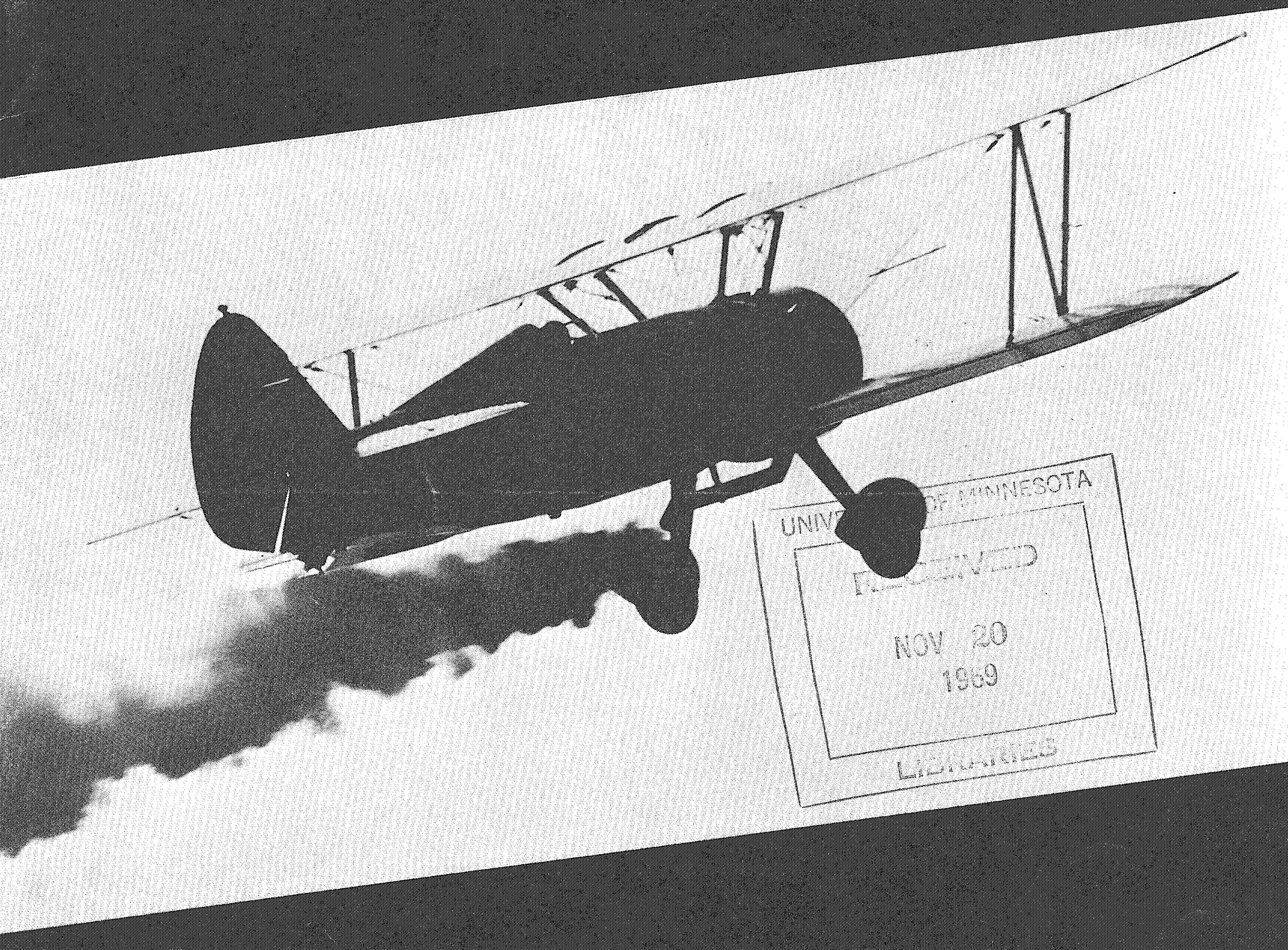
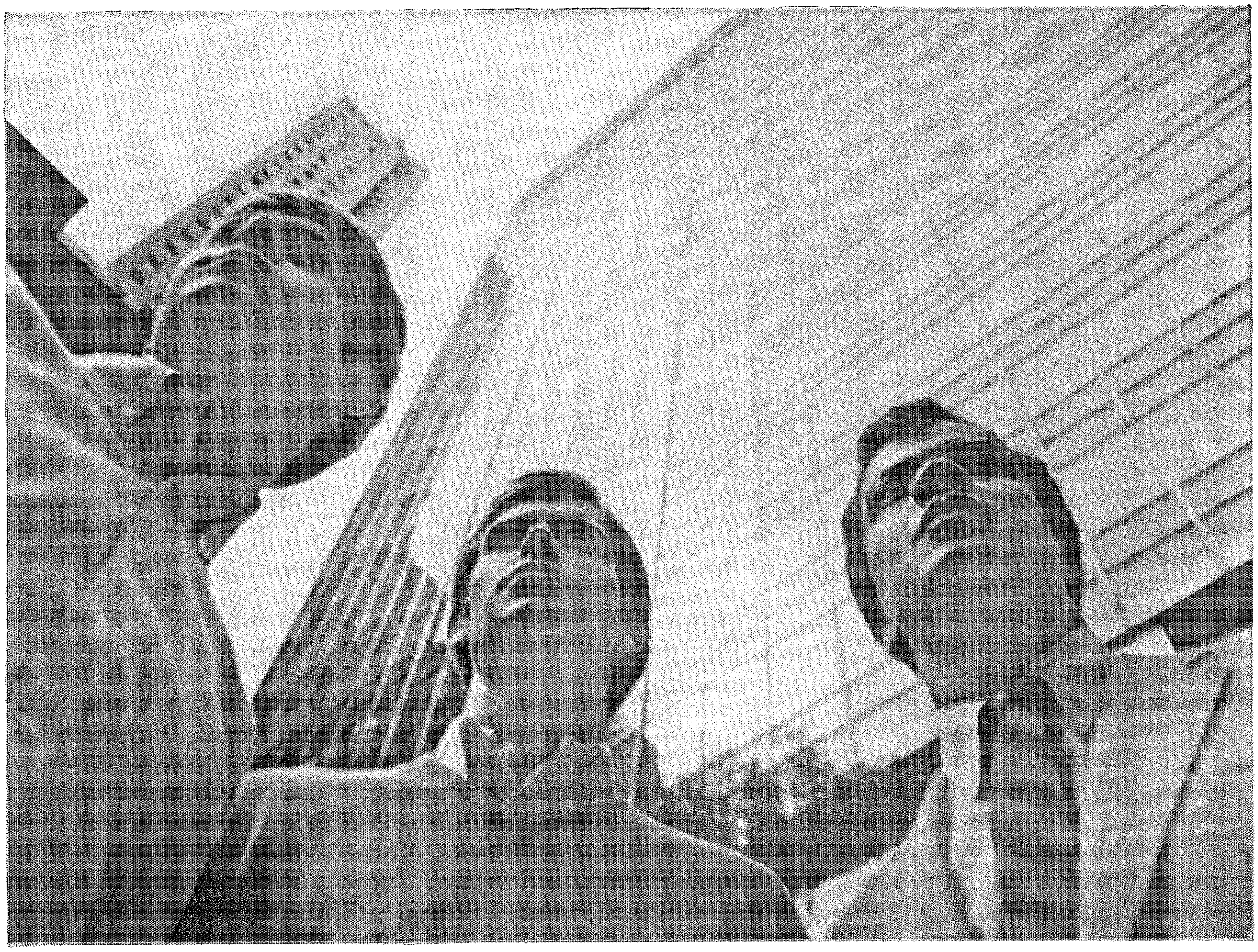
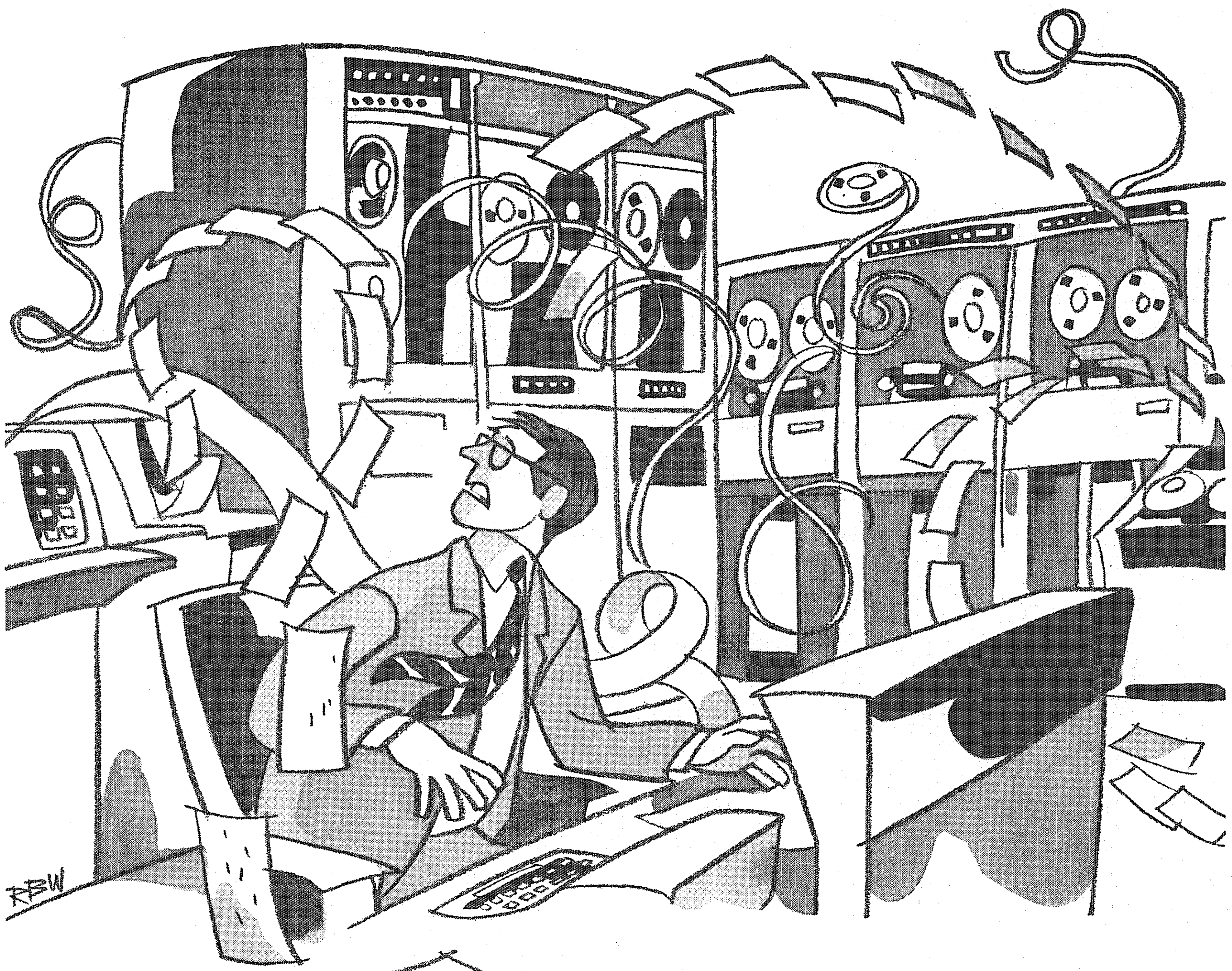
TECHNOLOG

NOVEMBER, 1969



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TECHNOLOG

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COVER: Chuck Doyle's Stearman N2S-2 as he takes off on another banner-towing assignment (see Banner Towing article.) Cover photo by Marlin Rekow.

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Speaking with

the Dean about . . .

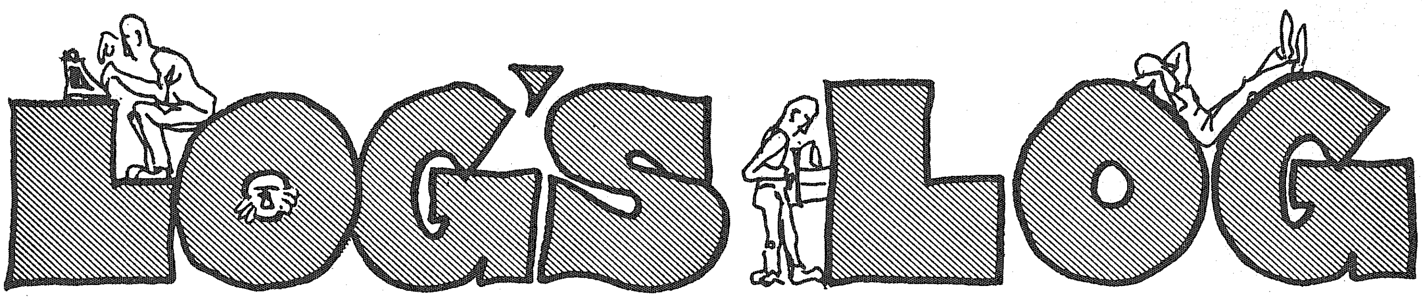
TRAINING PROFESSIONALS

A few days ago, as I was reading in the "Experiences" by the great British historian Arnold Toynbee, I ran across a discussion of his years at Winchester (a very old and distinguished British secondary school) and how he was confronted with the choice of further study in Latin and Greek or the calculus. Says Toynbee ". . . I feel sure that I ought not to have been offered the choice; the rudiments, at least, of the calculus ought to have been compulsory for me. One ought, after all, to be initiated into the life of the world in which one is going to have to live. I was going to have to live in the Western World at its transition from the modern to the post-modern chapter of its history, and the calculus, like the full-rigged sailing ship is one of the characteristic expressions of the modern Western genius . . ."

Toynbee admits that it should have been more important sixty years ago for an educated Englishman to have become acquainted with "one of the characteristic expressions of the modern Western genius" than to have studied the classics an additional year. Now, after a technological revolution of immense dimensions, the lesson learned by Toynbee has still not been absorbed within the western humanist tradition. Yet before we in the sciences become too critical of our humanist friends who are not only ignorant of the basic concepts of twentieth century science but also, incredibly to us, prefer to remain ignorant, we should examine how we approach the process of education of prospective scientists, mathematicians, and engineers. We start with the assumption that we are training professionals and, only incidentally, educating citizens to live in the last three decades of this country. But surely the latter task is more important than the former. Perhaps we professionalize our curricula because it is something we know how to do well and feel woefully inadequate for the task of educating prospective citizens of the technological decades ahead.

This is why I am very enthusiastic about the present studies that are being carried on in IT on curriculum reform. The goal of these studies is the development of curriculum patterns which appear to be relevant to the 1970's rather than to the past decade. In a university as large as the University of Minnesota, there exist immense faculty resources to be tapped for the implementation of curricula ranging widely in depth and scope. We waste these intellectual resources when we adopt curricula which are characteristic of smaller schools with very limited resources. Also with restricted over-professionalized curricula, we ignore the wide-ranging interests and the high degree of native ability of our student body.

Warren B. Chester



The Engen-Kehrberg Report

Introduction: Take it from the E-K Report, work is a pain in the posterior. It's nice to have the green coming in, but egad what we won't do to avoid earning it. I mean like stretching coffee breaks and going on vacation and being sick. I mean like whenever I can get a partner, I'll be sick. And then I look fondly back to my four years at the U of M and my three to four classes a day. Ruff! But that was poverty. I used to think then about how great it would be to be out in the world and carrying it home in bushel baskets. Well, what with federal and state income taxes, sales tax, health and life insurance, retirement, car payments, food, and rent I carry it home in a half-pint jar, large enough only to hold the electric personality of Harold LeVander. As for the Navy, Dan has this to say: "The pay is lousy but we don't get it that often." And then there was a mutual friend who posed this question: "For what do Dan and Dave need money when they've got those bodies of theirs?" For a cure, baby, for a cure.

Broad Minded

In the supreme effort to convince Raquel Welch that Dan and Dave can be had, the E-K Report would like to announce the First Annual (and if it's a success, we'll do it again tomorrow) Turn On of the Engen-Kehrberg Report.

Now the rules are quite simple; in truth there are none. We feel that no attractive young woman should be denied the opportunity, nay the pleasure, of turning on Dan and Dave. But the problem is, all the attractive women we know feel that they should be denied the opportunity to turn us on. And that's the kind of credibility gap we could do without. In fact that's what we are—doing without. All of which gives rise to our problem: we've taken so many cold showers, we've got dishpan bodies.

The result of all this is that we've decided to adopt the orgy-saturation method of gratification and are herewith inviting all the eligible young birds on campus to come by and drop a little on us. Reservations, entrance fees, and starting times may be obtained by coming down to the *Technolog* office (ME 2 or me too) and, if your form is filled out, you will be permitted, nay encouraged, to turn on Dan and Dave.

Now just to dispel any notions that the E-K Report has never been turned on, we should like to remind our readers about last year, when the rest of the *Log* staff turned on us. And as Dustin Kloth, IT rake, once said: "It's the people you love that give you a pain."

For the Birds

Just think what our society would be like without the airplane. No more sonic booms, no air traffic controller strikes, no lost luggage, and no Aeros. But don't get us wrong, we're not bad mouthing the great iron bird. Heavens to Orville Wright! All we're saying is that if God had wanted man to fly He'd have given him a ticket.

And let's not forget the stewardess. Coffee, tea, or a double bourbon aside, we sometimes wonder if these aisle mädchens could ever cope with an emergency situation. Like, e.g., the john in the men's room clogging up. Quite a problem really as we doubt that any stewardess school curriculum ever included rudimentary plumbing along with the usual Eye Make-Up 102.

And you'd really be nervous if you knew what manner of man was flying the plane. Without exception these fearless aviators are frustrated radio announcers. For example, flying at 40,000 feet once, our pilot announced that from the right side of the aircraft any passenger not blocked by the wing (i.e., four people) could see the largest buffalo chip in Wyoming. Gosh! And not trying to cast aspersions on peeps the airlines are taking now, we once flew with a captain who had three stripes on his sleeve, which was nice and all, but the men's room attendant had four. Next time we're taking the bus.

Hippie Rater

Following in the tradition of past E-K Reports the Log's Log presents another in its series of probing questionnaires. This one will give you your hippie quotient. Or in other words whether or not you would like or Haight-Ashbury.

1) Do you:
   a) love beads
   b) wash
   c) tease your hair
   d) tease your hairdresser
2) Are you:
   a) on grass
   b) on acid
   c) on speed
   d) ON
3) I think Timothy Leary was:
   a) Stenvig's campaign manager
   b) once Dean of the School of Forestry
   c) Kate Smith's first husband
   d) the first man on the moon
4) The Establishment:
   a) stinks
   b) blows its mind on prune juice
   c) buys plastic poppies from veterans
   d) pays sales tax on free love
5) Last summer I:
   a) met Mary Jane
   b) cut the grass
   c) took pot luck

6) Bread is:
   a) the root of all evil
   b) for squares
   c) the reason for keeping in touch with Mom & Dad
   d) 33¢ a loaf

7) The fuzz are:
   a) groovy
   b) too hard on speeders
   c) a riot

8) Free love:
   a) can't be undercut by Japanese imports
   b) is getting bigger
   c) is being caught in the inflationary squeeze
   d) makes it possible to enjoy Europe on $5 a day

9) My favorite place to go on a trip is:
   a) San Francisco
   b) Tijuana
   c) my pad
   d) Mars

To be considered a genuine, 100% love person you should have answered questions 1, 2, 3, 4, 6, 8 and 9: "e". The answers to questions 5 and 7 were "d". In the event you can't see that, just consider yourself to be out of touch with the out of touch.

Sore Loser

Everyone knows someone who is, in the idiom of today, a loser. And maybe you even have tried to help one or two. Well that's what the E-K Report has just attempted and while not entirely successful, it did have its moments. Since we were seriously going into this save a loser business, we decided to find the worst case we could. And to no one's surprise it turned out to be a math major. And to avoid naming names and libel suits, etc. we shall use the pseudonym, Icabod. And that's what he had too—an ick of a bod. Now, we realize that everyone can't be dynamite in the looks department but Icabod hadn't even kept his powder dry. His body was a walking advertisement for McDonalds (i.e. he had a good size *gut,* his breath was a *bomb,* and he had fallen *arches*). His personality? Well it went out to lunch one day and never came back. He was a zero or, more to the point, he was a zero with the rims rubbed out. But he did have one good quality. He was a completely honest person. He wouldn't dream of cheating or lying or even stealing a pencil from work. In fact, Icabod has worked in a bath house for ten years and we've never known him to take one. There was our challenge and we were ready with Plan A.

Plan A consisted of a crash program to break Icabod out of his shell. We gave him mambo lessons, took him to the Gay 90's for a whole week straight and got him hooked on Virginia Slims. Well Icabod broke out all right, not out of his shell, but with acne. On to Plan B.

The intent of Plan B was to get Icabod a little female companionship. And it was decided that an IT co-ed would be ideal for this project as she's about as little as you can get. We went over to the off-campus office of the IT Co-ed Association (ITCA) and scanned their membership rolls. Well, we very rapidly came to the conclusion that even Icabod deserved better than Excedrin headaches 1107 to 1153. On to Plan C.

Plan C called for Icabod to contract some exotic disease. The rationale here was that he'd have an interesting time getting it, find his inner strength through the recuperative period and after recovery he'd have something to talk about at cocktail parties. Catching the rare malady decided upon required a visit to one of St. Paul's ill-famed houses. Well, Icabod opened the door, took one step inside, took a look at the ladies assembled and took off for the safety of the Physics building. We didn't hear from Icabod until he called and asked us to visit him in the hospital. After a talk with his doctor we were surprised to learn that Icabod had actually caught an exotic disease. It seems that Icabod was the only person in medical history ever to have contracted syphilis from a doorknob. On to Plan D.

Plan D consisted of us throwing in the towel (which we had stolen from Icabod's bath house anyway). And although not yet convinced about the leopard and his spots, we certainly are convinced about math majors and theirs.

Official Daily Bull

Having just spent the last three hours banging our head against the wall for dumping a dog who subsequently turned out to be a late developer we are in desperate need of having our spirits lifted. So we are going to Stub and Herb's and lift a few.

And since we're crying in our beer anyway we might as well shed one more tear. It has to do with women and their inate advantage over men. If they can't get what they want by being smart, they get it by being dumb. Which brings us to the Slogan of the Month: Draft Women, They're Dirtier Fighters.

Nov 16-30
16—Egyptian Victory Day (no longer celebrated)
19—Try Umph Day
23—Doris Day
27—Pilgrims give Indians the Bird Day
30—French Your Poodle Day
Dec 1-15
1—Land a job with Fuller Co. Give your girl the brush Day
5—Hickey Day (Have a bite with a friend)
9—Next morning, after your wife shaves her legs with your razor, Day
12—Optometrist hustles girl patient. First case of optic nerve
15—Save Your Asp Day (It may be worth something someday)

Conclusion: In a recent effort to find out the answer to: "me, why is it always me", we ran across the only living member of the Flying Azmanto's. He told us the only reason he survived the fatal fall which killed his mother, father, sister, and three brothers was that he was having his fancy tickled by the bearded lady and missed what turned out to be the Azmanto's final performance. Queried as to his current life, the last of the Azmanto's said he had seen the light (when it was turned on by the bearded lady's husband) and was now a minister in the Church for the Criminally Insane. [Ed. Note: There must be a moral there somewhere but we can't find it.]

Log Line

Thanks Dean!

After generations of students have failed to radicalize IT or humanize engineers, Dean Cheston is an envigorating experience. From his Marty Allen hairdo to his jovial tummy he is truly an experience.

His work on the Task Force on Human rights helped to radicalize the Dean, if you will pardon the verb.

Since his appointment the old school has seemed more lively.

When Moratorium Day preparations were in progress in October many proposals for cancelling classes were advanced but, realistically, what was needed was a way for everyone to act according to his own conscience.

Vice-President Shepherd pronounced the official word on class scheduling. His idea was that instruction must be provided for those who wanted it, either by substitute teachers or by alternate classes.

Dean Cheston released a statement leaving the choice to the instructor's conscience.

Both men said that the policies were not contradictory, but Cheston's was obviously easier to live with. It allowed both professors and students a greater chance to make their choice on moral grounds.

Professors from colleges that always scorned the technical world across Church Street were jealous of the liberal and fair atmosphere that Cheston created.

Besides the obviously important days like IT Week, we can now be absent from class for moral reasons, and we thank you, Dean Cheston.

Bob Klepinski

Moratorium

No doubt many of our readers are aware that prior to last month's Vietnam Moratorium, the Daily ran a full page ad with the names of about 500 University staff members who supported the Moratorium. Since IT students are supposed to be interested in figures, here are a few garnered from that ad:

1) Sixty-two names were those of engineering or science staff.

2) Of the 62, 23 were from the Physics Department, 22 from the Math Department, and 6 from Chemical Engineering.

Inescapable conclusion: 11 people from other engineering and science departments cared enough to support the Moratorium by so simple an act as filling out a coupon and dropping it in the campus mail.

"Interesting," you say, "but not particularly significant."

Wrong!

It is significant. It has suddenly become apparent to us why there is so little response to our editorials from the faculty and the students. It is because from the head of IT to the lowliest TA, from the Tau Beta Pi candidate to the most plebian freshman, nobody gives a damn about the real world as long as it doesn't affect his classes or his family.

Joseph H. Sausen

What is Science?

A sure way to cause an argument among scientists is to ask them that question. After hours of debate, they will not have a definition acceptable to all scientists.

To the man in the street, science means putting a man on the moon, or television, or heart transplants, or a new detergent. If he is pressed for greater detail, he may be able to remember one of Newton's three laws or $E=MC^2$.

This kind of explanation of science depends on examples of what science is or is not, and it is not a statement that will include all science and exclude all non-science.

Webster's Dictionary defines science as follows: 1) possession of knowledge as distinguished from ignorance or misunderstanding; 2) knowledge attained through study or practice; 3) a department of systemized knowledge as an object of study; 4) something that may be studied or learned like systemized knowledge; 5) one of the natural sciences; 6) knowledge covering general truths or the operation of general laws, esp. as obtained and tested through the scientific method; 7) a system or method purported to be based upon scientific principles.

A choice can be made among the seven statements, or all can be used as a tentative definition, but none is really adequate. All consider science as history rather than a growing entity. For instance, if all the research centers, and all the laboratories were closed down, and all experiments stopped, would there still be science or would there just be history?

Another word found in Webster's helps us with this dilemma. A definition of art tells us what we should do with the knowledge we have gained through study; art is a systematic application of knowledge or skill in effecting a desired result. Students of art however will disagree with this definition, saying that art is man's need for order in life. Webster's definition is perhaps more pertinent to engineering than science in general.

In getting back to the last question we posed, it can be seen that Webster's definition is inadequate, because for science to exist, knowledge must be used and expanded. But how does the definition of art work into this?

Why does man do research? Is he looking for a faster way to make coffee, or for a cure to cancer, or to see what is beyond the atom? He is looking for all these things, and when he finds them he will have still more things to look for. However, is there a finite or an infinite number of problems to be researched? If there is a finite number, then when the final problem is solved, science will be extinct, and the universe will be in order. But if there are an infinite number of problems, science will exist as long as man exists, and man will continue to need order in his life.

What is science?

This time we can answer the question better, although perhaps not with a consensus. James B. Conant in his book *Science and Common Sense* gives us our useful definition: "Science is an inter-connected series of concepts and conceptual schemes that have developed as a result of experimentation and observation, and are fruitful of further experimentation and observation." This definition covers science as Webster sees it, i.e., as a history, and science as art sees it, i.e. as man's need for order in life. It also tells us how man is to search for order, i.e. by experimentation and observation based on knowledge.

Rodger Whipple

Vietnam Demonstrators

A generation used to be defined as about twenty years. It has grown constantly shorter, until we can call a college term of four years, a generation.

Ideas change and perspectives shift so quickly that a reversal of opinion can occur easily within our generation definition.

Formerly a reversal in public opinion in twenty years was fast. As a result, wise elders urged restraint on those clamoring for change. Today, however, one fifth of that time can bring a nation to reverse its opinion.

In that time discussion of Vietnam has changed from a question of whether or not to stay to one of how fast we intend to leave.

In January 1966, the Log presented an editorial representing the majority opinion of the times, that "We should stay and fight to win or at least until we can reach an honorable settlement." Military might was all that Hanoi understood, according to the editorial. Hanoi would not negotiate, unless it was from a position of strength.

Today that majority has disappeared, replaced by growing discontent in all parts of American Society.

Moratorium Day events showed that dissatisfaction was widespread, not only among radical youths, but in all parts of society. Where tens of weird kids held protest marches four years ago, thousands of people paraded for peace on October 15, 1969.

In the editorial there was reference to a CBS poll that found only 17% of those questioned believed the demonstrators were sincere.

Contrast that with the recent Gallup Poll, in which 57% of those polled agreed with Sen. Goodell's bill. This bill would end the war by the end of 1970. It would remove the administration's power to keep troops in Vietnam after that date.

The tiny minority has grown up. Whether out of moral outrage, sadness at the loss of life, or dismay at the inflationary economic effect, the majority is now ready to leave Vietnam.

Where small groups of peace demonstrators tried to interrupt speeches four years ago the opposite is now true. At the Moratorium Day speech of Senator Walter Mondale a small group of conservative youths heckled him. The minority tactics that the hawks decried four years ago are now their weapons.

The strongest factor in this change of heart can be attributed to the middle class respectable citizens. In the past this silent group privately scorned what they referred to as unwashed punks.

Now these families are beginning to realize the effects of war upon the country. Mothers are now out marching with the kids.

The prophesy of the demonstrators has been fulfilled. Only the Spiro Agnews of the country persist in calling them communist dupes.

Now that the justification for U. S. intervention in Vietnam has been repudiated, it is time to thank the people in the streets that have been insulted so long. After all, who was right in 1965?

R. Klepinski

HOMEBUILT AIRCRAFT

by DAVE BEULKE

How about it, engineers, are you tired of the humdrum hobbies most of you are bound to? Why not try something daring, something that will bring out your real engineering ingenuity. Why not build your own airplane? Thousands of people are now either flying their own aircraft or building them in their back yards or garages. These people are making amateur built aircraft flying one of the country's fastest growing pastimes.

The Mecca of the amateur aircraft builder is the Milwaukee suburb of Hales Corners, Wisconsin. This is the home of the Experimental Aircraft Association (EAA). Founded in 1953 by Mr. Paul H. Poberezny, the original goal of the organization was to establish a local flying club. This modest goal has mushroomed to where there are now 328 EAA chapters with more than 40,000 members.

What kind of people join the EAA? Membership might be divided into roughly three classes. The largest group consists of individuals who wish to fly for the sheer fun of flying, but do not have the financial stature to invest $6,000 or more for a factory-built aircraft. These people have found that a satisfactory single-place aircraft can be constructed for approximately $2,000 to $2,500.

A rather surprising fact about many homebuilts is that they perform better than their factory-built counterparts. For example, the Wittman "Tailwind," a two-place high-wing monoplane of welded steel tube for the fuselage and wood wing construction with fabric covering, pow-

HOMEBUILT AIRCRAFT

ered by an 85-horsepower Continental engine, has consistently demonstrated a top speed of 175 miles per hour, with a cruise speed of between 150 and 155 miles per hour. When compared to a commercial aircraft of similar size, the "Tailwind" flys about 45 miles per hour faster, and costs about $5,000 less.

The second group of EAA members is represented by those who might find it easy to finance the purchase of a production aircraft, but cannot find one with either the performance or features they want. This group includes those who wish to race their aircraft or test their own design ideas.

The third main group of EAA members are those who are preoccupied with restoring antique aircraft to original conditions. Many of these individuals build vintage designs, such as Fokker Triplanes, Curtiss Pushers, and SPADS, from scratch. Antiquers are probably the most conscientious of all homebuilt builders, spending countless hours merely doing research on a particular aircraft.

Probably the two most famous aspects of the EAA are the EAA Air Museum and the International Sport Aviation Convention held annually at Rockford, Illinois. Second only to the official Air Force Museum at Wright-Patterson Air Force Base in Akron, Ohio in size, the EAA Air Museum houses some 65 individual aircraft displays, along with 30 display engines and an extensive propeller collection.

The Rockford fly-in is probably the largest and best known of all the world's aircraft conventions. Aircraft of all types are brought there so that pilots can exchange ideas and pool their knowledge in the field of amateur-built aircraft.

The EAA also publishes a monthly magazine, *Sport Aviation*, for its members. It also prints handbooks related to various skills required in building an airplane, e.g., welding, woodworking, engine maintenance, etc.

The prospective aircraft builder has a wide choice of aircraft types from which to choose. The cost of plans ranges from the EAA Biplane at $20 to the Great Lakes Sport Trainer at $150. Plans for racing planes, retractable gear aircraft, and scale replicas of antique aircraft are also available from a variety of sources.

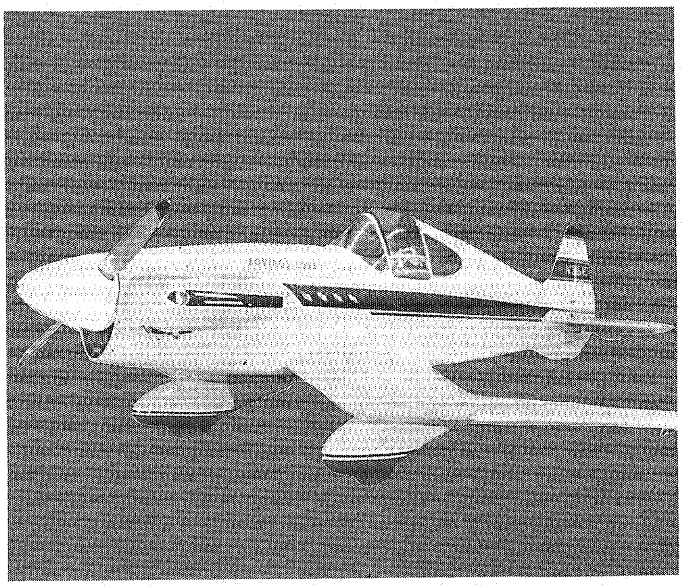
Engines used in homebuilts are generally in the 65- to 125-horsepower range. A favorite engine of homebuilders is the 125-horsepower 4-cylinder Lycoming GPU (Ground Power Unit). These engines are modified for use in aircraft. The cost of engine plus modification runs to about $600 as compared to $900 for a typical used aircraft engine.

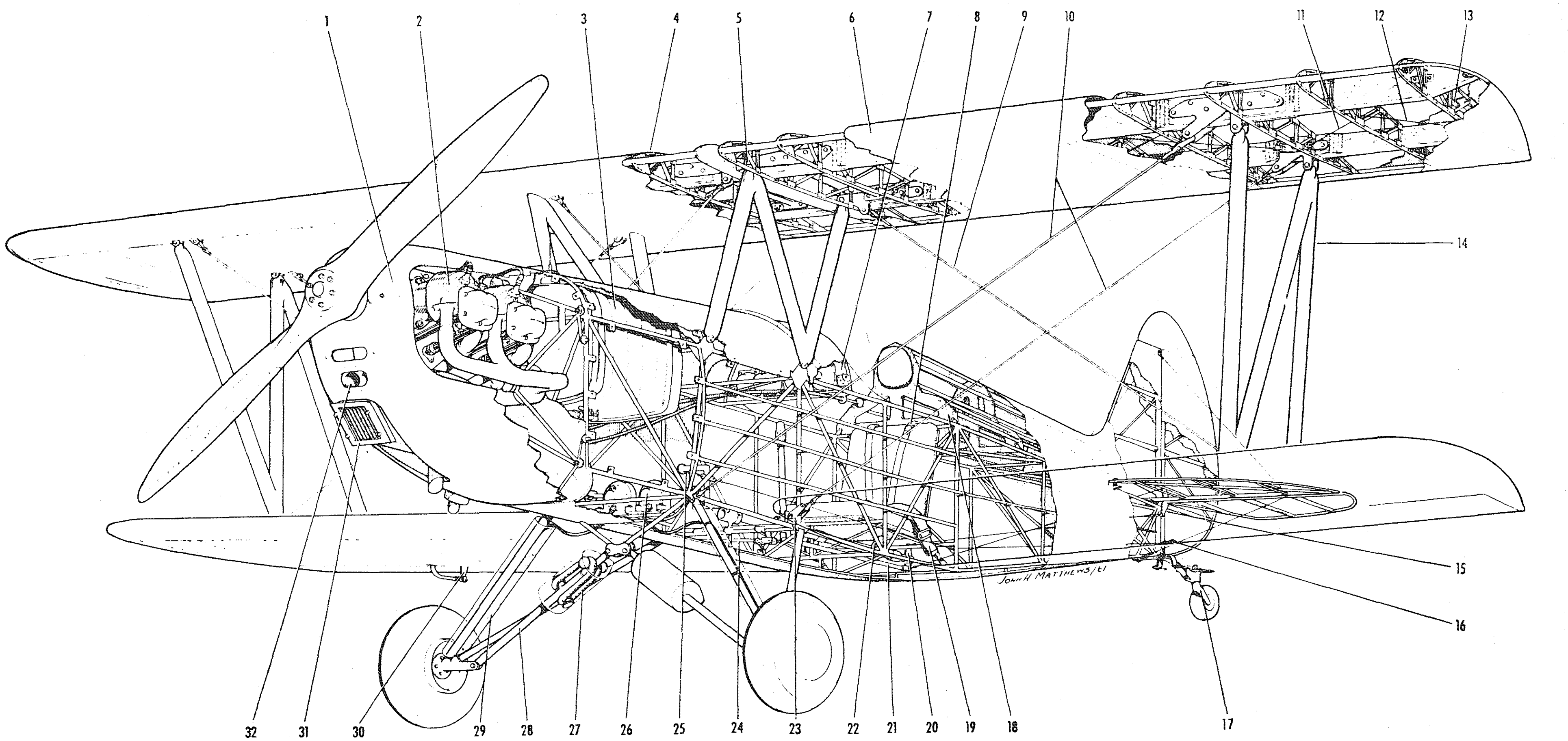
All homebuilts, of course, must meet minimum federal standards for flight safety. A test period of about 50 flying hours is necessary to license the aircraft in the amateur-built, "Experimental" category. After this trial period, the aircraft may be flown with almost the same freedom as any other private airplane.

So, engineers, if you have some spare cash, spare time, and a desire to do something unique, why not investigate the growing world of amateur aircraft. Better yet, drop a line to the Experimental Aircraft Association in Hales Corners, Wisconsin and get full information on homebuilt aircraft.

Preceding Page: This ¾ scale version of the Fokker DR-1 triplane took two years to build and is powered by an 85-h.p. engine.

Below: Two extremes in home built design are exhibited by the homemade-looking aircraft on the left and the sleek racer on the right.





Pictorial Cut-away by John H. Matthews, EAA 9776

EAA BIPLANE

1. Piper J-3 Style Cowling
2. Continental A65 Engine
3. Piper J-3 gas tank
4. Center section assembly
5. Wing attachment fittings
6. Aluminum leading edge to main spar
7. Instrument panel
8. Shoulder harness
9. Streamlined landing wire
10. Streamlined flying wires
11. Anti-drag wire
12. Drag wire
13. Compression strut
14. Streamlined steel tube inter-plane struts
15. Elevator horn
16. Rudder horn
17. Piper J-3 tail-wheel assembly
18. ¼ in. ply formers
19. Seat belt
20. Elevator bell crank
21. Elevator push rod
22. Lower rear spar attachment point
23. Lower main spar attachment point
24. Right aileron push rod
25. Rudder pedal
26. Brake pedals and pumps
27. Landing shock cords
28. Modified Piper J-3 landing gear assembly
29. Streamlined aluminum strut fairing
30. Aileron horn
31. Carburetor air intake
32. Carburetor heat air intake

by DAVE BEULKE

The next time you attend a Gopher or Vikings football game you'll probably notice a biplane towing a banner.

Not only are you viewing a beautifully restored and maintained Stearman biplane, but you're also watching one of the few remaining banner-towing businesses in the U. S. in action.

The man who owns, flys, and maintains this immaculate aircraft and who runs the only banner-towing business in the Twin Cities is Charles (Chuck) Doyle. Chuck, by profession a commercial airline pilot, spends his spare time towing banners at sporting events in our area. When not working at his banner-towing business, Chuck can be found skywriting or just rebuilding antique aircraft at his home. He is currently restoring a P-51 Mustang fighter plane (See October 1968 *Technolog*).

Probably the most interesting part of Chuck's banner-towing business is his use of the classic Stearman biplane. Officially designated as a Boeing A75N-1, this airplane is a highly modified version of the Stearman N2S-2, a primary trainer used by the Navy in World War II.

Chuck purchased this Stearman as government surplus for $250.00 in 1946. Modifications incorporated in the aircraft included replacing the original seven-cylinder, 220-horsepower Continental radial engine with a nine-cylinder, 450-horsepower Pratt and Whitney radial. The fuselage, normally covered with fabric, has been metalized. The vertical and horizontal stabilizers are also metalized. The front cockpit has been replaced by smoke tanks used in skywriting. The center section of the top wing has been modified and enlarged to give greater fuel capacity and increased lift. A radio and a 24-volt electric system including a starter were also installed. The finishing touch of a propeller spinner, engine cowling, and wheel pants, along with a spotless turquoise with blue and white trim paint scheme, make this Stearman a truly outstanding aircraft.

The performance specifications of this modified Stearman in themselves are outstanding. The takeoff run is about 500 feet, rate of climb is about 1350 feet per minute, and fuel consumption is 17.8 gallons per hour.

The rather glamorous job of towing a banner begins with the rather unglamorous task of assembling a banner. After his client has selected an appropriate slogan to be advertised (Chuck's towing rig is capable of towing a 40 letter banner, but he likes to limit banner length to 30 letters), the banner is assembled from a complete alphabet of nylon letters. The letters are held to each other by eight thin nylon tapes which are attached to spacing poles between each pair of letters. As a safety measure, Chuck has two additional cords running along the top and bottom of the banner. The banner is then rolled up until it is to be towed.

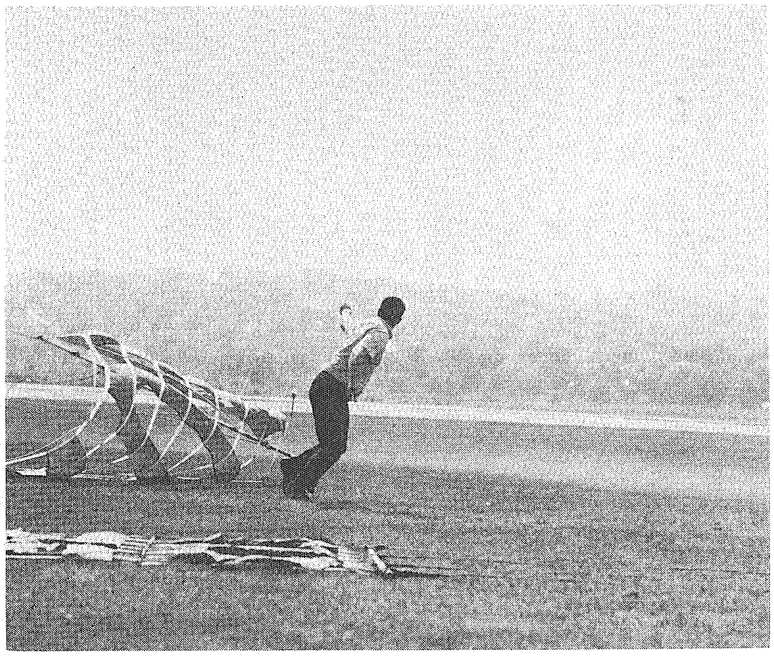
The most exciting part of the entire banner-towing process is the take-off. The banner is unrolled at an angle of about 15 degrees to the path of take-off. A 400-foot cord attaches the banner to the aircraft by a special latch (see photograph) which Chuck later uses to detach the banner from the airplane. The Stearman then takes off into the wind and literally peels the banner off the ground as it flys by (see diagram and photos). A wind sock is attached to the end of the banner before takeoff to keep the letters taut and readable.

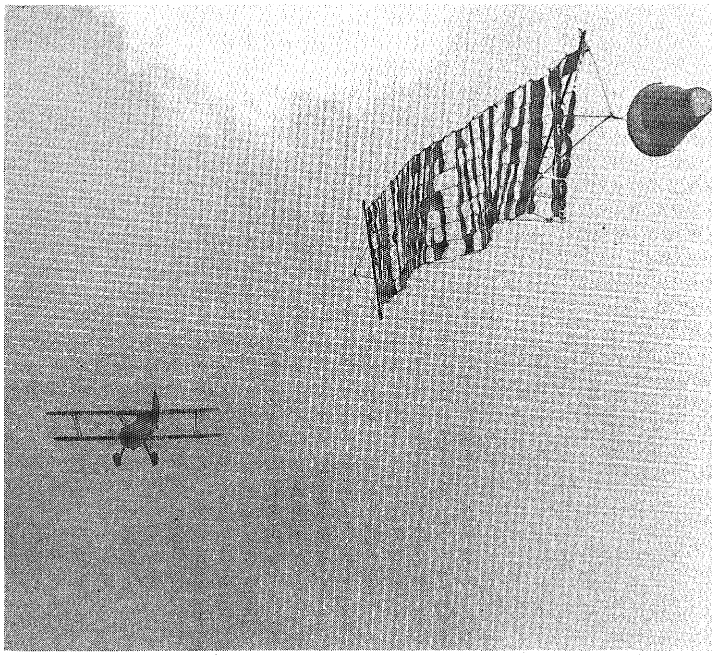
Since the banner faces the pilot's left, he must fly in a left-hand circle so the crowds below see only the left side. Flying with a banner decreases the airspeed considerably. Chuck estimates that his airspeed decreases by about 30 to 35 miles per hour when towing the banner.

The method of dropping the banner is quite simple. Chuck flys low (about 300 feet) above the airfield. From the inside of the cockpit he then releases the banner. Because of the use of strong nylon letters and spacing poles of high-impact synthetic materials there is little chance of tearing or breaking any part of the banner.

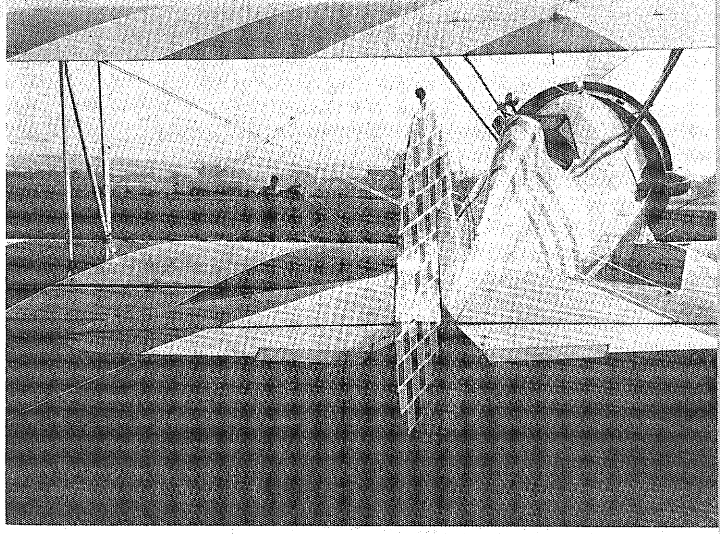
So, next time you hear that deep roar of a radial engine and see the Stearman pulling a banner, keep in mind that you're watching a rather unique and quite rare part of the advertising industry at work.

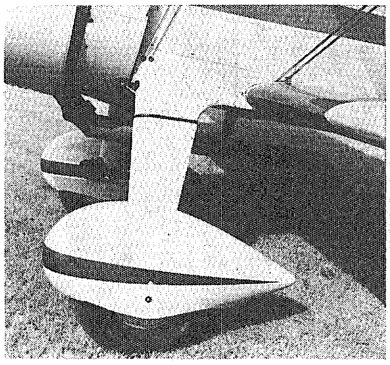
Banner towing begins with a dramatic takeoff run. Chuck Doyle applies power to his magnificent Stearman Biplane and literally peels the banner off the ground. Taking off with a banner requires every ounce of power the big Pratt and Whitney engine can put out.





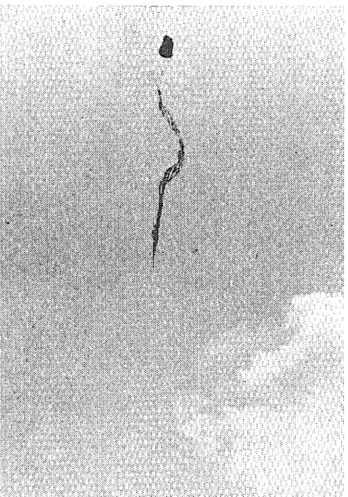
Banner Towing

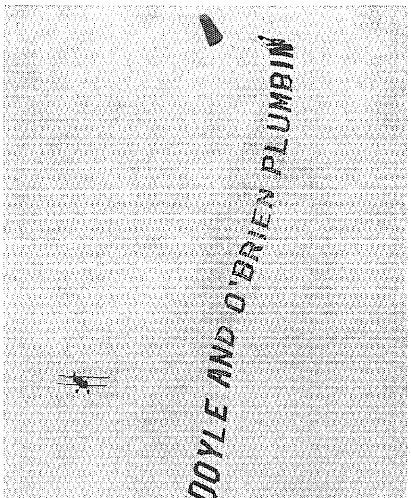


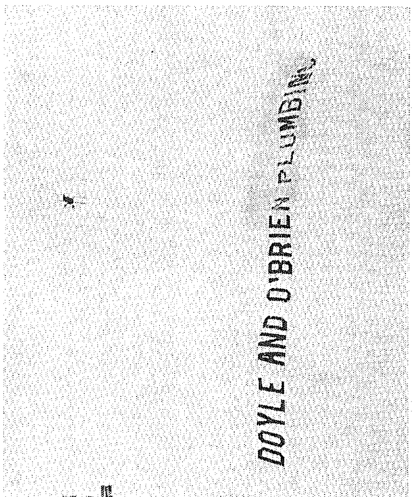


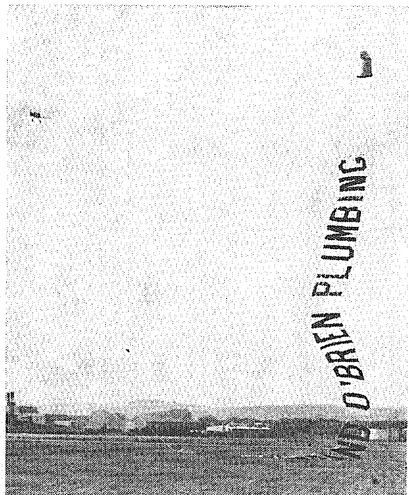
Above: Chuck Doyle, with help from his sons, Chuck, Jr., and Bryan, runs one of the few banner-towing businesses in the U. S. On clear summer days he can also be seen skywriting over the Twin Cities. Skywriting smoke is emitted through the exhaust pipe under the engine cowling.

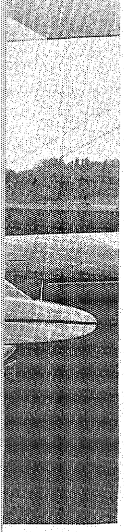
Below: After about 45 minutes of banner towing, Chuck flys low (about 300 feet) over the airfield and releases the banner with a special latch at the tail of the airplane. The rugged construction of the seven-foot nylon letters, prevents any serious damage as the banner hits the ground.

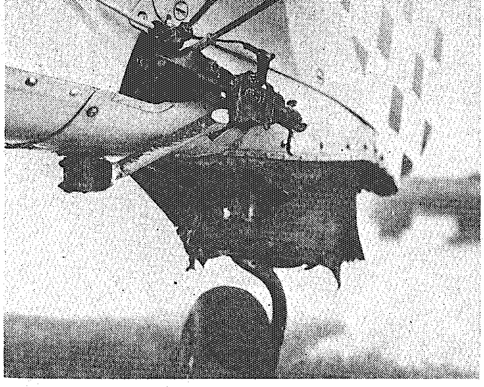


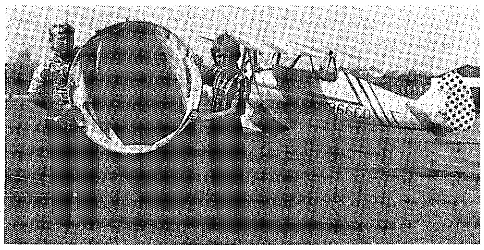


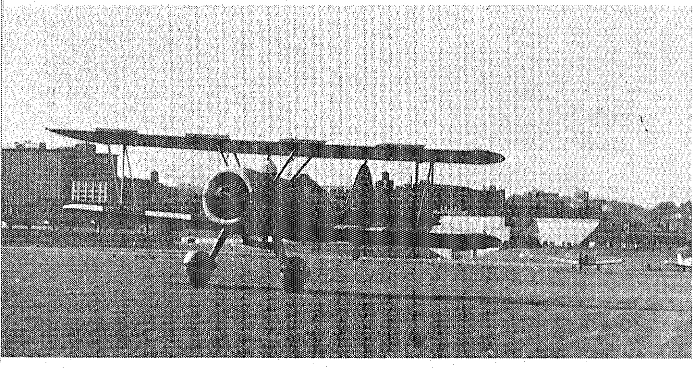


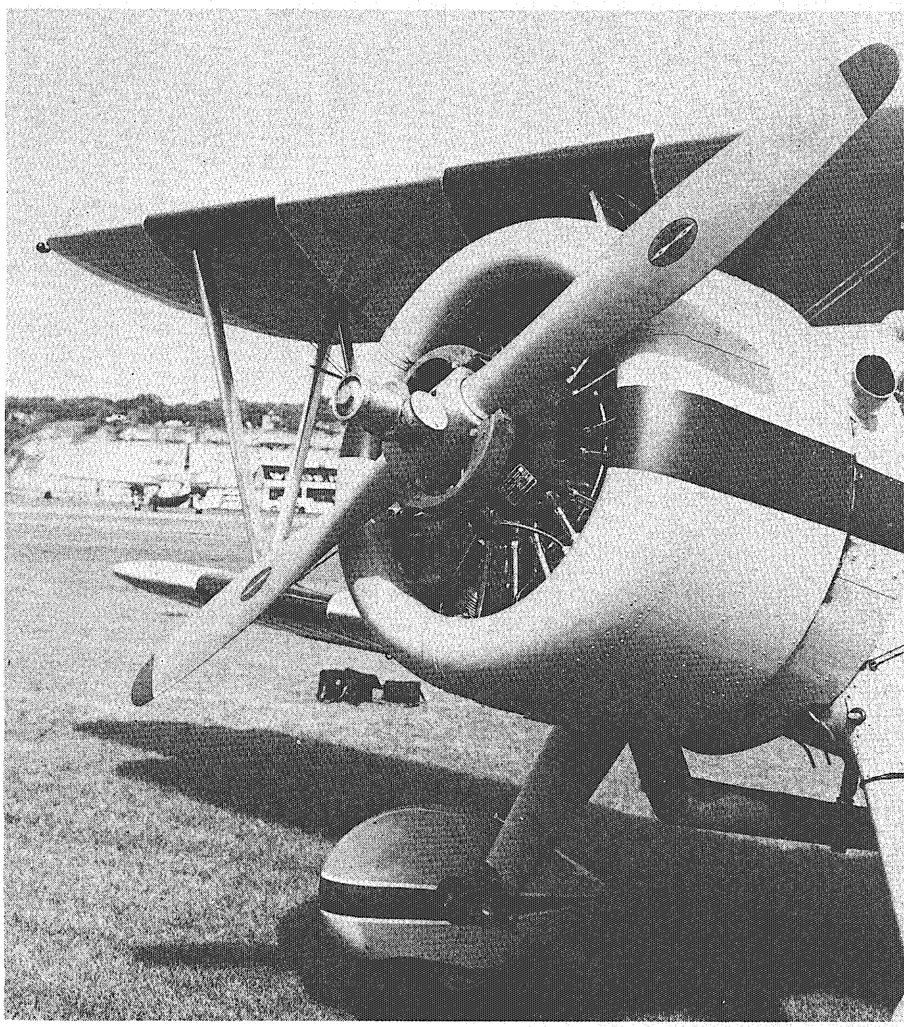












ENGINEER'S BOOKSTORE

SELLS

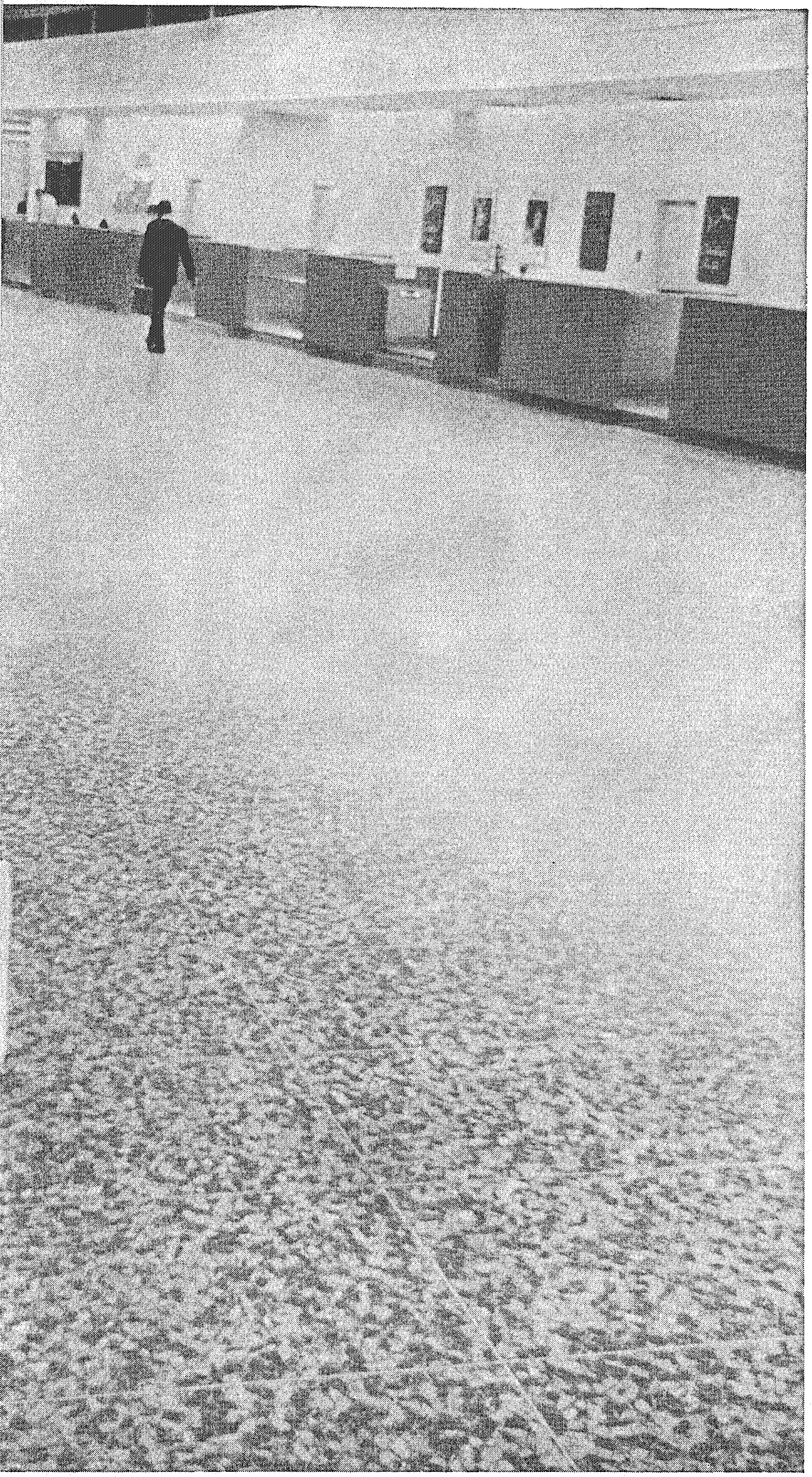
SWEATSHIRTS

AND OTHER

APPAREL

Someday soon, a fog disperser may guarantee that you won't lose a single day of Christmas vacation.

PHOTO: JOHN HARRISON



So you want to learn to fly!

THE PRIVATE PILOT'S LICENSE

is the first step toward the free blue skies.

by BOB JOHNSON

Flying is not really a sport, it's a disease of the mind for which there is no known cure. When you push the throttle in and get the tires off the runway you never want to come down again. But alas, after a few hours you'll run out of gas so you have to buy more and that costs money which most of us don't have. Well, here's where the good old University of Minnesota Plant Services comes in to help everyone out. Plant Services has an excellent flight facility which is open to all faculty, staff, and currently registered students at the University. Through them you can get a Private Pilot's License, a Commercial Pilot's License, Instrument Rating, and Flight Instructor and Instrument Flight Instructor Ratings, or just fly for fun.

Now I suppose you're going to say "Ha! The University takes all our money for fees and books, they're not going to let us fly for nothing." Well—that's right, but their price is very, very reasonable. As a matter of fact, they are about the cheapest in town and have some of the best planes to boot. It should be noted that the flight facility is completely self supporting and doesn't receive any allowance from the University.

When I say best planes, I don't mean to degrade any airplane manufacturer, it's just that the aircraft owned by the flight facility are the most modern Piper aircraft on the market and are kept up by a full-time staff of maintenance personnel.

For the beginning pilot, the facility has a fleet of Piper Cherokee 140's which are two or four passenger, low-wing craft that are simple to get used to. The 140 is powered by a 150 horsepower engine that Piper says will move the plane at 140 miles per hour top speed and cruise comfortably in the 120 mile-per-hour range. There is a lot of controversy about whether high-wing or low-wing planes are better as trainers. Each type has a number of advantages. The high-wing (wing above the fuselage) planes are probably simpler for the novice to start in since they are slower, giving you more time to react to any situation that might arise. High wingers also handle slightly easier in crosswind take-offs and landings and have better visibility below for sightseeing. As far as low-wing craft go, the advantages become more important as you build up flight time. You'll naturally want to check out in larger, faster, more sophisticated aircraft. These are primarily all of the low-wing type. It is easier to advance in your ratings by working in the same basic type of craft than to go to the top of one line of planes and find that to go further you have to switch to something completely different. Like changing horses in the middle of the stream—not impossible, but it is difficult.

In a few years you'll see how valuable flying can be to your career. As a consulting mechanical engineer, for instance, you may be calling on clients by air. A pilot can have a breakfast meeting in Duluth, lunch with a contractor in St. Cloud, visit a job site in Alexandria in the afternoon, and still be home for dinner. A lot of companies have planes just for these purposes. Or, how about a short vacation in Florida during the winter. It can be reached in less than a day in a twin-engine plane and there's plenty of room for four or five friends to go along. Better yet, there's a 4,000-foot, paved runway at the Playboy Club at Lake Geneva, Wisconsin. How's that for convenience? What it boils down to is that small planes save a lot of time and energy in transportation and they're a lot of fun. You can make your own schedule to go where you want when you want.

There should be a word of caution to everyone who thinks flying is a snap. It's relatively easy to maneuver a plane up and down, but unless the pilot is ready for anything, he's in serious trouble. Planes seldom hurt anybody, but an irresponsible pilot can. Over-confidence on the part of a pilot can kill.

One of the best things a new pilot can do is to go through a Federal Aviation Administration approved ground school course. Ground school courses teach meteorology (weather), flight principles, instrumentation, Federal Aviation Administration regulations, navigation (both electronic and by pilotage), radio use, and a number of other things. One of the most important subjects taught is weather because it can kill you. You'll learn to read weather maps to plan your course around rough areas and through the smoothest skies.

One thing that may be bothering you is, what happens if the engine stops? At first it would seem like sheer disaster. However an airplane is just a heavy glider and you must learn how to handle it as one. Some planes have glide ratios of close to 10 to 1 which means that from an absolute altitude of 5,000 feet they can glide for close to ten miles in any direction. This gives you some 300 square miles to land the plane in and that's a lot of room. It will also reassure you to know that the new airplane engines are so reliable that they're rated at running 2,000 hours before requiring a major overhaul. Averaging 100 miles per hour flight time, that's around the world eight times! Airplanes have to be inspected every twelve months by federally licensed mechanics and rental aircraft are inspected every one hundred hours of flight time.

Another thing you'll learn in ground school is navigation, both radio and pilotage types. With the radio equipment in most small planes today, you can fly from here to any place in the Continental United States without looking for one landmark. You can also tune in on a particular omni station and find the radial that you are on from that station. Repeat this procedure for another omni station and where the two radials intersect on your map is your position. It's so simple, I had a radio like that put in my car.

In your in-flight training you'll get about eight or ten hours of time in the air with an instructor and then you get signed off for solo flight which is really a thrilling experience. You are up there all alone for the first time and you feel like the world is all yours and you're a little scared at the same time. The plane will be a couple hundred pounds lighter without your instructor so it will keep flying a lot longer than you're used to. As you land you'll probably try to face the plane down on the runway and richochet back up in the air. After porpoising down the runway awhile, the plane will finally slow down enough to land and you feel like you should crawl into a hole and die. There's only one thing to do, though, and that is go out and try it again. The secret to good landings is consistency, develop a pattern, regulate your altitude and airspeed all the way down, and you should be in good shape for a smooth landing. It takes a lot of work and concentration but its very satisfying to hear the wheels squeak and not feel a jolt.

After ten hours or so of solo practicing take-offs and landings, you'll go out with your instructor to practice maneuvers, cross-country flight, night flight, instrument flight, emergency procedures, and many other things. You are than required to have ten hours solo cross-country flight after which you should have almost enough flying time in to take your test. To get a pilots license you have to take a written exam, an oral exam, and a proficiency test in the plane. If you pass all these, you'll find your work is just beginning. It's up to you to remain proficient, to keep your plane in the best condition, and to be a safe pilot.


CAVU*

FLYING CLUBS

by PAT HINES

The initial investment involved in the ownership of an airplane or the high cost of renting a plane does not necessarily dash to bits a new pilot's hopes of doing any pleasurable flying. Rather, many pilots today are gaining membership in flight clubs and are doing their flying at a reasonable price, one which an average fellow can afford.

What is a flight club? The Federal Aviation Agency (FAA) accepts the definition given in the Minnesota Statutes. They state that "'Flying Club' means any person other than an individual which, neither for profit nor reward, owns, leases, or uses one or more aircraft for the purpose of instruction or pleasure or both." Ask a flight club member and he will tell you that it is a non-profit organization, chartered through the state of Minnesota, for the promotion of the social and enjoyment aspects of flying. Almost everyone agrees that a flight club is in existence when a group of people join together, buy an airplane, use it, and share in the costs.

A flight club, normally, for the protection of its members, is a corporation. By becoming chartered as a non-profit corporation, the organization itself assumes liability at any time, rather than the individual members sharing it as they would have to do in a profit-taking corporation.

Most clubs have officers just as business corporations do. Normal positions are president, vice-president, secretary, treasurer, and operations officer. These positions carry about the same responsibility as those of any other organization. The operations officer, however, assumes the duties of scheduling the use of the airplane(s) and other arrangements concerning the operation of the plane. In the smaller clubs, the president often doubles as the operations officer.

In the larger clubs, with three or more planes, other positions are created, such as maintenance officer and program officer. The duty of the maintenance officer is taking care of the normal maintaining chores of servicing the aircraft, keeping track of what it needs when.

A flight club is financed solely by its members. To form a club, usually a few pilots each contribute a share of money to purchase an aircraft. It's logical that they should want to do so, for the cost of a new airplane is seldom less than $10,000. Used ones aren't much cheaper. Once the club has been chartered as a corporation by the state, each member holds a legal share in that corporation and is on equal voting status with the rest of the club members. From then on, each member usually pays monthly dues, which pay for storage of the aircraft, liability insurance, and operating expenses of the club itself. This results in the saving of money by all members. Not only does a member avoid the large capital outlay to purchase an aircraft, but he pays only a part of the hangar rental he would have to pay if he owned the plane himself. Normal dues range from $10 per month to more than $25, depending on the type of service which the hangar crew supplies, the number of planes to be stored, and the type of insurance carried by the club.

Another way the club supports itself is by usage charges from those operating the plane. When a member wants to use an airplane on a certain date and/or for a certain time, he contacts the operations officer and reserves the plane for that time. When the member is through using the plane, he is charged a specified rate for the hours of *flying time* which actually occurred. Normal charges range from $6 per hour for the smaller planes up to $15 or more for some of the larger and faster planes (these are for a *wet* plane, meaning the gasoline is included in the hourly rental). The charges for flying time are programmed to just balance the depreciation and the gas and oil used. Thus, the club makes no money and can be classified as non-profit.

Some clubs sponsor activities other than those which use aircraft. Most hold monthly meetings where pilots can socialize and talk shop, as well as getting regular business taken care of. Twin Cities Mile High Flying Club sponsors flight safety seminars to entitle members to pick up safety tips and procedures. Many people can complete their flight training in a flying club at a lower than normal cost. By buying a share in the club, rental expenses will be cut quite a bit. Many clubs have instructors who will give instruction to pilots qualifying to pass the written examination. However, this cannot always be done because this puts the club in the commercial operations category, for which they must pay a commercial license fee and carry commercial insurance.

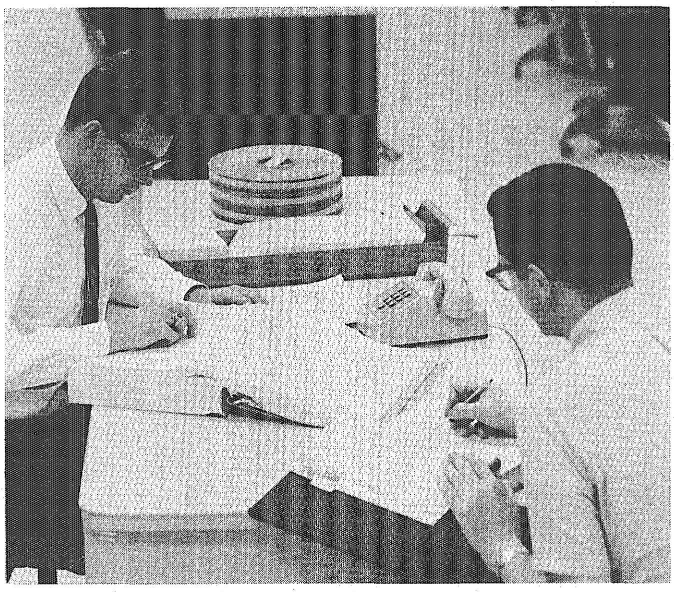
Most airports have one or more flight clubs associated with them, and membership is open to anyone with a private license or to students trying to obtain such. It's part of the answer to low cost flying for the average man.


We've got some
unusual shoes to fill

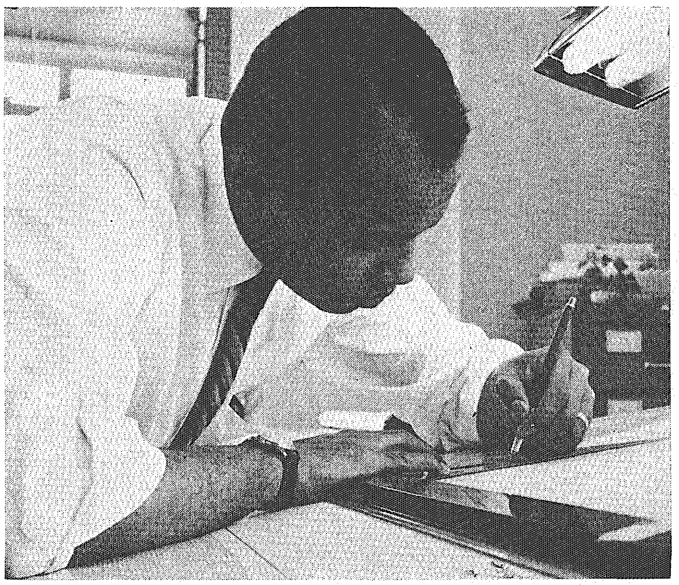
Engineers in Industry at . . .

The Bell System

by NORTON JOHNSON



Engineers translate telephone company specifications to electronic language.



a draftsman at work.

Name a field. Business, government, education, medicine, agriculture . . . activities in any of these fields are almost certain to require up-to-date communications services. Today, the rapid exchange of information is essential in doing whatever needs to be done.

The communications explosion is here, and as the demand for more and better communications services grows, so does the requirement for talented people. In the years just ahead, the Bell System will need many new managers and engineers—capable people who can handle jobs with responsibility and challenge.

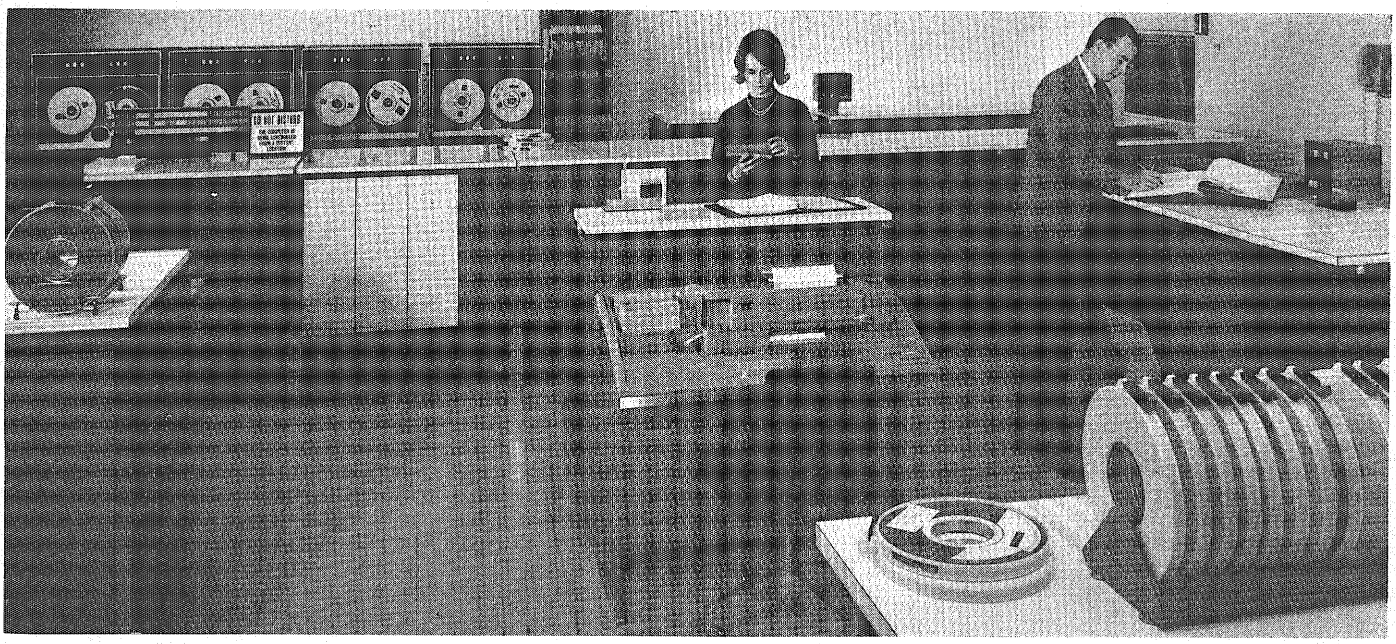
The Bell System offers many career opportunities to the graduate in all areas. Bell Laboratories and Western Electric are two of the technical branches of the Bell System a graduate may consider.

Bell Laboratories is one of the world's oldest, and still one of the largest, research and development organizations in private industry. It is Bell Labs' task to undertake the basic research, development and design, and systems engineering necessary to provide the Bell System, and, in turn, society, with new and improved equipment and services for communication.

Bell Labs employs almost 15,000 people, who work to improve communications and to serve our nation's defense. These employees can be divided into three parts: One third are members of the technical staff; the second third are technical aides assisting the first group in their work; the remaining third are the administrative and supporting staff, who provide all the necessary services required by the technical staff.

Bell's field is communications, but research, at one time or another, can involve almost every branch of science and technology. Hence, many *electrical engineers, physicists, mathematicians, chemists, metallurgists, mechanical engineers,* and *statisticians* are needed. But *crystallographers, psychologists, oceanographers, logicians, biologists,* and *civil engineers,* are also needed. Bell is continually seeking experts in a wide variety of areas.

This diverse need results from the tremendous extent of Bell Laboratories' technical interests. They begin with the study of the basic structure of materials; that concerns specialists in modern *physics, chemistry,* and *metallurgy.* Then follows the study of how the materials can be best employed in new sorts of components and/or circuits; that calls for the expertise of, for example, *physicists, chemists,* and *engineers.* There is also a third level of



This computer room is part of one Bell System training center.

interest combining these components into communications systems. This may involve such people as *mathematicians* and *electrical engineers.* Of course, at all these levels of interest there will be both research and development involved, employing talent from many more disciplines than those few cited as examples.

At Bell, none of these experts need work only as he might in a purely academic setting. He has the freedom to achieve results within his specialty, but he also has the opportunity to participate in a complex system of many related skills, all working in constant interplay with each other. One of the unique things about Bell Laboratories is that a scientist or engineer may work individually in his own laboratory to discover the transistor effect, or couple his specialty with that of hundreds of other experts to build a telstar satellite.

The final output from Bell Labs consists of designs for new and improved materials, devices, and systems. When Bell Labs' innovations are ready for manufacture, they are turned over to the Western Electric Company. Western Electric also purchases, distributes, and installs almost all of the Bell Systems' equipment.

Western Electric is the largest of the units that make up the Bell System. The company works closely with Bell Labs which has branch laboratories at nine Western Electric Plants. Their joint research and development yields the designs and processes required for tomorrow's telephonic equipment.

Opportunities in a wide range of vital engineering and scientific pursuits exist in manufacturing communications equipment. Western Electric needs imaginative and creative engineers from these major fields: *electrical, mechanical, chemical, industrial,* and *metallurgical.* In addition, they need *mathematicians* and *physicists.*

Systems engineers are one of the last in the chain of specialists that oversee the development and installation of a communications system. These engineers work closely with local telephone companies to help assure that their equipment provides the services the customers need. In addition, this special breed of engineer may assist in selecting sites for central offices, perform scheduling work, or supervise the development of engineering specifications and drawings for Western Electric installers.

To succeed, an organization of Bell Labs' size must have a carefully planned structure to govern its over-all operations. Talented people are needed here too, in management. If you seek a solid future in this area, Northwestern Bell, another part of the Bell System, offers their Initial Management Development Program (IMDP).

IMDP is based on the straightforward idea that the best way to find out if a person can manage or engineer —and do well —is to let him try. Participants in the program have backgrounds in *business administration, education, psychology, history, mathematics,* and *engineering.* The program is set up so that after joining Northwestern Bell, you'll have a few days to get acquainted with the company, meet some people, get settled into your job. Then they'll cut you loose on your first assignment. It'll be tough and demanding—one that will test your stamina. You may be made supervisor of a group of telephone people, responsible for planning, leading, and expediting their work, or you may be given a number of short-duration "solo" assignments, requiring you to analyze and find solutions to some many-sided problems. Either way, you will be held accountable for the results. You'll work for an individual well qualified to evaluate your performance. He'll help you get off to a smooth start, but you'll be expected to run your own job and make your own decisions.

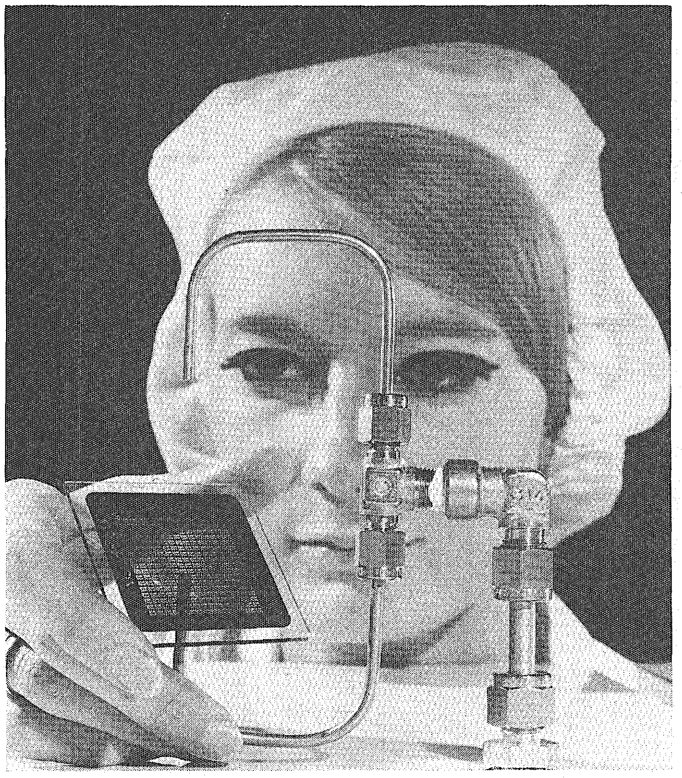
All in all, the Bell System offers a diversified range of employment opportunities in all of the technical fields. Perhaps, more importantly though, it offers you, as an engineer, scientist, or mathematician, the opportunity to advance in whatever field you enjoy, even though it may be quite different from the field you first choose. A man may start working at Bell Labs as an *electrical engineer,* become a *mathematician,* and then a *systems engineer.* Many Bell Labs supervisors, department heads, directors, executive directors, and vice presidents have done just that, crossing interdisciplinary lines many times as they advanced.

What's New in Science and Engineering

by JOANN HAWKINSON

Fair Wind

A single speck of dirt could ruin one of the hundreds of tiny microcircuits being held by Joyce Forst, so she gives them a dusting with a blast of air before they are installed in a data keyboard. Miss Forst works in the "ultra-clean" room of Honeywell's Solid State Electronics Center in Minneapolis, where the air is kept 10,000 times cleaner than in the average industrial plant.



Four-Legged Thing

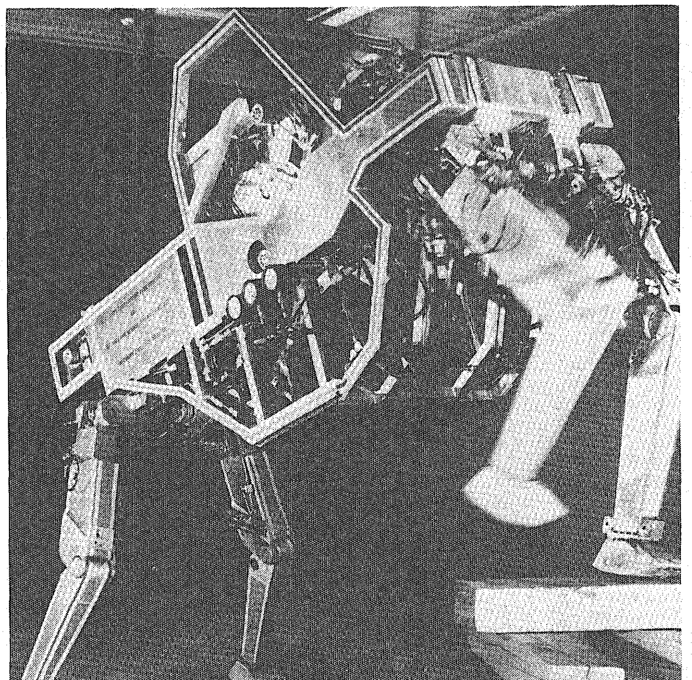
"Forced feedback" is used in this four-legged walking machine, designed and developed by General Electric Company under U. S. Army contract. By means of an advanced control system, the machine mimics and amplifies the linear movements of its operator.

The "force feedback" system is an engineering technology in which part of the forces generated or encountered by the machine are duplicated and reflected to its operator. If the machine's foot, for example, strikes a solid object, the operator feels this contact with his arm or leg. In the quadruped, a human being furnishes the nervous system for a four-legged machine constructed on the Cybernetic Anthropomorphous Machine System. The new system makes it possible for the walking robot to become an extension of the human operator's own arms and legs. In effect, the operator actually feels what he is doing even in cases where he is unable to see.

The research prototype which is 11 feet high and 3,000 pounds in weight, was built by the GE Specialty Materials Handling Products Operation under a project sponsored jointly by the Advanced Research Projects Agency, Department of Defense, and the Department of the Army.

The operator of the "walking machine" can maneuver it forward or backward, balance it on two diagonal legs, make it climb over a four-foot-high obstacle or walk a narrow path. In initial tests the "walking machine" has successfully walked across level ground, turned around, climbed obstacles, lifted a small military vehicle out of a mud hole and hoisted a 500 pound load onto a truck with one foot.

The robot is operated on a hydraulic system. The "muscle" on each leg of the prototype is a hydraulic actuator driven by high-pressure oil. Oil input to each actuator is regulated in direction, quantity and pressure by servovalves that respond to the operator's hand and foot controls.

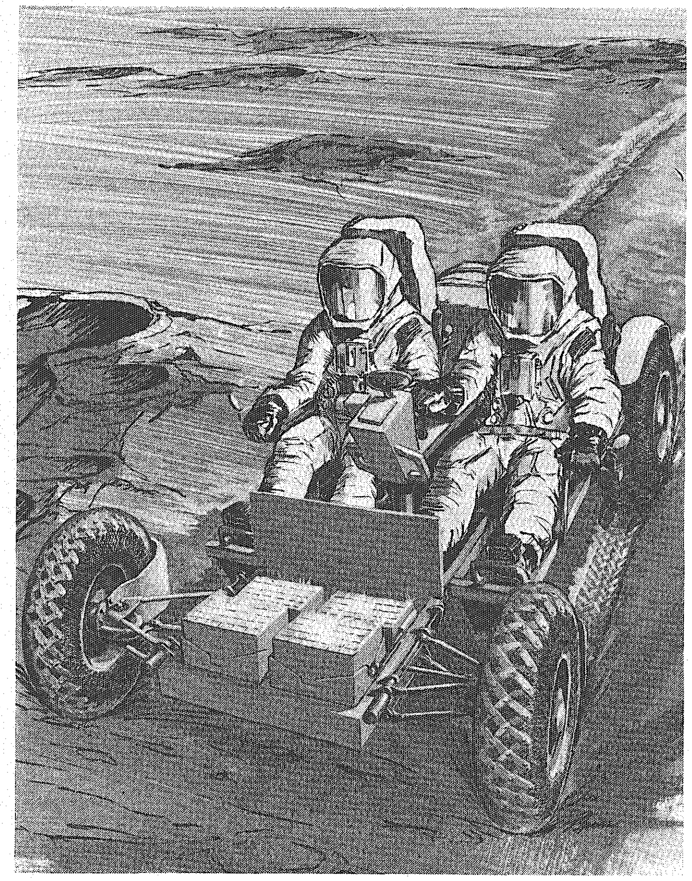


The power system is made up of a gasoline engine, hydraulic pumps and hydraulic accessories, such as heat exchangers, and accumulator, filters and valves.

The walking device may or may not prove to be a desirable addition to the Army's vehicle fleet, but the Army will continue its research activities with the ultimate objective of creating control mechanisms that will make it possible to develop revolutionary equipment for the handling of material and the transporting of cargo and personnel.

Lunar Rover

This Boeing designed rover carries two astronauts over the moon's rugged landscape as shown in this artist's conception. The 400 pound moon buggy would provide surface transportation for two astronauts, their hand tools, equipment, collected lunar samples, and experiments. Electric motors would power the vehicle at speeds up to about 10 miles per hour. The Boeing Company has teamed with General Motors Corporation's AC Electronics Division in seeking the National Aeronautics and Space Administration assignment to develop the vehicle. The first rover is slated for use on the moon in mid 1971.



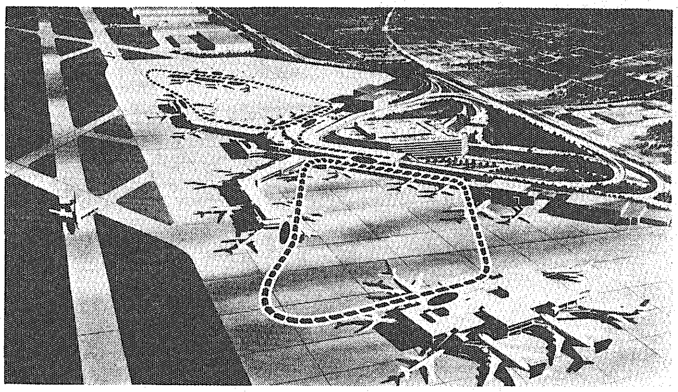
Automatic Transport

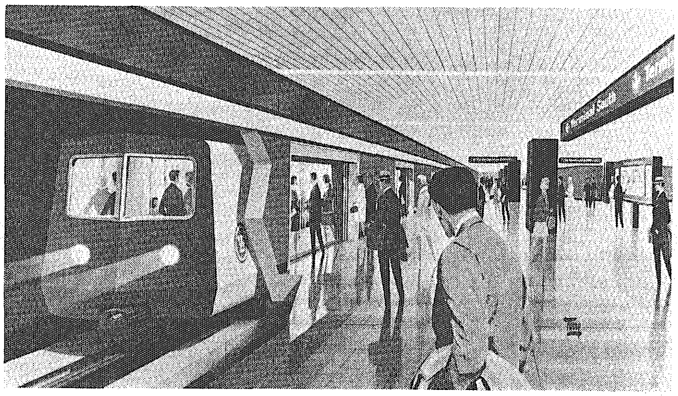
A $5.3 million contract for the most sophisticated, automatic transportation system ever ordered for an airport has been signed by the Port of Seattle Commission and Westinghouse Electric Corporation.

The system, expected to be completed in 1972, will include nine computer-supervised 106-passenger transit vehicles that will serve intra-airport passenger stations.

The Seattle-Tacoma system will consist of two loops and a shuttle on which vehicles will operate independently and automatically. It will be the first all-underground system of its size and sophistication ever installed at an airport.

The 3,700-foot-long South Loop will link an enlarged main passenger terminal and the South, or International, Satellite and the end of Concourse B. The 4,000-foot-long North Loop will connect the main terminal with the North Satellite and the end of Concourse C, which is now undergoing further extension. (Routes of the new underground satellite transit system are shown superimposed on an architectural rendering of the airport as it is expected to look).





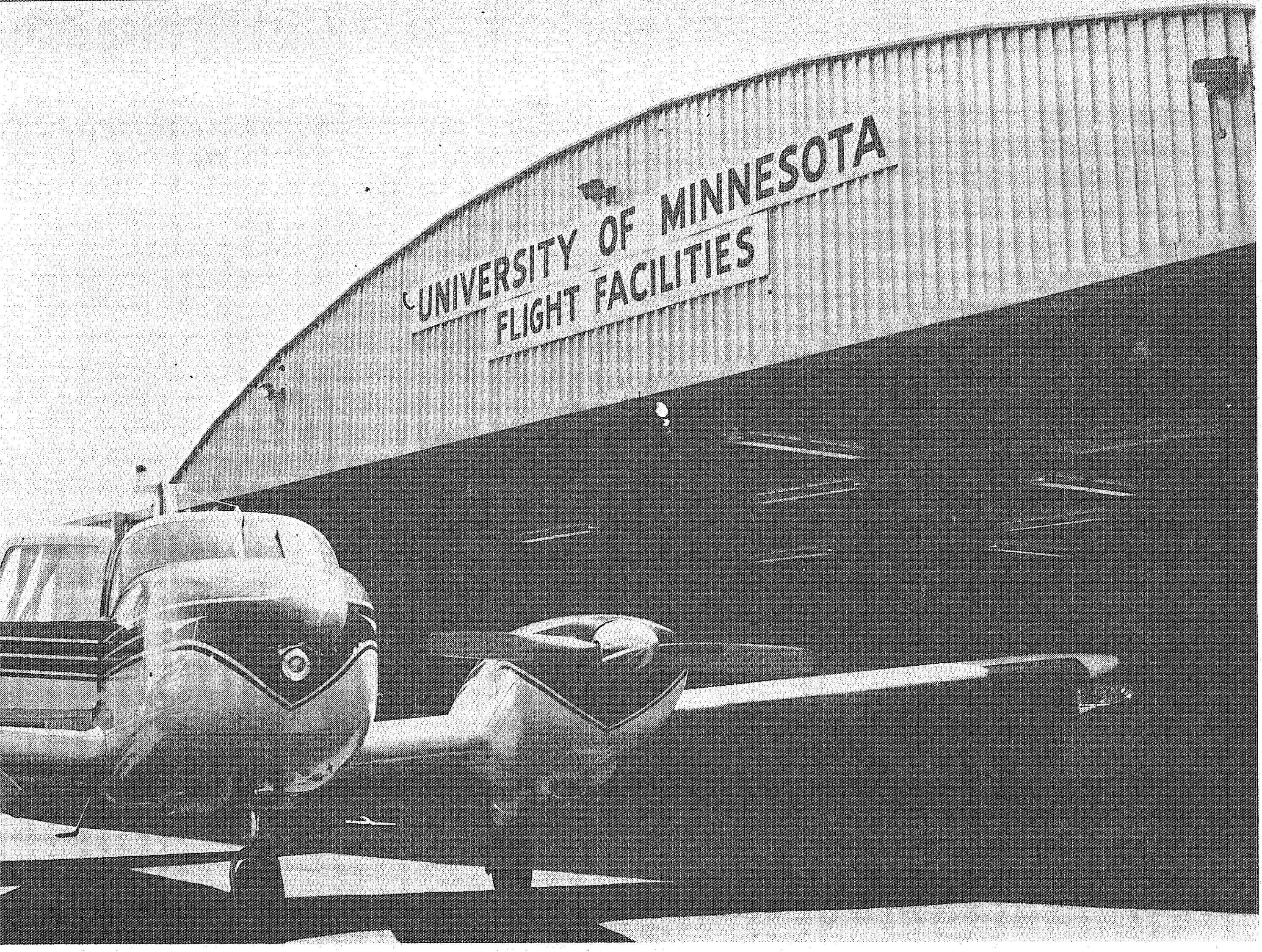
In 1965, some 50 million passenger trips over domestic routes were logged; by 1970 it's expected to be 75 million; and by 1975, as many as 150 million.

At primary airports in 1975, up to 10,000 passengers an hour will have to be accommodated. This ground barrier will be as tough to break as the sound barrier unless skill and imagination are applied to intra-airport transportation as has been done at Seattle-Tacoma.

The Seattle-Tacoma Airport system will eventually be capable of transporting 1,200 passengers one way on each of the two loops, every five minutes. Passengers at any of the six stations will wait as little as 100 seconds for a vehicle except during the two to four hours of the night when passenger traffic is at a bare minimum. During those slack hours, the system will work "on call", much like an automatic elevator.

Under the contract, Westinghouse will provide nine lightweight, rubber-tired, electrically powered vehicles which will operate in tunnels on their own concrete rights-of-way. The vehicles will follow an "I" shaped guide beam, located in the middle of the running surfaces, to which the vehicles will be positively locked through their guidance systems.

Westinghouse will also provide the automatic train control and communications system, guideway, vehicle transfer tables, television monitoring systems, and power distribution systems for the airport subway.



Introducing . . .

THE UNIVERSITY FLIGHT FACILITIES

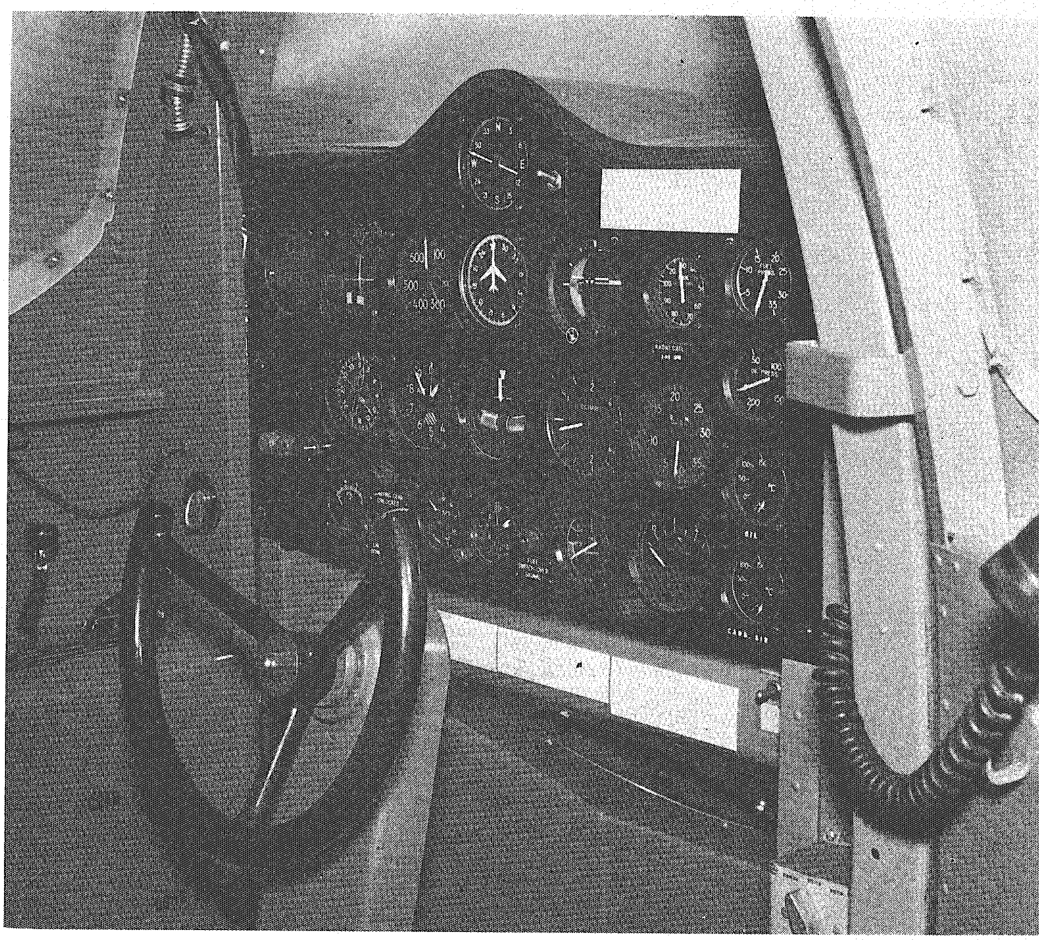
by JOANN WERNER

Imagine yourself soaring through the sky in a small airplane, looking down at the clouds and catching glimpses of the earth below—with YOU at the controls! Sound exciting? The University Flight Facilities offers training courses to any student who wants to learn to fly.

The flight center, located at the Anoka County Airport, offers various services. In addition to training students, they train all University men in ROTC who will be pilots, and also provide transportation for faculty who are on official University business. The ten planes owned by the center include six Cherokee 140's, two Cherokee 235's, a Comanche, and a Piper Aztec. The Cherokee 140's and the Cherokee 235's, which are two-place and four-place planes respectively, are both used for flight training. The six-place Piper Aztec and the Comanche supply transportation only.

There are three types of licenses offered by the flight center. The easiest to train for is a student's pilot license. The student is given a card which must be signed by his instructor after his first solo, and it must be signed again after his first cross country flight. After a total of forty flying hours the student is eligible for his private pilots license which entitles him to carry non-paying passengers. A commercial pilots license is also available for which the student must take both a written exam and an in-flight test. The most difficult test to pass is the test for an Instrument Rating. A student who has passed this is able to land at night or in limited visibility by relying totally on instruments in the cockpit.

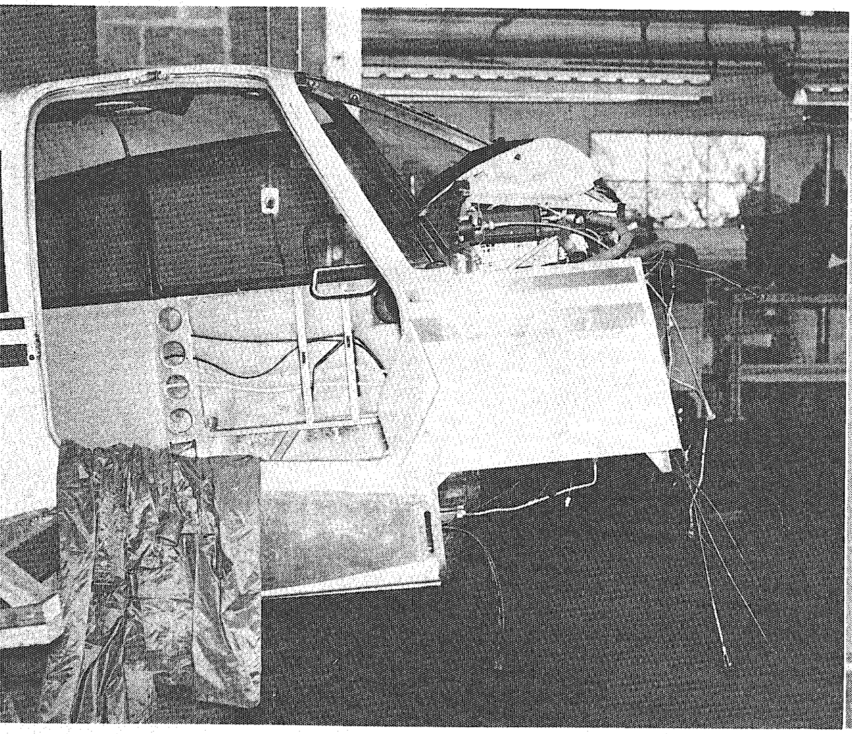
A small part of the Flight Facilities job is to track balloons sent up by the physics department. Transmitters are installed in the balloons that send signals back to a radar tracking station at the airport. When a balloon comes down, someone flies to its downed location and picks up the transmitter after it has parachuted to the ground. ■

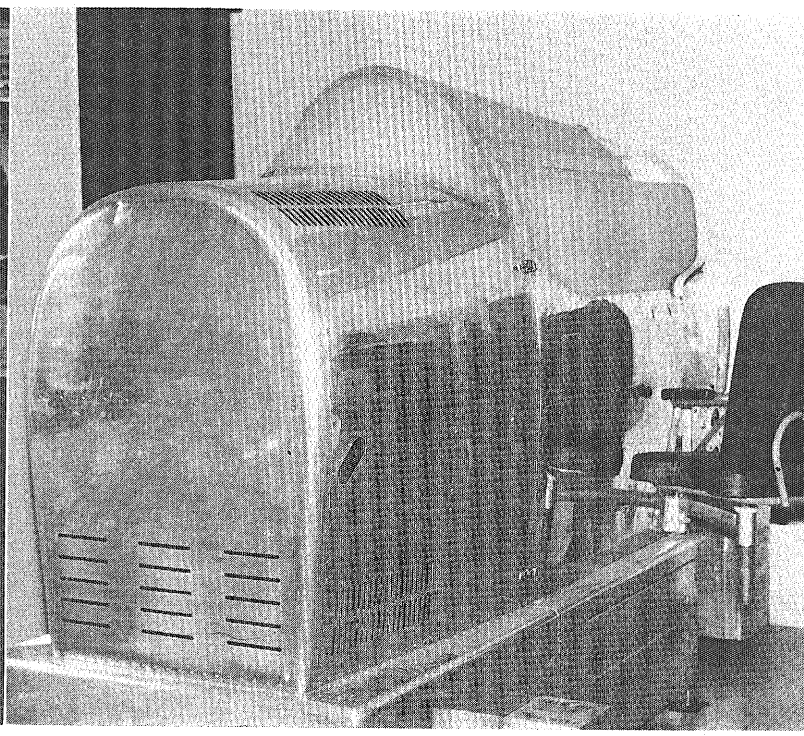


photos by BARRY BRIDGES

ABOVE AND BELOW RIGHT: The instrument panel inside the simulator must be mastered to obtain an Instrument rating.

BELOW: A Cherokee 140 stripped down for overhaul.





UNIVERSITY OF *Minnesota*

OFFICE OF THE PRESIDENT
202 MORRILL HALL • MINNEAPOLIS. MINNESOTA 55455

To a. The Parents of———————————————————————————
b. The Guardian Last First Middle Initial
c. Whom it may concern

Dear Sir or Madame:

In order to help promote more personal relations between the University and you, I am sending this form letter. We are proud to announce that your a. son b. daughter has been chosen to receive a scholarship to the University because

a. of his/her fine academic record
b. of his/her athletic ability
c. of his/her calling off a sit-in at Morrill Hall
d. you are a Regent

It is hoped that in his/her pursuit of TRUTH, JUSTICE, AND THE AMERICAN WAY (as taught at this University) that he/she will be

a. a credit to the University
b. a deduction from your income tax
c. a deferment for his/her? draft board

You may notice that the scholarship does not quite cover the tuition hike instituted during the current fiscal year. We feel that in order to provide an education for the independently wealthy, we must make it financially impossible for a student to work his way through college (unless, of course, he/she is

a. counterfeiter
b. a dope peddler
c. a prostitute
d. a student athlete).

As part of our social service program, several dormitories have been made co-educational. We have systematically assigned only those girls who would otherwise be social outcasts due to personality or physical malformation to these dormitories. All those girls who might be subject to overt sexual overtures from the male population have been

a. assigned to Sanford Hall
b. assigned to local hotels, under the constant supervision of the Regents.

We at the University hope that this letter has helped answer some of your questions about this great institution; but should any problems arise or should you desire any further information, feel free to write me personally. When doing so, please use the following account number: 0-446-9527 and include a photostat of your son's/daughter's current, paid, fee statement.

Yours Sincerely,

Milk'em Moos

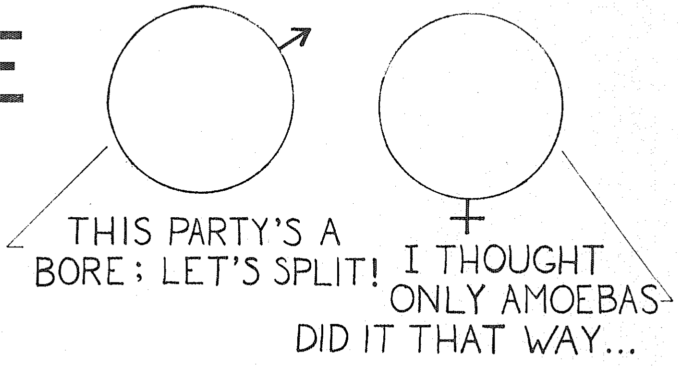
Milk'em Moos

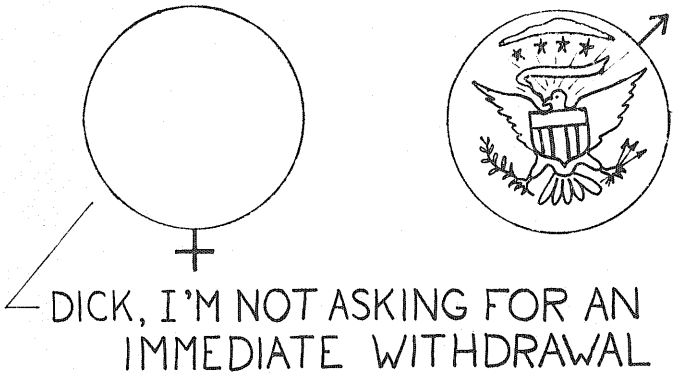
P.S. Enclose a stamped, self-addressed envelope with every inquiry.

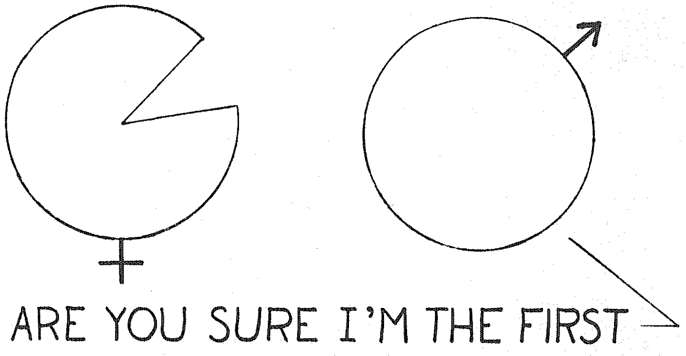
MM/co

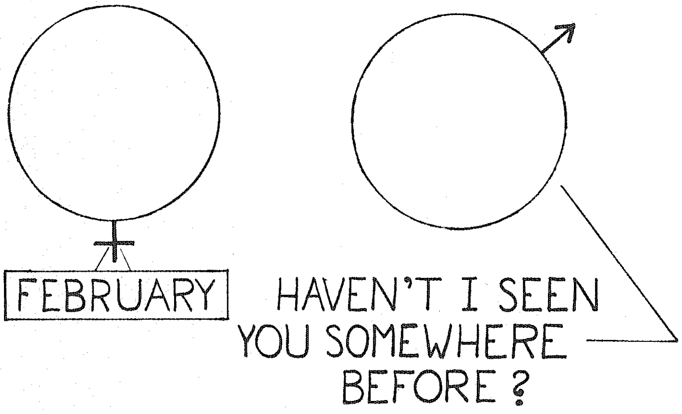
THE SYMBOL THINGS IN LIFE

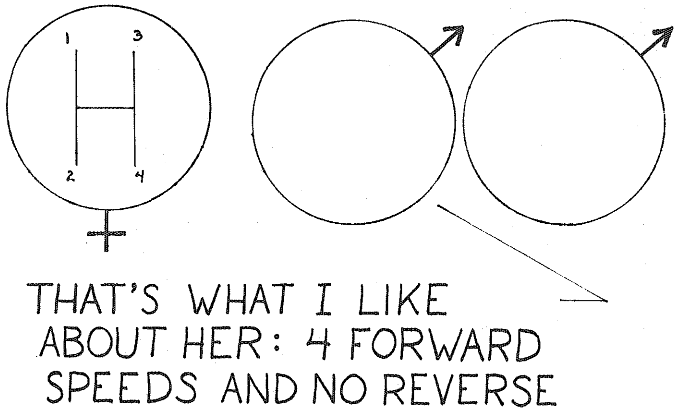
by CLIF OLLILA

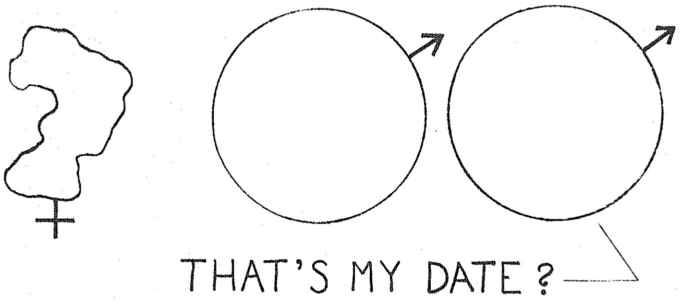


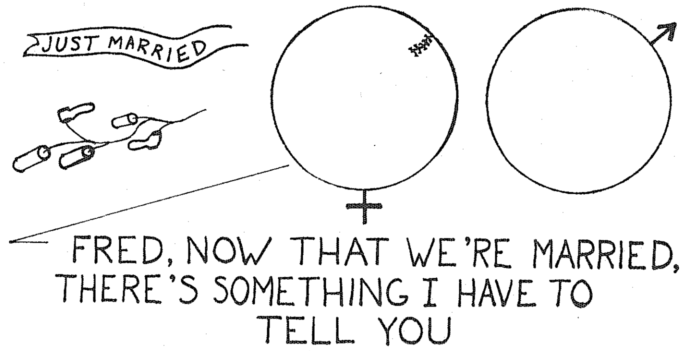


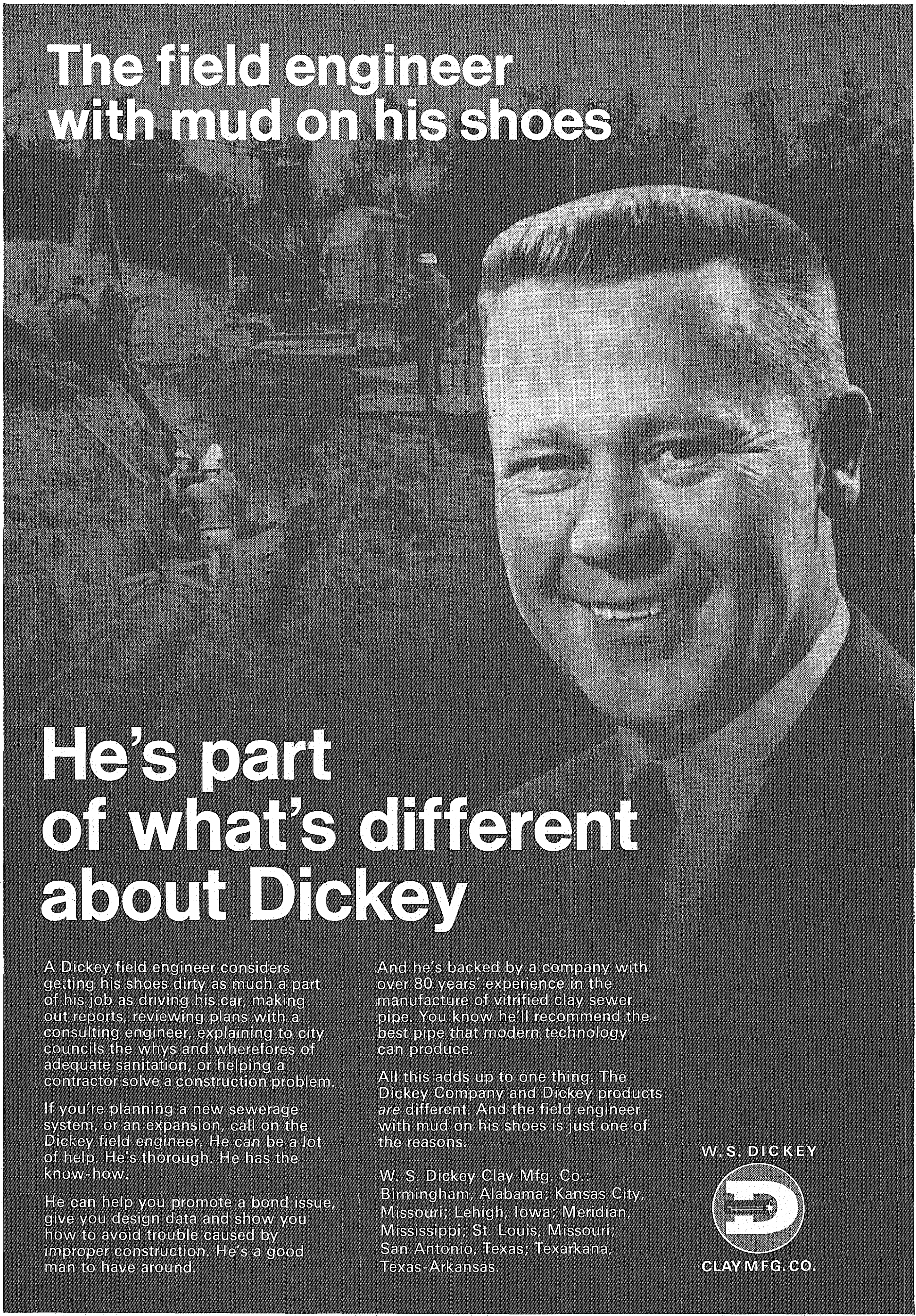


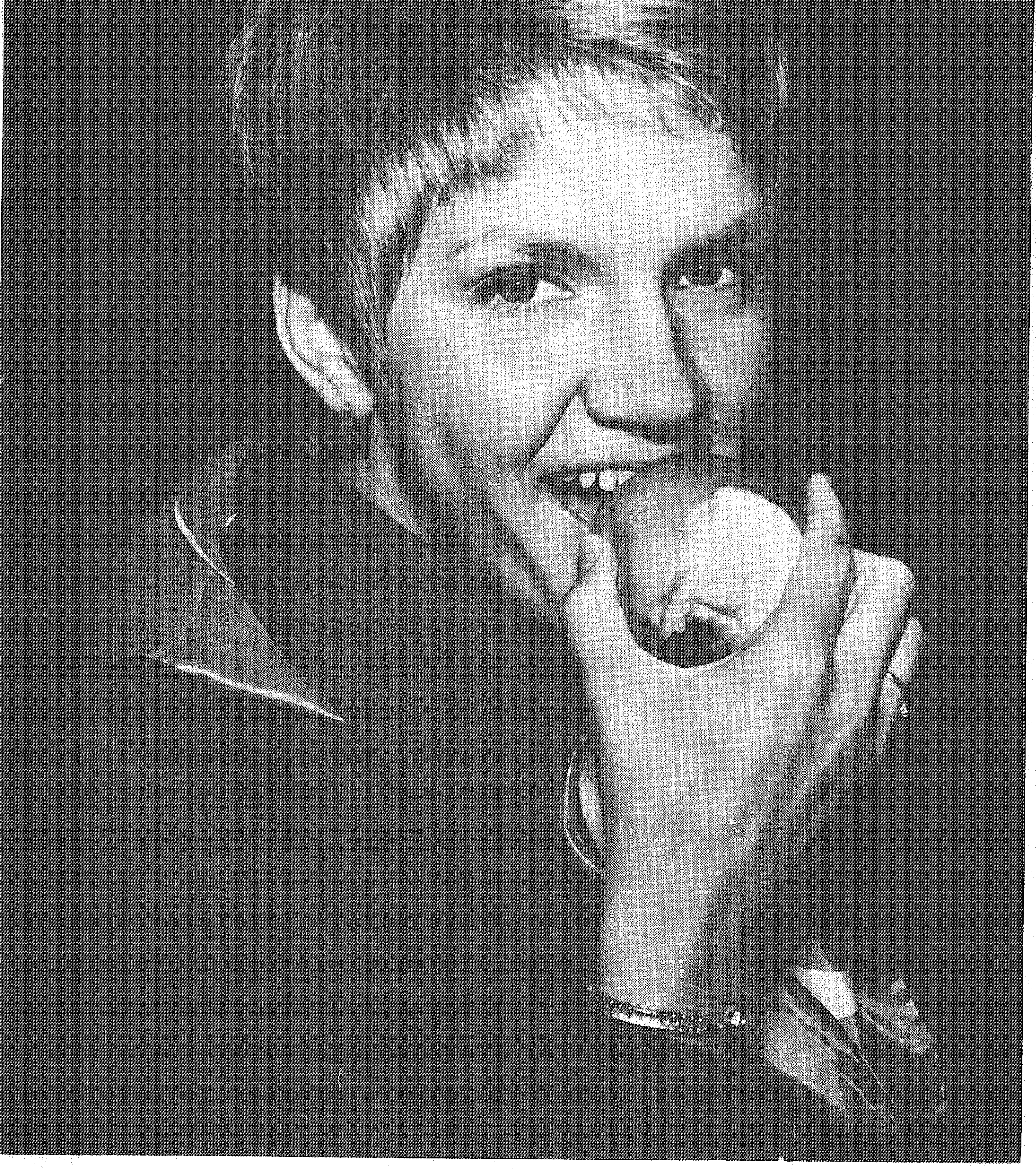









The field engineer
with mud on his shoes
He's part
of what's different
about Dickey
A Dickey field engineer considers getting his shoes dirty as much a part of his job as driving his car, making out reports, reviewing plans with a consulting engineer, explaining to city councils the whys and wherefores of adequate sanitation, or helping a contractor solve a construction problem.
If you're planning a new sewerage system, or an expansion, call on the Dickey field engineer. He can be a lot of help. He's thorough. He has the know-how.
He can help you promote a bond issue, give you design data and show you how to avoid trouble caused by improper construction. He's a good man to have around.
And he's backed by a company with over 80 years' experience in the manufacture of vitrified clay sewer pipe. You know he'll recommend the best pipe that modern technology can produce.
All this adds up to one thing. The Dickey Company and Dickey products *are* different. And the field engineer with mud on his shoes is just one of the reasons.
W. S. Dickey Clay Mfg. Co.: Birmingham, Alabama; Kansas City, Missouri; Lehigh, Iowa; Meridian, Mississippi; St. Louis, Missouri; San Antonio, Texas; Texarkana, Texas-Arkansas.
W. S. DICKEY
CLAY MFG. CO.



Miss November . . .

Trix Morris

photos by BARRY BRIDGES

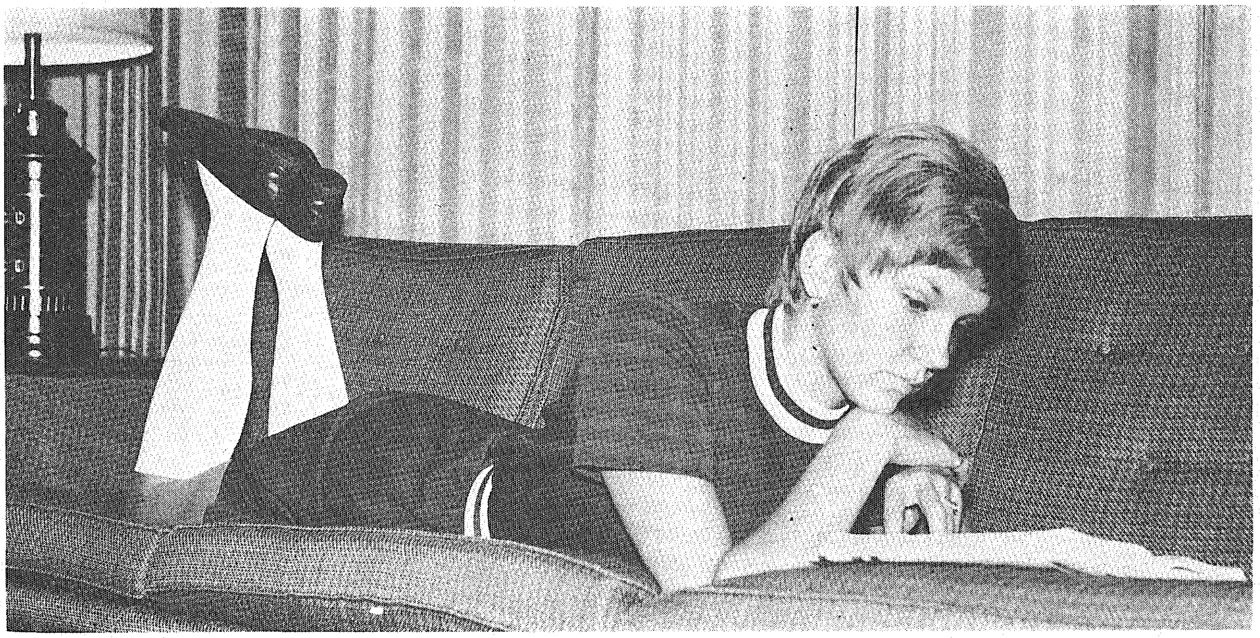
A great outdoor enthusiast, Trix thoroughly enjoys camping, fishing, and being involved with nature's elements. In her terms, she "really grubs Minnesota" because of the variety of our seasons.

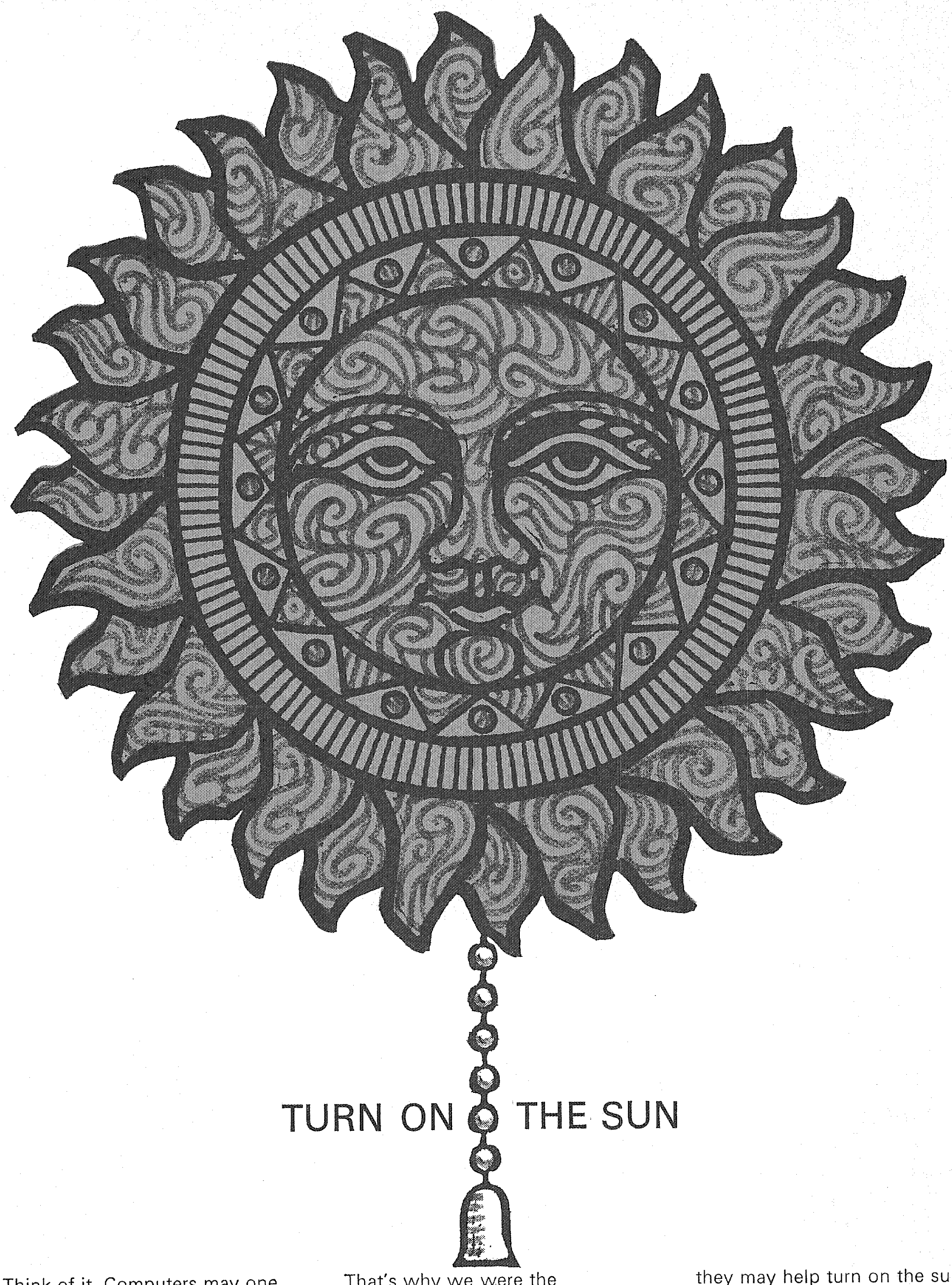
A compassionate individual, Trix feels that her "calling" is in physical therapy where her sunny, yet sincere disposition is a great asset. Any conversation with her is a warm, friendly experience.

In addition to a mean sophomore load of 17 credits, Trix works 20 hours a week as an undergrad TA. Job's Daughters and several committees at Sanford Hall also draw on her time.

Dorm life means no kitchen for Trix. It seems that the stove is one of her tools for expressing her creativity, so Thanksgiving dinner at home should give her plenty of opportunity to be creative.

At this point we would like you to try Trix' trick—touch the tip of your nose with your tongue. Very few, other than our gal, can manage this feat.





SPLINTERS From the Log

by CLIF OLLILA

—vilitas et crudus semper eternam

Once upon a time, there was a zoo which bred a race of porpoises which would live forever so long as they were fed live sea gulls from the Puget Sound area. Every month a truck-full of gulls would arrive at this zoo (which happened to be the only one in the state).

It also happened that this zoo had but one lion, which by some quirk of fate escaped one day only to be run over by the truck bringing in the sea gulls from the West Coast.

The truck driver was immediately arrested for "crossing the state lion with gulls for immortal porpoises"!

* * *

I tried to get drunk last night; the flesh was willing, but the spirits were weak.

* * *

Aero: "I've invented a vehicle that has four wheels and flies."

Civil: "A new garbage truck, huh?"

* * *

A middle-aged couple were having marital problems and so decided to take separate vacations. To irk his wife, the male half sent her the following telegram:

Having a wonderful time STOP Found twenty-year-old nymphomaniac STOP Hope you are well

JOHN

Immediately upon receipt of the telegram, the wife, not to be outdone, sent back the following:

Have found twenty-year-old lover myself STOP Twenty goes into forty more than forty goes into twenty

MARSHA

* * *

A bachelor is a man who has been lucky at love.

* * *

When people go to summer hotels for a change and rest; the bellboys get the change and the hotels get the rest.

The police were questioning an eyewitness to a jewelry store robbery:

"Tell me in your own words what happened."

"Well, a yellow moving van pulled into that alley, and two men got out. They were dressed in tuxedoes and wore white socks. One seemed to me to be left-handed."

"Anyway, they opened up the van and led out an elephant with 'EAT AT JOE'S' painted on his side. The elephant then charged the wall of the building and opened a big hole into the jewelry store."

"Could you tell by the ears if the elephant was an Indian elephant or an African elephant?"

"No sir, the elephant had a nylon stocking over his head."

* * *

Accident: Where presence of mind is good but absence of body is better.

* * *

Adolescence: The age between puberty and adultery.

* * *

The American economy has become so dependent upon the credit system that all money will soon have the inscription "I.O.U.S.A."

* * *

You can't marry amiss if you marry a widow.

* * *

In Biblical days it was considered a miracle for an ass to speak; now it would be a miracle if one kept quiet.

* * *

The difference between a professional athlete and an amateur is that the former is paid by check.

* * *

What attracts the senses attracts the censors.

* * *

Autobiography could better be termed alibiography.

* * *

The deaths of many crazy drivers has advanced the science of autopsy.

Abraham was sitting at home one day when his son entered and said, "Today, father, I was converted to Catholicism."

Greatly perturbed, Abraham ran to Isaac's house: "Isaac, Isaac, my son has turned Catholic! What shall I do?"

"Funny thing you should say that," Isaac replied! "Only today, my son, too, turned Catholic! What shall we do? What shall we do?"

Together Abraham and Isaac decided to go to Jacob's home. "Jacob, Jacob, what shall we do? Our sons have turned Catholic!"

"Funny thing you should say that! My son also has become a Catholic just today! What shall we do?" moaned Jacob.

"Let us pray to God for help!" cried Abraham; they all agreed.

"God, God, our sons have turned Catholic! What shall we do?"

Suddenly a bank of black clouds rolled in and from them thundered a voice, "Funny thing you should say that . . ."

* * *

My hometown church has seen so many shot-gun weddings that it's popularly known as Winchester Cathedral.

* * *

Impotence: Emission Impossible.

* * *

The newlyweds had checked into their Honeymoon Suite at the Sheraton. Both were very excited, and the groom quickly disrobed and clambered into bed to wait for his wife.

Ten minutes passed. Twenty minutes passed.

Finally, he could stand it no longer! "Dear?" he said loudly.

"Yes?" came the answer from the sitting room.

Walking into the suite's living room, he spotted his wife sitting expectantly on the sofa. "Aren't you coming to bed?" he asked.

"Not quite yet, dear. My mother told me this would be the most exciting night of my life, and I'm staying up to see what happens!"

* * *

Love may be blind, but the Campus Cops aren't.

* * *

Then there was the unfortunate voyeur who was apprehended at the peek of his career.

Contrary to Mayor Stenvig's contention, minority groups are not led by bloc heads.

* * *

Just because a fellow prefers blondes doesn't make him a gentleman.

* * *

If all the people who eat at boarding houses were put at one long table, they would reach.

* * *

In politics, the payments come first and the charges come later.

* * *

The young are now rebelling against the duly constipated authorities.

* * *

The Gay Nineties believes in the power of gauze and effect.

* * *

Did you hear about the associate editor who was captured by cannibals and became the editor-in-chief.

* * *

Conscience doesn't keep you from doing anything; it just keeps you from enjoying it.

* * *

When she was good, she was very, very good, but when she was bad, she was better.

* * *

Then there was the tragedy up on Echo Ridge: A whole women's club died trying to get in the last word.

* * *

I always hear about how we creamed the Japanese during the Second World War. So how come they called it chipped beef?

* * *

Men are endowed by their Creator with certain inalienable rights, all of which they must fight for.

* * *

Contrary to the promoters of a certain housing development, if Huck Finn were alive today, he would not be living in Riverview, but more likely he'd be in Red Wing.

* * *

When a man's engaged, the lucky woman is the girl's mother.

* * *

The aim of birth control is to make our population less dense.

* * *

The downtown prostitutes are giving "green stamps" now because they're losing so many customers to the suburban "discount houses."

Ennui: Boredom with money.

* * *

Enthusiasm is a nervous disorder afflicting the young and inexperienced.

* * *

The Eskimos are God's frozen people.

* * *

It's not difficult to meet expenses these days; one meets them everywhere.

* * *

An efficiency expert is one who is smart enough to tell you how to run your business and too smart to start one of his own.

* * *

When a mother explains the facts of life to her daughter the daughter learns a great deal—about her mother's ignorance.

* * *

Familiarity breeds.

* * *

It takes dozens of pages to write a historical play, but only a couple of sheets to make a bedroom farce.

* * *

Figures don't lie, but under examination some of them won't stand up either.

Diplomacy: Lying in state.

* * *

Where there's a will, there are dissatisfied relatives.

* * *

After a divorce, a woman feels like a new man.

* * *

"Do you really think I can be a star?" cooed the young actress, snuggling closer to the famous producer.

"I certainly do," he replied. "You're already starting to make it big."

* * *

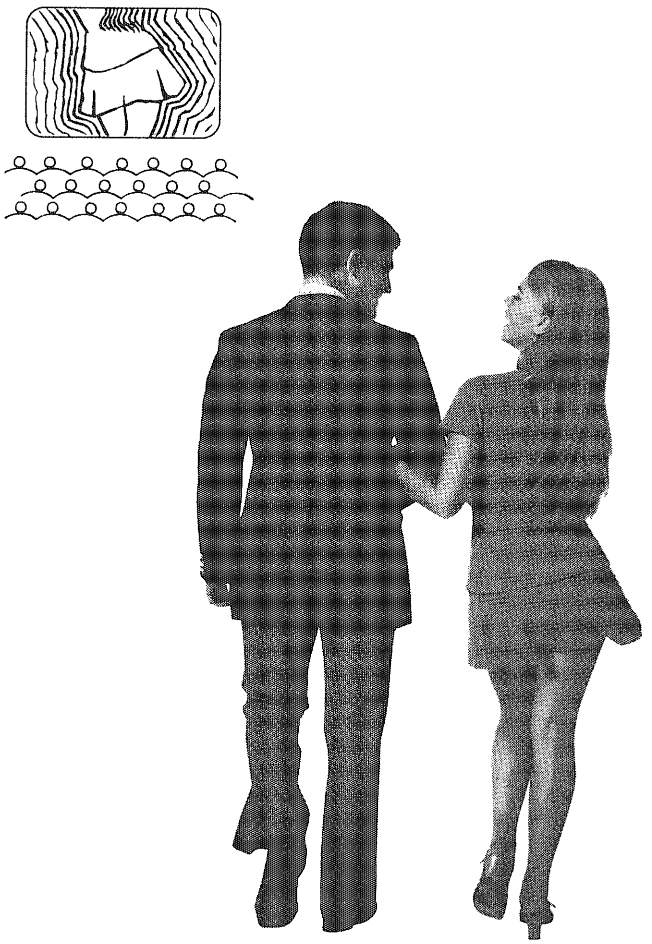
A young secretary had been working for Zenith for a year when she noticed that while she did not have a name plaque on her desk, several recently hired girls did. Miffed by these circumstances, she went to see the head of her department.

"Sir, why is it that some of the girls hired after me have name plaques on their desks, but I don't?"

"My dear, it's quite simple. Around here I'm known as Mr. Quality, and at Zenith, quality goes in before the name goes on!"

* * *

Did you hear about the old maid who didn't like flies until she opened one?



We want engineers who want to get away from it all.

If you're the kind of engineering student who can't stand the thought of someday sitting at the same desk in the same office day after day, then you're one kind of engineer we want. The kind of engineer we want for a career in technical marketing.

Engineers in this field spend most of their time out in the field. Systems sales and application engineers are always on the go. Talking with customers, selling products and systems. Solving other people's problems.

To do that, you have to understand a lot more than engineering. You have to understand people and how to communicate with them. And that can be one of the toughest jobs there is.

Does it sound like a job you're up to? Then maybe General Electric's Technical Marketing Program has a place for you.

Or places, rather. You might start out in upstate New York. And move on to southern California. Or Atlanta. Or Minneapolis.

But wherever you decide to move with GE, you'll be learning the business. Learning in months what it takes some engineers years to learn.

Our Technical Marketing Program is the one way to get away from it all and, at the same time, get ahead.

GENERAL ELECTRIC

AN EQUAL OPPORTUNITY EMPLOYER

For more information about technical marketing at General Electric, please write to Educational Relations and Recruiting, Room 801T, General Electric, 570 Lexington Avenue, New York, N.Y. 10022


Air
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Coca-Cola
It wasn't a matter of
Crisis
SMOG
ugly
Inciner
DDT
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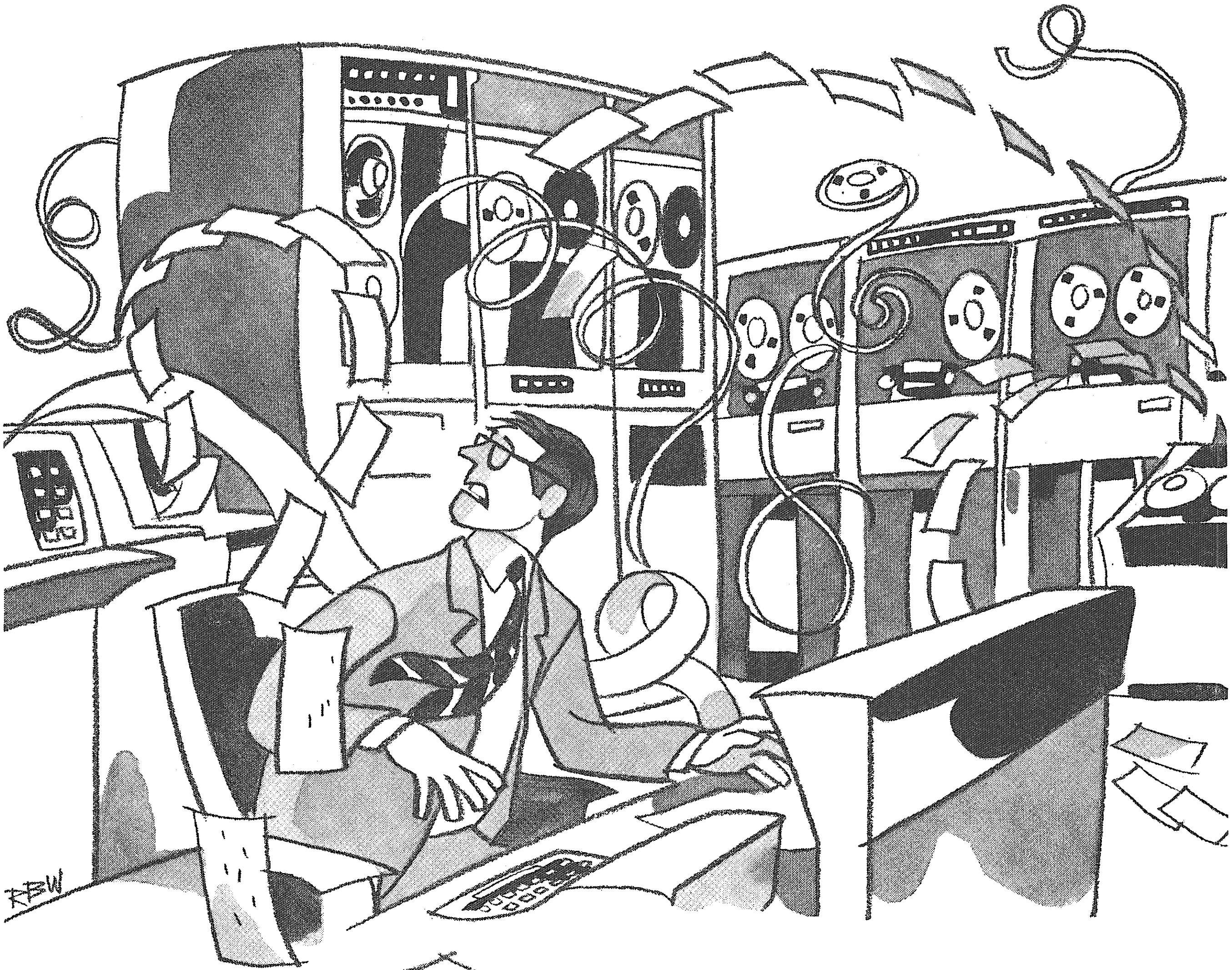

TECHNOLOG

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

COVER: Pollution takes many shapes and forms, each contributing to the contamination of our entire environment. Cover by Carol Hawkinson, Bruce Wright, and Marlin Rekow.

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Speaking with
the Dean about . . .

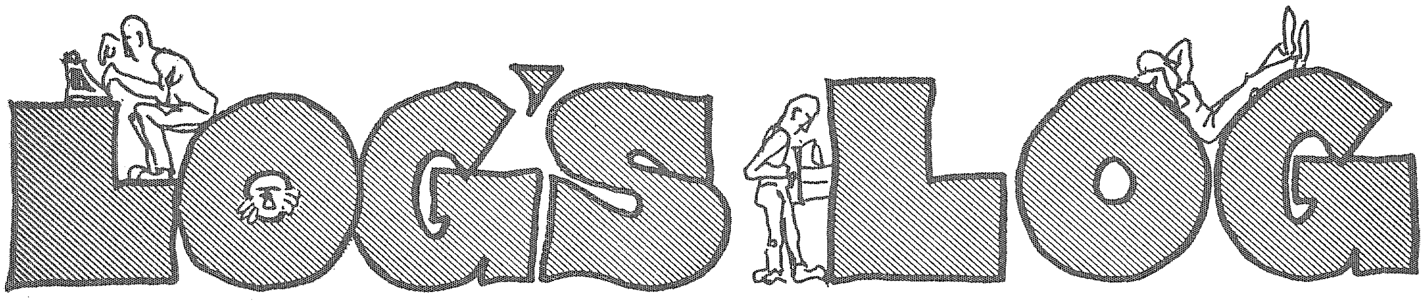
Pollution and Education

The one area in which we may be justifiably pessimistic is man's attempts to survive the annihilating effects of his own detritus. There are many reasons for this, but the two most important contributing factors are man's basic drives towards a comfortable existence and the reproduction of himself. There is a terrible price to pay for centralized heating and the electric toothbrush. Both are conveniences, but certainly not essential to either the body or, as it is quaintly called, the spirit. We face the prospect of slowly dying from the products of our greed and our lust, albeit comfortably warm and with shining teeth. Yet hope that we could learn to recycle our waste, to correctly assess the cost of each new technological advance so that we might make choices based on the effects of these advances on our environment, etc. might exist if only we would all agree to take steps to stabilize the world's population. Some would even settle for a stabilized population growth rate. Certainly the problem of keeping under control the polluting effects of an individual's needs for electrical power is challenging enough without being forced to contend with exponentially increasing numbers of said individuals.

In the past few years, there has been so much written and spoken on the subject of pollution that it is unnecessary for me to attempt to write anything new. However, it is becoming increasingly apparent to me that we in universities must reexamine our educational priorities in light of this impending disaster of self-destruction. Somewhere in the educational process each student of science and engineering should become aware in detail of the effects of technological and scientific advances on the environment—land, water, air—in which he lives and eventually dies. The concern for fallout of all kinds from our advancing technology should become an automatic response to all scientists and engineers. To accomplish this it would be necessary to make room in our curricula for the development of such a concern. I have a few suggestions in this regard. First of all, we might consider removing some of the over-specialization in our curricula. Secondly, we might treat reading and writing as skills to be learned in high school, not at the University, and remove Freshman English as a credit-earning course in our curricula.

While we are devoting ourselves to human concerns by substituting a study of the environment for the acquisition of some elementary skills and over-sophisticated specializations of a debatable value, we might even pause to examine the history and sociology of science and technology. The products, if I may use this term for students, of such a revised educational system might be more valuable additions to the decision-making segment of society than esoteric plumbers. At least we all might live more satisfactorily in a healthier environment.

Warren B. Cheston



The Engen-Kehrberg Report

Introduction: In case you haven't heard what's on everybody's lips it's too bad, because we can't print that. What we did print is another edition of the Engen-Kehrberg Report. While that may not do much to your nerve endings, it does keep our hands on the typewriter and out of the petty cash. But don't get us wrong. Dave Engen and Dan Kehrberg are beyond reproach. Or as Dean Cheston likes to say, "beyond hope." And that set us to thinking about ourselves and our collective image and our purpose in this veil of tears and all that B.S.b.s. And after searching unsuccessfully through eight dozen fortune cookies for the blinding flash of lightning, we have decided to follow the example of HHH and ignore the following Macedonian proverb: "It is better to keep your mouth shut and be taken for an idiot than to open your mouth and remove all doubt."

Ode to a Sot

Starkle, Starkle, little twink
Who the devil you are I think,
I'm not under what they call
The affluence of incohol.
I'm not so drunk as thinkle peep
I'm just a little slirt of sheep,
Tee martoonis make a guy
Fell so dizzy, don't know why.
So pass the mixer and kill my fup
I've all day sober to Sunday up.

Rita the B.

The E-K Report has never been known as a standtaker and for good reason. They're too bulky to slip under your coat. We have been urged by the rest of the *Technolog* staff, however, to comment upon a situation that has been festering over this past summer and all throughout fall quarter. It seems that the long standing practice among the *Log* staff (no, not that one) of illegal parking has and is being challenged. And throwing down the opera-length gauntlet is Rita the B., the vindictive meter maid.

Now the *Log* staff is not all up tight about the $3 fines or the $5 fines or even the suspended sentences. What has us all aghast and irate is that all of the citations are signed by the crusading constable, Rita the B.

Now being the nice people that we are, we decided to approach Rita and see if the misunderstanding could be amicably settled. And so one day, we happened upon her as she was shaking down the manager of the Dinkytown Dime. We stood there for awhile, awaiting the proper moment to broach our subject. Well, you'd have thought we had just robbed the Meter Maid Widower's and Orphan's Fund of its last nickel. Not only would she not listen to our simple suggestion about looking the other way, she accused us of being brainless, ineffectual, inane, and stilted writers. Well, anyone who can make brilliant personality judgments like that is much too dangerous to be trusted with a ticket book.

And as you might suspect, that ended our efforts at reconciliation. We are, in this article, assuming the offensive against our beast in blue. In trying to do justice to the warm heart of Rita the B., we asked Dr. Christian Barnard for his honest opinion and his response was: "It's enough to drive a surgeon to general practice." And to sum it up in a phrase, Rita the B. is a can of Mace looking for a riot.

But in the spirit of the second verse of the Boy Scout Oath (that's the one about the Explorers, their trip to NY and the big city girls they met there), we should try to resolve our differences, despite the danger in overheating our medullas. We are, after all (and settling for less), two of the brightest stars in the literary firmament and ideas flow from our minds like barf from an AA drop-out.(?) Well anyway, our Solomon-like compromise is: the *Log* staff will register for next quarter during the last hour and Rita the B. will donate her body to medical science—immediately. That may seem like a one-sided decision, but can you imagine what kind of schedule the *Log* staff is going to have next quarter? Rita will, at least, have a decent lab section.

First and Last

Being first is one of the real status symbols in America. It involves ticker tape parades, T and V, fame, glory and money. But it wasn't always that way. Nor was it always done in the glare of publicity or without some personal sacrifice. Well, the E-K Report has scoured the long list of "firsts" and is hereby presenting the first annual Best

First Award to the most outstanding trendsetter we could find. Previous award winners include: Adam (1st through 1,736th you know what), Cain (first only child) and Noah (first floating crap game). This year we are giving it to Abraham. It should be recalled that he endured the world's first circumcision. And he was 80 years old at the time. And the "surgical procedure" in them days consisted of hitting it four times with a blunt rock. But while that may have hurt, just imagine how much it would have hurt if everybody else would have decided to become conscientious objectors—or Baptists.

Being last is a great big red in the face. And one of the last things still around in this old world is the king. There aren't many left. We were made aware of this recently when ex-King Constantine of Greece came to the E-K Report and asked for help in finding a job. Well, not knowing too many openings for royal majesties, we asked him what he did before becoming king. He said he was a prince. "Well," we said, "what did you do as a prince "

"I went around helping maidens in trouble," he said.

"Oh, you're an abortionist," we said, "there's plenty of work for them."

"You misunderstand me," he said, "I never take money for it."

Which goes a long way toward explaining why there aren't many kings left.

T'aint Necessarily So

Those members of the establishment known as critics have many times labeled the Log's Log as instant pollution. That is inaccurate. There is nothing instant about the Log's Log. We are freeze dried. And while it may not seem that way, the E-K Report labors long and hard(ly) to turn out this supreme noneffort. Or as Ray Charles said in his ringing endorsement of the Log's Log: "I can't see it."

Well the point in all this is, the establishment has coopted the anti-pollution bag (i.e. save the grass, etc.). And when this hit SDS headquarters, Tom Hayden, Mark Rudd, etc. wafted over and asked us to come up with a position paper on this for the anti-establishment movement. (How about Charmin?)

Anyway, we first have to recognize that many of our concepts on pollution and polluters are inaccurate. Gone are the iron, coal and steel magnates whose by-product (pollution) was easily identified and, when vigorously challenged, easily defeated. The new pollution is, as the psychologists say, psychological. And it is reshaping our American traditions.

Today we live in a cosmetic society where public sins are covered over by Noxema and Preparation H. In this new society we are forced to suffer everything from "systemic fluid buildup" to armpits that are not permitted to sweat. The new logic states that Rap Brown is not really bad, he just has an Excedrin headache. And the only concern is over whether or not he will consider himself an Uncle Tom for picking the cotton out of the top of the bottle.

And just in case you aren't yet a believer in the influenciapability and scope of the new pollution, we should like to make you so by recalling the story of the queer who passed out cigars when his boyfriend got the mumps. Believer?

Official Daily Bull

Just think here it is almost 1970. Or it's that to some of us. We are all aware of the distinct Chinese New Year and Jewish New Year and even the Arabs have a different year on their calendars. Well so does Poland. This coming new year is, in Poland, the year 20. Actually it has been the year 20 for 19 hundred and 50 years. It seems the Poles have never mastered counting higher than Σ hand-sies and toe-sies. But the good part about this is, they never have to trust anyone over 30.

And just to demonstrate how time flies, it may interest you to know that when Raquel Welch was a small child she was an orphan and had nobody. Now she has some body! Which brings us to the Exposé of the Month: TUMS (for the tummy) spelled backwards is SMUT.

Oh, and lest you think all is peachy keen with the world, it was recently announced that Greece has the A-bomb. Onassis bought it. And why not; he got everything else the President had.

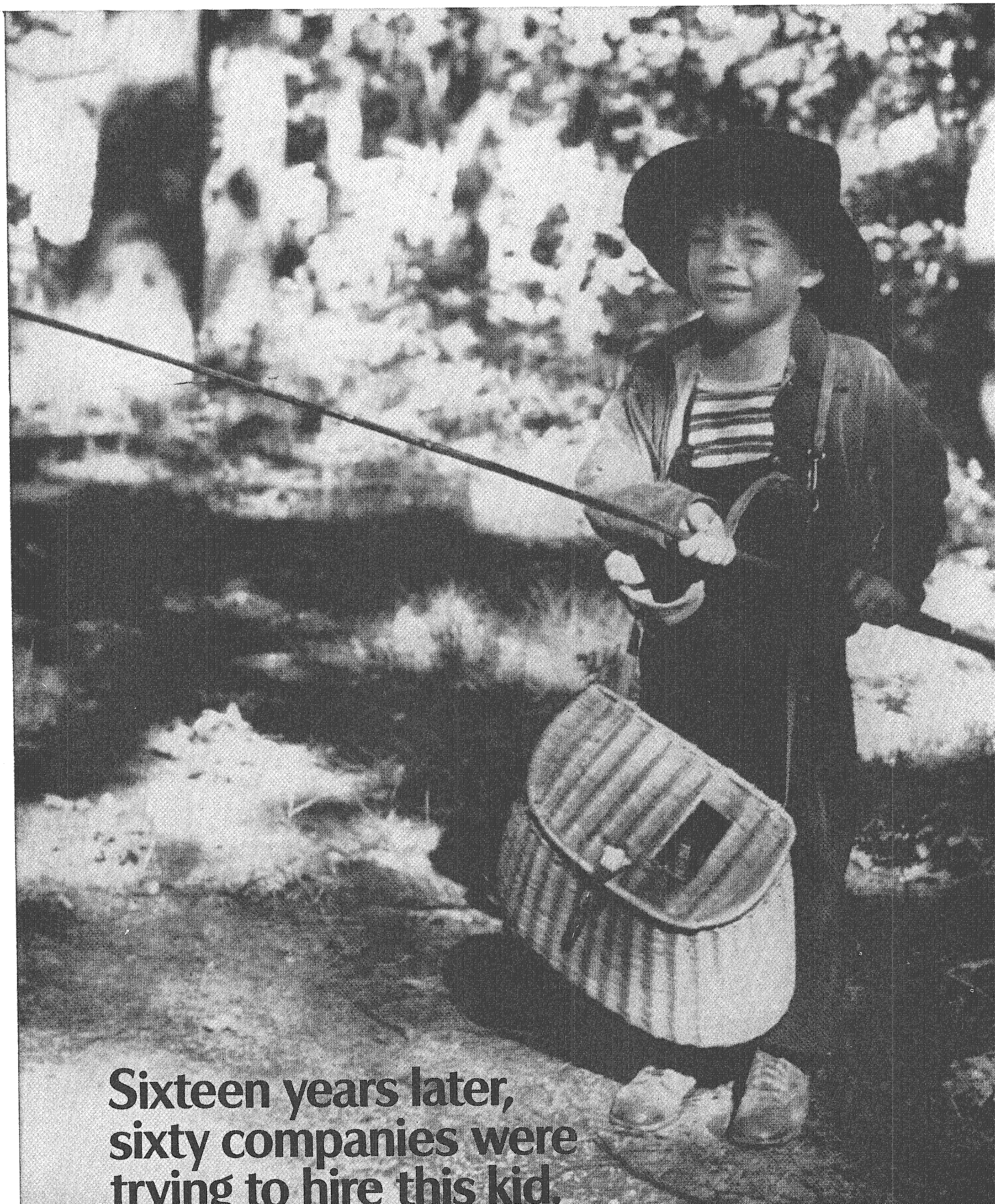
Dec. 16-31

- 16—Get hired by Brunswick. Have a ball Day
- 21—I.T. Co-ed Week Ends (Before it begins)
- 25—St. Nick adopts new (left) image. Becomes Peace Nick.
- 27—I.T. Co-ed Week Begins
- 31—Splitting Headache Day Eve

Jan. 1-15

- 1—1969 seems like only yesterday Day
- 5—Urban Renewal Reversed. Shacks Up Day
- 9—No Bra Friday (Pass it on)
- 13—County Health Dept. closes Custer's Last Stand.
- 15—Danish Day. Have a roll Day

Conclusion: Saying good-by is always difficult but even more so when you want to go and some people won't let you. No, this is not about encountering a bank of 25¢ toilets with only a dime in your pocket but rather it is the story of how one man said good-by to Thule, Greenland and the Air Force all in one day. It all started innocently enough. A certain airman 2nd received a package from home. It consisted of two cap pistols, holsters, and a pair of cowboy boots. And since there was nothing to do in his off duty hours, this airman 2nd practiced his quick draw and actually began to live, rather than imagine, his role. Well one day the colonel came to see this airman and very kindly and sympathetically explained that he would have to take the airman's guns and cowboy boots. The airman gave the colonel his guns and cowboy boots resignedly but then, as the colonel was leaving, this airman 2nd said, "You may have gotten my guns and cowboy boots but you'll never get my horse." The freedom bird for this airman was the next C 130 leaving Greenland. And so as we bid farewell to this edition of the Log's Log, the E-K Report would like to join in a spiritual hand clasp with this airman 2nd and say to all of Uncle Harold's very nosy narco agents: "You'll never get our horse."


Sixteen years later,
sixty companies were
trying to hire this kid.

While still in kindergarten, science was already moving to make Dennis Twining a hot property.

"By the eleventh grade they launched Sputnik I. The science race was on and I was in it. I started cramming.

"After high school, I had a chance to go to the University of Michigan and work as a research assistant.

"Our project was in a cemetery in case of explosions. Great for dates.

"When I got my metallurgy degree there were sixty companies with jobs for six of us. I checked out the top ten and picked International Nickel. Why?

"Because they gave me the best chance to stay at the front edge of technology and also learn the other half of the equation—business.

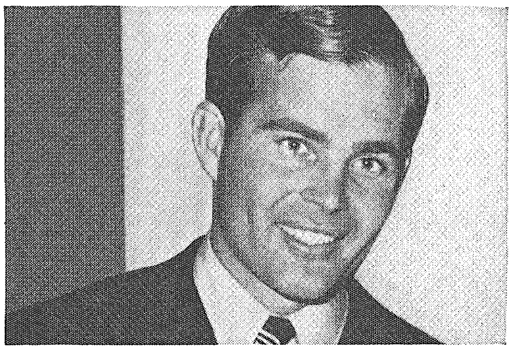
"It worked.

"I spent the first year in research. Then moved on to marketing—Chicago, Hartford, and now New York. Fantastic city.

"I'm responsible for development in mainstream markets—motor freight, containerization, construction equipment.

"Here I am on Wall Street, past halfway to my MBA at NYU with a thousand opportunities in front of me.

"Yes, Sputnik took me quite a way."



Nickel helps other metals resist heat, cold, impact, pressure, abrasion, corrosion...to advance engineering in vital fields—power, desalination, electronics, transportation, aerospace.

We're doing everything we can to produce more nickel. Searching around the world—Indonesia, Australia, Guatemala, Canada. We've found ways to extract nickel from ores thought too poor to mine a few years ago.

We count our blessings and respect our surroundings. From nickel ores, we recover platinum, palladium, twelve other commercially useful elements. Make iron pellets for steel. Convert smoke in our stacks to chemicals for other industries. On sand left from processing ore, we grow meadows of hay.

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Log Line

Man—The Disappearing Species

There are few subjects more popular than the future of mankind; and yet, the time has come to ask "on which planet?" For the fact is that our good earth may soon be unable to support human life and whoever among us is unfit for space travel could be doomed to a short and unhappy existence.

Such prophecies are not, unfortunately, the private mania of religious fanatics. Today's alarmists come not from prayer meetings, nor desert fasting, but from the ranks of science itself. They are ecologists, dedicated to the study of how environments work, and how this particular planet sustains the life of mankind. And they are worried, worried men. Here are some of the catastrophes they foresee:

1973—TV screens are filled with news of the Great Smog Disasters. In New York and Los Angeles, hundreds of unattended people choke to death outside hospitals. We are faced with nearly 200,000 corpses.

1974—A great drought signals the birth of the Midwestern desert. Air pollution has caused gross changes in climatic patterns such as the jet stream.

1975—Various fishing industries begin to disappear—whaling, anchovies, salmon, etc. The breeding grounds are so polluted that ordinary homing instincts result in mass suicide. Japan and China are faced with mass starvation.

1977—Science magazine announces that air pollution has significantly reduced the incidence, or power, of the sun's rays. Many forms of vegetable life are doomed.

1979—Huge blooms of a poisonous diatom are reported in the world's oceans. Fish and birds of all kinds perish from this pesticide by-product. Large areas of coastline must be evacuated to escape the stench of dead fish.

Not all of these are inevitable; but they are certainly possible. Consider the rate at which oil spills over our beaches, airplanes destroy our hearing, and automobile smog forces us indoors. One is tempted to ask if there is intelligent life on earth; and more specifically, to wonder how this enormous catastrophe began.

The historian Lynn White, Jr. traces the blame to Christianity, and its ruthless suppression of all animal- and plant-worship. According to White, the Christians of Western Europe and America have been able to rape the planet without a single compunction, since their religion decreed that an abstract God was alone worth respect.

Others have called in capitalism for all the blame; after all, socialist countries like Finland and North Vietnam do have markedly less pollution. In America, capitalism does not even respect private property: if a freeway, for example, is more profitable than a man's house and garden, the house and garden must go. Pollution, as a rule, seems to increase with a nation's industrial wealth, whether socialist or capitalist.

Can anything be done? This is the hardest question of all. We cannot expect pure air and water overnight; but we can say "no more!" through concerted political action. This is the goal of Students for Environmental Defense, and many similar groups—to minimize some disasters, and prevent others altogether. Man has been a "slow learner" so far; he must *experience* Los Angeles before legislating against smog. This jive, as they say, has got to stop.

Bob Hertz

The Button

Are you tired of pushing the same button?

A typical day. You have five minutes to spare (maybe not so typical?) You walk along the hallways of the engineering or physics buildings and you are confronted by a button. "Push me" says the simple instructions. So you push it and watch the familiar reaction of the device enclosed in the glass box above it.

If you are a freshman, this typical day has been happening for only a couple of months. If you are a senior, it has been going on for over three years with the same devices, the same reaction.

Are you waiting for the day when there will be a new gizmo in the box that will do something besides what you've seen the others do again and and again? No doubt you are. And now you can do something about it.

The facilities and the funds are available for constructing new displays. Ideas and designs are desparately needed. Bring your idea or complete working design for a display exhibiting some aspect of mechanical, electrical, or aeronautical engineering or physics to Room 114 Main Engineering (Tech Commission office). As many of the designs as possible will be constructed and displayed. Recognition will be given to the designer along with the display. Some of the more outstanding ideas will be featured in a future *Technolog* issue.

Bruce Nelson

E-Day

"They say Engineers' Day is May 8 this year. Ever heard of E-Day before?"

"Sure I have. The IT students have this day in the spring, you see, where they do all kinds of crazy things. It doesn't seem to change much from year to year though. I never go to the convocation, and the open house displays in the Architecture Court seem to be all the same. What's more, with all those high school and junior college students around during IT week, it looks like all the fuss is for them, and not us IT students."

"Hold it! Haven't you heard? They're changing all that this year."

"Really!"

"Of course! They're going to bring

the high school students here in the fall, when they have more questions about college, so we will have IT week to ourselves."

"Great!"

"You can imagine what that will do to attendance at the convocation and open house, so they're planning on doing away with them too."

"Really? But there won't be much left of E-Day will there?"

"Are you kidding? They have enough stuff lined up to keep 3600 IT students busy for nearly a month. Surely you remember last year's tournament which were nearly the largest intramurals the University has ever seen. It will be the same thing this year and everyone will be invited to take part."

"How about last year's home-made car race out on Church Street? That was the greatest thing I've ever seen!"

"That will be there, and the rules will be even wilder!"

"Will anything replace the convocation and the open house?"

"Listen, I've got some inside information that they're setting up seminars on current conversational topics and, to get the ball rolling, a well-known personality will be here giving several talks. Everyone will, of course, be invited to take part."

"That certainly will stir things up around here!"

"The open house will be taken over by the departments of IT. Instead of displays by industries, most of the departments will be putting up exhibits for everyone to view."

"What about the other festivities—the road rally, picnic, brawl, queens contest, and chariot races—will they continue?"

"Yep! They'll all be here, bigger than ever and, as a matter of fact, the black book dance is coming back."

"This really sounds great, but you know May 8 is a long way off yet. Is there any reason why we have to start thinking about it now?"

"Sure is! The planning must begin now so all the activities can become as worthwhile as possible. In fact, you can be a part of setting up IT week by simply joining one of the IT Week Committees."

"I'll do that. Say, when did you say E-Day was again?"

"Friday, May 8."

Bill Lange, E-Day Chairman
Bruce D. Nelson, President,
Tech Commission

Engineering Challenges in Control of Industrial Air Pollution

by KNOWLTON J. CAPLAN
Assistant Professor
School of Public Health

Challenges to engineering design ingenuity and potential technical breakthroughs abound in the design of industrial air pollution control equipment. Technical fields where such opportunities exist are:

- Instrumentation and Controls
- Structural Panels
- Fiber and Textile Technology
- Reaction Kinetics and Catalysis
- Combustion
- Particle Technology

. . . and probably many more.

Background

A general description of air pollution control problems is probably useful in bringing the situation into focus. Of course, these will be generalities to which there are always exceptions; but it will serve to give a general, broad picture for further thought on the part of the interested reader.

Air pollution control for most industrial operations involves equipment which must handle a large volume of gas, usually air (or mostly air), containing a low concentration of contaminants. Typical concentrations of gaseous contaminant range from the part per million range up to a fraction of a percent, seldom as high as one percent. Loadings of particulate matter may range as high as several grains per cubic foot of gas and in some cases —usually with lower air volumes—may be as high as ten to one hundred grains per cubic foot (7,000 grains = 1 pound). In addition, the large volume of gases to be handled may also be at a high temperature, ranging frequently as high as six or seven hundred degrees, and may also contain significant amounts of water vapor or other condensible gases. As a result of this characteristic, a very large housing is needed to contain the flow of the gases. Usually this vessel is constructed to withstand a pressure or vacuum of up to 15 inches water gauge (about ½ pound per square inch) and to withstand whatever temperature and corrosive conditions may exist. For large installations, the housing of the control equipment is too large to ship in one piece and must be fabricated in sections and field erected. One result is that a very large fraction of the cost of air pollution control equipment is represented by the installed cost of the large "tin box" which contains the gases while they are undergoing treatment to rid them of contaminants.

Another general aspect of the control equipment concerns the nature of the industry. The total sales volume of equipment used for industrial gas cleaning is currently in the region of 100 to 150 million dollars per year. The installed cost of the complete pollution control system will be about three times the equipment price. Partly due to the nature of the equipment described above—which means that any sheet metal fabricator can fabricate the tin box, and that shipping costs become significant—and partly due to the historical nature of the industry, there is no "big three." There is a large number of small corporations involved in the market. Any large corporations that are involved usually have only a fraction of their business represented by industrial pollution control equipment. Thus, there is an absence of a strong concentration of technical prowess and financial strength; instead, these talents are rather diffuse. This, of course, has obvious disadvantages as far as technical development in the field is concerned, but one of the advantages is that it is relatively easy for an innovator to enter the market.

Another characteristic that has developed in recent years is the "takeover" of big markets by big industry who are not primarily engaged in air pollution control work. One example of this exists in the problem of automobile pollution. The first approach to the problem was the catalytic afterburner in the exhaust pipe, which would completely oxidize the exhaust gases and minimize or eliminate the air pollution problem from that source. Several organizations invested sums ranging from one to two million dollars in research and development efforts toward this end. Before the markets ever developed and became really profitable for devices of this nature, the automobile industry itself, under pressure from public opinion and federal legislation, became active in development work to reduce automotive engine emissions. In effect, the automotive industry said, "Never mind, fellows, we'll take over now." One cannot really complain about this, because if the automobile industry had not responded to the need, they would have been charged with being remiss in their public responsibility. Part of this responsibility involves the accomplishment of the objective in a way which is both practical and also at minimum initial and maintenance cost. Presumably, and at least to date, the engine modifications accomplished by the manufacturers do fit this criteria—they are of lower initial cost and lower maintenance cost than tail-pipe afterburners.

Another example of similar involvement is development in the power industry. One manufacturer of cloth arrestors (bag houses) became deeply involved in the development of that type of equipment to power plant application in order to achieve higher fly-ash collection efficiencies than had previously been considered practical by means of the conventional equipment used (such as high-efficiency cyclones and electrostatic precipitators). Other cloth arrestor manufacturers were involved to a lesser degree. The development proved to be reasonably satisfactory and it appeared that that was the direction the power industry would be taking in the future. One of the large major manufacturers of power plant equipment hired virtually the entire technical crew away from the dust collector manufacturer to set up its own department and to include the correction of the air pollution problem caused by the power plant along with the power plant itself. Again, this is a reasonable evolution and there are many who would argue that the manufacturer of equipment which causes air pollution should also undertake the elimination or correction of such pollution.

To generalize, it is probably safe to say that attractive development for air pollution control applications which are reasonably uniform—such as automobiles and coal-fired power stations—and nation-wide and large in character, will probably be taken over by the major industries already serving that field. The small company or individual innovator with a development applicable to this circumstance will probably find it difficult to invade the manufacturing and marketing aspects of such a market to any significant degree. He would be well advised to secure patents or other types of protection so that he may at least participate on the basis of royalties or some similar arrangement.

A brief description of some of the general fields of opportunity from the technical standpoint is offered in the hope that such description may spark the reader to effort and achievement in some area of interest to him.

Instrumentation and Controls

The basic problem is illustrated in Figure 1. Taking as an example a reaction furnace in which a product is made and which produces an air-polluting fume, one is confronted at the present stage of technology by the

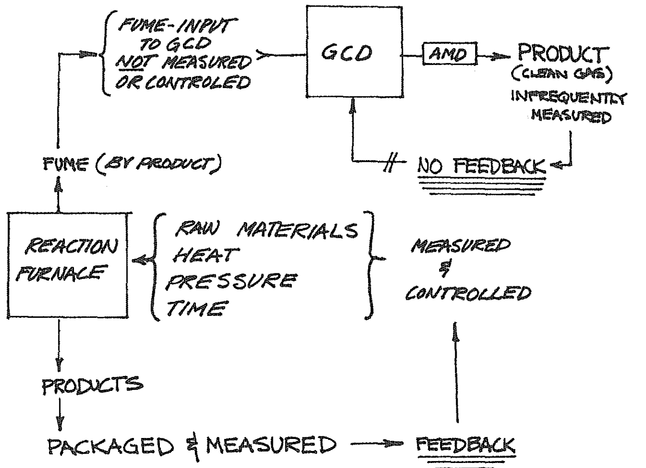

Figure 1. Instrumentation and controls required for pollution control.

situation delineated in that figure. The production process itself provides—with varying degrees of sophistication—that the raw materials and operating conditions of the furnace are measured and controlled. The basis of that control comes from the product which is measured, tested, or inspected in some fashion, varying from 100 percent non-destructive testing to statistical sampling for quality control. In any case, the measurement of the product, both in terms of quantity and quality, furnishes, through some feedback loop, the information for changing the controls and inputs to the reaction.

By contrast, the fume by-product of the furnace is a process-input to a gas cleaning device (GCD). The GCD frequently encompasses physical and chemical reactions which are as complex, or even more complex than, those which occur in the primary process. However, the input to the gas cleaning device is whatever comes out of the furnace and it is usually not measured and is almost never controlled. The fume-laden gases are sucked through the GCD by an air moving device, typically a fan, and then discharged through a stack as the "product" of the gas cleaning process. The "product" is "clean" gas, the residual contamination of which is very infrequently measured. In a very high percentage of the cases the level of contamination is never measured except by virtue of whether or not the neighbors are calling to complain about a visual effluent from the stack. There is no feedback loop from measurement of the "product" to change the operating conditions of the GCD or to control the input to the GCD. All engineers will immediately recognize that optimum design and performance cannot be expected from the GCD under these conditions. As a matter of fact, in the absence of instrumentation control and feedback loops, the gas cleaning devices themselves are designed as if such techniques did not exist. The machine design techniques used provide a machine which will cope adequately with any conditions within certain limits. The application engineering consists of sizing the equipment to handle some peak load which may or may not be adequately technically described and agreed-upon between purchaser and vendor.

The existence of this problem is not to be interpreted as sheer stupidity on the part of either the vendors or purchasers of this type of equipment. The instrumentation problems concerned with adequately and continuously measuring the product, the "clean" gas, are many and serious. Since the correction of air pollution in the past has usually been regarded as an overhead cost portion of the industrial activity, the development of such instrumentation has not received the emphasis that similar developments in other fields have enjoyed. If and when such instrumentation becomes available, it will then be at least worthwhile to investigate the possibilities of designing the gas cleaning equipment so that it may be operated on the basis of the amount and quality of the input and output of the process which it represents.

One simple example of such a control procedure does exist in the current technology. Figure 2 shows two types of variable pressure wet collectors. One characteristic of wet collectors is that their efficiency depends on the pressure drop in the contacting zone where the water and particulate matter is brought into contact. For operations in which the gas flow varies, these devices have a moveable element which increases or decreases the cross-sectional area through which the gases pass. By connecting this movable element with an operator governed by a differential pressure regulator, the pressure drop, and therefore the efficiency, of the wet collector may be kept constant regardless of the variation in gas flow.

Structural Panels

As previously described, the housing of the control equipment is a major element of cost. These housings usually need to be designed to withstand a pressure, either positive or negative, of about one half pound per square inch. They must be air tight and in many cases they need to be insulated. The conventional designs provide for a framework of channel and angle iron which is covered with formed sheet metal panels on the order of 14 gauge to 10 gauge with various rolled or welded-on stiffeners, and requiring a multiplicity of bolts or other fasteners for installation. Air-tight construction is usually achieved by field addition of sealing compounds and/or soft gaskets. It would seem that the application of some of the technology of air craft skin stress design, or building design using the sandwich panel concept, would offer some possibilities if adapted to the problem of air pollution equipment housings.

High Temperature Filters

Industrial duty air pollution control filters consist of a very tightly woven cloth fabric or a dense felted fabric, arranged in a series of bags or flat panels commonly known as a bag house or a cloth arrestor. The fabric itself will filter out much of the dust but the major portion of the filtration action is accomplished by the cake of already-collected dust on the surface of, and within the matrix of, the fabric. These filters are provided with some means of cleaning them in place by shaking the bag, or by reverse-jet pulses of compressed air, and by various combinations of such actions. The object is to maintain the porosity of the filter so that the gas will pass through at a reasonable pressure drop without the necessity or frequent removal and replacement of the filter media.

Cloth arrestors are one of the very best currently available types of pollution control equipment from the efficiency standpoint. On most industrial dust dispersions, weight efficiencies of 99.99 percent or better are obtained. There are several practical limitations to the use of cloth arrestors and one of the most serious is the temperature limitation. Currently available fabrics, made from synthetics, have an upper temperature limit of 425°F for fabrics made of Nomex, which is a special type of nylon. Glass fibers have an upper temperature limit of 550°F, but the glass fiber filter bags have serious problems of rapid wear and breakage. Nomex, being nylon,

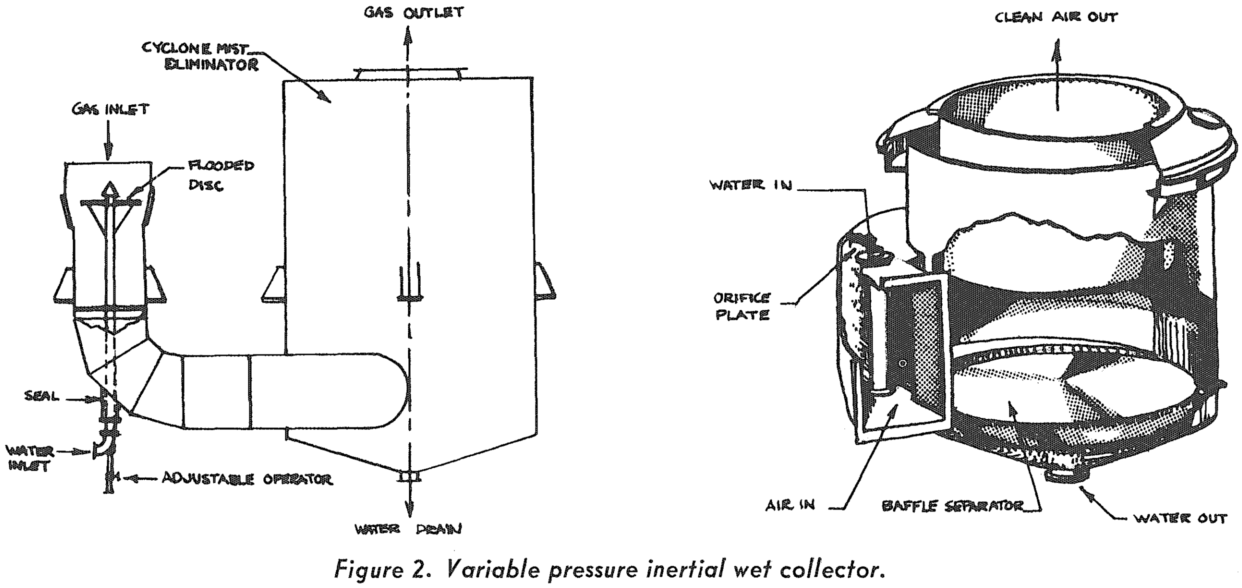

Figure 2. Variable pressure inertial wet collector.

is sensitive to rapid destruction by acid which spoils its possible application to coal-fired power plants because, if the temperature of the gases ever falls below the sulfuric acid dewpoint, the droplets of acid eat holes in the filter cloth. Fabrics made of Teflon have a somewhat higher temperature limit of 550-600°F, and are, of course, resistant to attack by almost all chemicals, but to date, at least, are prohibitively expensive for most applications. In addition, the temperature limit for Teflon is really not attractively higher than the other available fabrics.

There are, on the other hand, existing fibers of various refractory materials such as silicon carbide, carbon, etc. which offer the possibility of a quantum jump in the temperature range that could be handled by filters. Unfortunately, no one has as yet developed a fabric structure which can be made of such fibers and which is sufficiently strong and flexible to withstand the various types of filter-cleaning mechanisms which are required for the filter to be cleanable in place. Some years ago the Harvard Air Cleaning Laboratory developed, for the American Iron and Steel Institute, a filter using rock wool fibers. The fibers were slurried in water, deposited on a filter screen in a pan-type filter, and used to filter hot gases from an open-hearth furnace. When the filter loaded up with particles, the entire structure of fibers and particles was dumped, reslurried, separated, and re-deposited. This filter, in prototype, operated at a reasonable efficiency, pressure drop, and at temperatures approaching 1000°F. It was, however, judged too expensive in operation for practical application.

Thus, an opportunity exists in the fiber and textile field for the creation of a suitable fabric from the high temperature fibers which are now available. A parallel line of inquiry would be the development of cleaning techniques which would be practicable and applicable to fabrics so constructed.

Reaction Kinetics and Catalysis

There are significant industrial sources of gaseous pollution. Typical of these are the oxides of sulfur and nitrogen. The problem of removing oxides of nitrogen remains largely unsolved from an economic or practical point of view. One method of removing oxides of nitrogen from a gas stream is to mix the gas with a reducing gas such as methane and subject it to catalytic reduction producing nitrogen, carbon dioxide, and water vapor. This process is very expensive and, to date, applied only to relatively small gas streams.

The predominant oxide of nitrogen, NO_2, is quite soluble in water. The simplified reaction is as follows: $3\ NO_2 + H_2O \rightarrow 2\ HNO_3 + NO \uparrow$. Thus that every time three molecules of NO_2 are absorbed into and react with water, one molecule of NO is generated which is relatively insoluble and comes back out of solution into the gas phase. The oxidation of NO by atmospheric oxygen is a relatively slow reaction which, therefore, necessarily increases the retention time or treatment and the size of the pollution control equipment. In this case, due to the corrosive nature of the solutions, the equipment soon gets very expensive. An absorption and oxidation process for recovery of NO_2 from chemical gas process streams has been available for some years, and is usually operated at a pressure of 25 pounds per square inch in order to reduce the volume of the gases handled and to increase the speed of oxidation of NO. It is commonly regarded that the feed gas to such a unit must be in the range of one to two percent NO_2 before the process is economic, in terms of recovery values of nitric acid.

It would appear that there is a fruitful field for research here in further investigation of the reaction kinetics and the possibilities for catalysis, either in the gas or liquid phase, to make this absorption reaction process more practical and economic.

Particle Technology

Most air pollution control efforts to date, with respect to particles, have concerned themselves with the industrial dust dispersions which range down to one micron or somewhat smaller in particle size, and with metallurgical fumes which are in the range of 0.1 micron to one or two microns. There is evidence that suggests that a much finer spectrum of particles, in the range from 0.1 down to .001 micron, may be of significance as far as the atmospheric and climatological effects of air pollution are concerned, and perhaps even with respect to some of the health effects. Particles of this size are usually generated from combustion sources. If they are generated from other sources, their presence has usually been ignored. (Since the weight of the particle varies in general with the cube of its size, the percentage weight contribution of these fine particles is exceedingly small.) More investigation is needed on the fate of aerosols of this size in the atmosphere and on their effects. It is not known whether or not it will be necessary to remove particles of this size from air pollution sources, but if such should prove to be necessary, the industrial-scale technology for such removal is virtually untouched.

Combustion

Combustion technology has received considerable emphasis over the years primarily with an interest toward improved economy of combustion and the capability of using different or low grade fuel sources. What—if anything—can be done to change the combustion conditions to reduce the generation of oxides of nitrogen is little known. In general, whenever the oxygen and nitrogen in air are heated to high temperature in the combustion process, oxides of nitrogen are formed; and if cooled reasonably rapidly for heat transfer purposes, they are "fixed" in the flue gas. Combustion research aimed toward better understanding of this phenomenon and investigation of possibilities of economical combustion conditions which would minimize the formation of oxides of nitrogen, are needed.

The foregoing obviously leaves a lot of loose ends and dangling problems—however that is the intended message. There is a need for a fresh approach to the design of industrial air pollution control equipment; the structure of the business permits such an approach to be taken. If suitably handled and protected, it offers the promise of material compensation along with a contribution of significant import to our country's economic and environmental well being.

The Environment

and

The Engineering Profession

by STEVE J. GADLER
Professional Engineer

Engineers are concerned with problems of pollution. They are concerned not only with the problems of how to prevent the further degradation of the environment, but also how to prevent the further destruction of the air, water, and soil required by mankind if it is to continue on its celestial mission on the Space Ship Earth. This space vehicle is not serviced by a celestial waste collection system, nor can the Space Ship Earth stop to dump its accumulated cargo of sewage, toxic and radioactive wastes, and air pollutants; neither can it take on a cargo of clear, clean, potable water and clean air.

What is pollution? Pollution generally consists of abusing, assaulting, and misusing the air, water, and soil with organic and/or inorganic waste materials and with thermal, noise, and electromagnetic waste energy.

As an example of organic pollution, quoted from an article by Franz Scholz in the *Lowell Massachusetts Sun* newspaper for September 3, "A rat infested river of blood and other animal wastes demanding more of the Merrimack River's oxygen supply then required by the city of Nashau flowed from the Manchester slaughter house directly into the river. The smell of the fresh blood, rats and solid material carried by the stream of blood caused our photographer to gag to keep from vomiting. A Nashau tanning company with the same name as the Manchester packing company poured about 1/3 as much solids into the river as did the city of Nashau. Its wastes when released colored the river white and red. But the largest polluters are the paper companies who run the entire river through the plants. As the river enters, it appears to be greenish brown and when it comes out of the other side of the plant it is absolutely white and carries acids and other chemicals." This example of waste disposal is not of a hundred years ago, but of the year 1969.

With reference to the disposal of organic wastes from the slaughter house, the tanning factory, the paper mills, and the city of Nashau cited in the above example, it must be noted that the cheapest method of waste management was employed by dumping the wastes into the river which is the neighboring community's "backyard." The profits and savings accrued by the industries and communities utilizing this type of waste management practice becomes an economic hardship to downstream communities. Certainly all engineers understand that it is technically feasible to discharge clean effluence into the river. Engineers also understand that lack of waste treatment will produce more profits for the upstream plant owners while bringing higher costs to the downstream industries, municipalities, and other users of the river.

The harm done by dumping wastes into the environment, according to some engineers, depends not so much on the kind of waste that is discharged into the water, but on the amount, season of the year, timing of discharge, and the assimilative quality of the water. That is the ability of the water to put into action the subtle biological processes that recycle the waste to the environment. Many engineers have wondered and pondered for a long time about the chemical and biological processes that take place after the waste has been dumped into the water. For example, what are the synergistic effects of paper wastes when dumped with sewage, various chemicals, and toxic materials that are dumped into the river by a nearby factory further upstream? What, for instance, is the synergistic effects on a river overloaded with raw sewage when it encounters thermal discharges from an electric generating plant?

Human, animal, and vegetable wastes begin to undergo degradation or decomposition by a bacterial action as soon as introduced into the environment. Through this natural action, the products of the decomposition find their way back and are recycled into the environment.

There are limitations on the amount of purification that can be carried out by nature and for this reason the engineer must assist the natural process through providing proper waste management facilities and purification systems. Bacteriological and oxidation processes that are carried on in the environment do not prevent pollution. For even while the natural biological action is breaking down the waste for recycling into the environment, the water in the river has, of course, a reduced value. It follows that if the river or body of water continues to receive wastes and if the amounts of organic waste material discharged exceeds the capacity of the natural cycle of purification, then that body will continually remain polluted and eventually become a cesspool or in the case of a river, a sewer.

Organic wastes can be handled by nature if the quantity is not too great. But mineral or inorganic wastes are more non-degradable. This is why the pollution of Lake Superior, by the dumping of approximately 60,000 tons of taconite tailings into the lake every day, is producing, in the largest of our great lakes, a serious and long term pollution problem. It now appears that the Federal Water Pollution Control Administration and the State of Minnesota Pollution Control Agency will take action to resolve this serious problem of pollution.

Some of the ore that is produced resulting in the taconite tailings pollution problem is used to produce the automobile, an item supposed to provide pleasure, comfort, and transportation. In manufacturing the automobile, inorganic wastes are produced which are not recycled into the economy, but instead are dumped into the water and air as pollutants, degrading our environment. These wastes from the production of the automobile, have been dumped into the environment in such quantities that it has probably destroyed Lake Erie beyond rehabilitation. The automotive industry is one of the major polluters of the Detroit River and the gaseous wastes produced by the automobiles, according to the United States Public Health Service (USPHS) are the primary causes of our national air pollution problem.

This is only one example of the shortsightedness of man; for he practices the ethic that short term profit and convenience, along with a long term pollution, will somehow equate with environmental degradation. This is inconsistent with the responsibility that engineers have for the future.

The manifestation of engineering capability may best be illustrated by citing the five-hundred thousand to six-hundred thousand chemicals that have been developed. Many of these synthesized chemicals have been introduced into the air, water, and soil to the detriment of man and the environment. As an example, DDT. Some scientists have indicated it has a half-life of at least 10 years, since it is a stable hydrocarbon. It is transported through the soil and water to become concentrated in the tissues of living plants, animals, and bird life.

The law of the conservation of matter certainly is applicable to the conservation of materials. Namely, no matter how we transform the materials for man's use, the total material utilized always equals the total material that remains as the finished product plus the part that is dumped as waste into the air or water. It follows, therefore, that no matter how the unwanted or unusable waste material is diluted or dispersed to the environment, the law of the conservation of matter is still valid. The philosophy that dilution and dispersion is a proper method of waste management is a canard that must be laid to rest by all engineers if inroads are to be made in retreiving our environment.

Since it has not been economically feasible to recycle the resources represented in the 30,000 automobiles which become useless, either through planned obsolescence, through deterioration, or accident each day in the U.S., another waste problem is increasing. Not only is the automobile polluting the air but it is now destroying our esthetic values. Automobile graveyards spoil the horizon and destroy happiness that should be found in the landscape.

It is interesting to note that the type and forms of the wastes are completely different in physical form than the natural materials that went into producing the product. This is a factor that must be considered in the waste management problem. According to J. H. Dales of the University of Toronto, another factor that enters into the the problem of waste management is the question of the natural resources utilized to produce products for the increasing population growth and the improving standard of living. An affluent society produces large quantities of wastes. As an example, W. E. Gilbertson of the USPHS office of solid wastes indicates that our yearly production of waste is well over a ton per person. He stresses the fact that this does not include sewage or solid wastes tossed from automobiles.

Engineers have devised many waste recycling systems. For example, fly ash once discharged into the atmosphere is now being reclaimed by electrostatic precipitators and is utilized in the manufacture of building material; saw dust and other lumber industry wood wastes are utilized in fiber board, desk tops, and compressed logs for fireplaces. Some junked cars are being recycled into the economy through reclaiming the iron, chrome, aluminum, and other metals and materials. Generally the recycling of wastes and the other methods of waste management has not prevented the pollution problem. Dr. Linsley, Head of the Civil Engineering Department of Stanford University, said that waste materials once produced are always with us except those which nature reconverts and recycles to useful products and that small portion which is recycled by man. Ultimately the production of wastes will overwhelm society and it will become smothered if we continue our present methods of waste management.

Almost all air pollutants, according to Dr. Paulus of the University of Minnesota, come from inorganic materials and, according to the USPHS information, 60 percent of the contribution to air pollution comes from motor vehicles. Can engineers devise methods to recycle the 300 million tons of waste materials that enter the environment each year?

A good problem for the electrical engineer and the chemical engineer is to determine the total amount of SO_2 that is being discharged into the atmosphere by the fossil-fuel power generating plants in the U.S. How much industrially useful sulfuric acid or sulphur could be recycled from this wasteful and environmental destroying process? From the literature it appears that there are several technologically and economically feasible SO_2 removal systems available at the present time for use in power plants for the recovery of sulphur products.

Secretary of Interior Hickle in a recent address before the National Executives Conference on Water Pollution Abatement said that the jet aircraft arriving and leaving from Washington D.C. airports dump 35 tons of solids into the air each and every day. Not only do the 4 engine jets dump waste into the air the equivalent of 8000 automobiles operating for an hour, but they have now become one of the great producers of noise pollution affecting the lives of citizens living near our great nations' airports.

Is the efficiency of our electrical and mechanical systems produced and manufactured to ease man's burden on earth based on the amount of noise and thermal pollution that the systems introduce into the environment? Noise pollution like thermal pollution must be properly managed if we are to prevent further deterioration of our environment, let alone action for its improvement. Noise pollution in some areas of our country has forced the introduction of bills into congress, by

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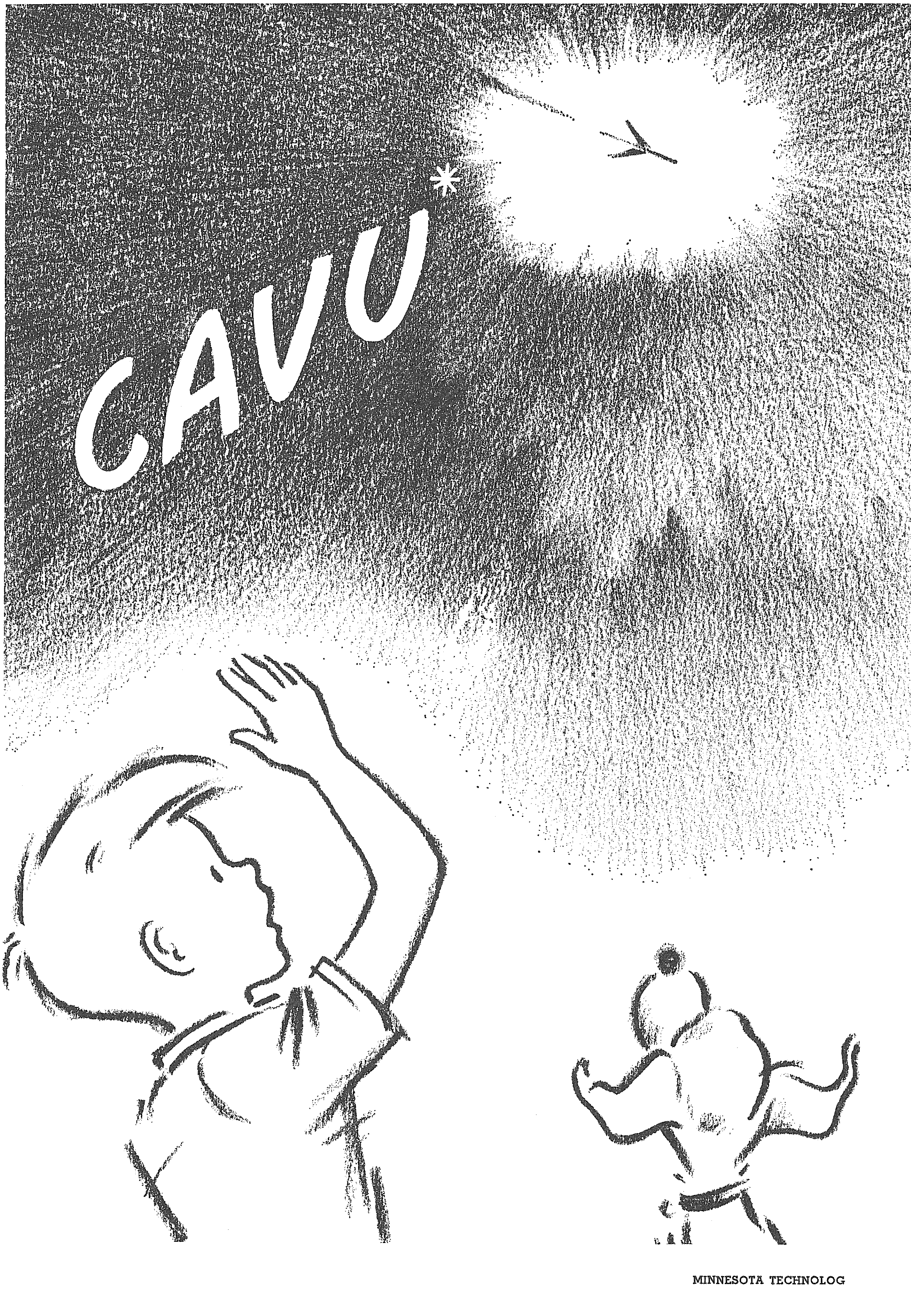

CAVU*

Hon. Charles H. Wilson of California, to obtain funds for the soundproofing of classrooms affected by jet noise. Why is this necessary if airborne silencers are available to contain the noise? Engineers have the capability to reduce noise to acceptable levels and society should demand preventative measures to be taken before loss of hearing and other health impairments result.

Another pollutant that is of concern, before we pass on to the waste that is posing the greatest peacetime threat to mankind, is thermal or heat pollution. This type of pollution concerns the amount of heat discharged into the environment. The BTUs of heat loss depends on the efficiency of conversion of the heat energy into electrical energy. The efficiency of fossil-fuel electric power plants are about 40 to 45 percent as compared to an efficiency of 20 to 22 percent for nuclear-fuel electric power plants. Therefore the heat loss in a nuclear power plant may be 78 percent and approach 80 percent. The great amounts of heat loss require large amounts of water for cooling. Here also the engineer has developed the technology and designed the systems for cooling purposes. Closed cycle cooling systems similar to radiation cooling used in motor vehicles will increase the cost of producing electricity but affords protection to the water.

The effects of the discharge of heat from a fossil or nuclear electric generating plant can have a serious and profound effect on the waters biota of the river since aquatic organisms are extremely sensitive to such changes in temperature. According to professor Irving Lyon of Bennington College, "Heat can cause changes in internal functions, in respiration, heart activity, rate of digestion and growth." Death from a reduced oxygen supply is followed by disruption of the food chain. Furthermore, with heat there is increased susceptibility to toxic substances. Synergistic effects come into play and the extent and effects are not too well known, "interference with migration, distributional spawning behavior, and other critical activities of the life cycle follows including altered hormone and enzyme action."

The effects to the environment from the introduction of radioactive wastes produced on the nuclear cycle, from the mining, milling, processing, fabrication of nuclear fuel utilization in power reactors and reprocessing of the contaminated fuel are of serious concern to the engineer. The radioactive wastes produced in the operation of electric generating plants reactors, according to C. R. McCullough, formerly chairman of the Advisory Committee on Reactor Safeguards, U.S. Atomic Energy Commission, must be considered qualitatively as a new kind of problem. "However, even allowing for considerable error in the quantitative assessment of this problem, it is still evident that radioactive poisons are more hazardous than chemical poisons by a factor of something like 10^6 to 10^9 (million to a billion)" continues Dr. McCullough in the book *Safety Aspect of Nuclear Reactors.* The poisons included chlorine, arsine, and beryllium. Because of the overwhelming toxicity of the fission products and other radioactive materials, the possibility of accidents and their consequences have to be carefully examined before attempting to operate —in fact before completing the design. Mr. McCullough feels that the best manner of dispersing radioactivity would be through the air; however, it may well be that the spread of radioactivity contamination by bird and animal life, by assimilation by crops, and by pollution of water could turn out to be more serious than that spread by meteorological factors.

Dr. Charles W. Huver, Associate Professor of Zoology at the University of Minnesota, has urged the Minnesota Pollution Control Agency to require containment and of site disposal of the liquid and gaseous radioactive emissions from the Monticello reactor in order to give the maximum protection to downstream and downwind residents in the Minneapolis-St. Paul metropolitan area, because of the extreme toxicity and the tendency of their pollutants to concentrate in biological systems.

Page 1535 of the Hearings before the Joint Committee on Atomic Energy, Congress of the United States, first session on Reactor Developments and Technology program held on April 24 and 25, 1969 lists twenty nuclear facilities that are no longer in operation and lists seven operational facilities. *Nuclear Safety,* a bimonthly technical progress review published by the AEC, lists five plants that were scheduled to come in line this year; however, slippages in time schedules have developed. As an example Jersey Central Power and Light Company's Oyster Creek plant reactor has had trouble with 137 stainless steel stub tubes. Reaction inspection revealed 123 cracks in the tubes, and welding defects at the control rod joints of the 137 tubes. Since Jersey Central is paying a high price for electric power from another utility during this time period it decided not to order any more boiling water reactors (BWR) from G.E., but instead ordered pressure water reactors (PWR) from Westinghouse.

Ten plants are due to come on line in 1970 with 12 more to go into operation in the 1972 time period. There was a surge in ordering nuclear plants in 1967 but recent information from the business news media indicates orders for new plants both this year and last year have taken a sizable drop. Reasons for the drop in orders included slippages, hazards in transportation of nuclear materials and the radioactive wastes, effects on the environment of radioactivity releases, additional experimental work required on some components, and training of personnel, both for construction and for plant operation. According to the final safety analysis report prepared by Northern States Power and submitted to the U.S. Atomic Energy Commission in support of an application for an operating license for the Monticello plant, there appears to have been back extrapolation of data used to come up with results that are consistent with predictions based on fuel physical property data.

At the present time there are two types of reactors of interest, both of which have been previously mentioned, but of interest is the fact that the BWR discharges more radioactive waste in the atmosphere than into the water and PWR discharges more radioactive waste into the water and considerably less into the atmosphere. The operation of these reactors produces several types of radioactive wastes — solids, liquid and gaseous; these are classified as high level, medium, and low level radioactive wastes. The high level radioactive wastes are contained and shipped to the U.S. Atomic Energy cemeteries for burial and continued maintenance at taxpayers expense. In 1959 the Joint Committee on Atomic Radiation of the U.S. Congress held a series of hearings on radiation matters. The following is a summary of their findings.

For the first time the magnitude of the waste disposal problem that the United States faces in the future was disclosed at these hearings. The disposal of radioactive wastes could easily be one of the most serious limitations on the expansion of the Nuclear industry. Ten years later the U.S. government's publication entitled *Selected Materials on Environmental Effects of Producing Electric Power* sets forth the present operational philosophy of the United States Atomic Energy Commission; all high level wastes will be contained and shipped to the Atomic Energy Commission operated radioactive cemeteries for perpetual cooling and care at tax-payers expense and all the low level wastes will be diluted and dispersed to the environment. *This type of waste management philosophy of diluting and dispersing radioactive wastes into the environment will impede the proper development of the nuclear industry and the effective utilization of nuclear energy for the benefit of mankind.* Not only will this type of radioactive disposal into the environment prevent the proper development of the nuclear industry but it will provide the vehicle for the continued increase in the radiobiological contamination of the Space Ship Earth.

Dr. Edward Teller, the father of the H-bomb, in May 1965 in an address entitled "Energy from Oil and from the Nucleas" said, "In principle, nuclear reactors are dangerous. They are not dangerous because they may blow-up. The explosion of a nuclear reactor is not likely to be as violent as an explosion of a chemical plant. But a powerful nuclear reactor which has functioned for some time has radioactivity stored in it greatly in excess of that released from a powerful nuclear bomb. There is one difference and this difference makes the nuclear bomb look like a relatively safe instrument." In fact Dr. Teller emphasized, in this address, that nuclear reactors did not belong on the face of the earth, because he said, "A gently seeping reactor can put its radioactive poison under a stable inversion layer and concentrate it into a few hundred square miles in a truly deadly fashion. This is why we must be exceedingly careful in constructing nuclear reactors. By being careful and also by good luck, we have so far avoided all serious nuclear accidents."

A BRW of the Monticello-, Brown's Ferry-, Vermont Yankee-, and Oyster Creek-type has an inherent defect in that as fission-product gas pressures build up, various radionuclides find their way out of the tubing containing the uranium fuel and into the primary coolant water within the reactor. It is because of this factor that the 56 Curies per year that will be allowable for the Monticello reactor to discharge into the Mississippi river above the Twin Cities water system intakes cannot be maintained. The release levels of radioactive wastes must be raised in order for the reactor to operate. Under normal operation, the plant will be allowed to discharge 315,000 Curies of radioactive wastes into the atmosphere; however, the operator insists that it will be impossible to operate with such narrow restrictions to radioactive waste releases. This is the reason, according to the March 7, 1969 issue of *Science,* that the power company wants a margin of error so that it is not subjected to legal action when the plant fails to meet performance standards or if an operating emergency causes radioactive discharges of abnormal levels.

Reliability of electric power is of concern to engineers, to industry, and to consumers, so the question must be asked: Will the Monticello nuclear plant prove to be reliable, safe, and be able to contribute to our local power needs? Judging from the performance of its sister plant and prototype, the Oyster Creek Plant, the local utility may not be able to furnish total power demands and we may be faced with a power shortage. The Oyster Creek Plant was more than two years late in producing power and is now down because of control-rod difficulties. It is understood that while waiting for the Oyster Creek Plant to come on line, Jersey Central Power and Light was forced to spend $60,000 a day buying power from neighboring power companies at 9.3 mills per kilowatt hour. Some utilities have taken a more responsible position in regard to the power shortage problem, "We decided we couldn't count on the nuclear plants coming in on time. None ever had, so we are building enough fossil capacity so that even if they never come in, we will have enough energy. All we want our customers to know is that when they press the switch they will have power" said Donald C. Cook, President of American Electric Power.

Professor Jack E. McKee of Environmental Engineering at the California Institute of Technology, writing in the June 1968 *Engineering and Science* magazine, is concerned with the fission products held within the cladding of a reactor. A Monticello-type and size reactor contains over a billion Curies and, in case of a major accident, this amount of radioactivity would present extremely serious difficulties to a successful evacuation of the metropolitan population.

Engineers have a much more serious and basic challenge: To develop the intestinal fortitude to express their convictions publicly and in this fashion represent the conscience of the engineering profession. C. C. Cutler writing in *Spectrum* the IEEE journal, said, "It was not engineers who mounted the assault on pollution, but surely it was the engineers who first knew what was happening to our water and it was not the engineers who forced the program of safety in car engine design, but who was more aware of the problem?" Who better than the engineers knew about the dangers in the Apollo spacecraft design and could have issued more effective warnings against the mathematically impossible accident and the loss of three astronauts."

Adolphe J. Ackerman, an internationally known engineer, writer and philosopher, has spoken out and exercised his professional engineering integrity by writing for the record in those engineering areas where the public interest was at stake. The neglect of the duty to speak is more severe than the penalty imposed through the loss of jobs, status and vilification. Mr. Ackerman quotes Herbert Hoover, our only engineer who was president, "Our greatest danger is not from invasion by foreign armies. Our dangers are that we may commit suicide from within by compliance with evil. Or by public tolerance of scandalous behavior. Or by cynical acceptance of dishonor. These evils have defeated nations many times in history. The redemption on mankind by America will depend upon our ability to cope with these evils here at home." Today, more than ever before, declarations by engineers are professional responsibilities. In the future it must be the engineers who mount the assaults on the destructive forces sapping and destroying our environment.

Air Pollution and Allergic Diseases

A research project concerning the incidence and etiology of allergic asthma on the campuses of the University of Minnesota has been in progress for the past several academic years. The study was prompted by the following factors: the occasional appearance of asthma on the University campus in epidemic proportions, the immediate proximity of an important source of air pollution represented by the grain industry, and the number of patients reporting to the University Health Service Allergy Clinic with clinical evidence of grain dust sensitivity. The most notable outbreak of asthma occurred in November 1954 during a period of stable weather conditions lasting several days. A characteristic grain odor was noticed throughout the Minneapolis campus area at that time. On the first day of the outbreak, eight students suffering acute asthma reported to the Health Service and two of them were hospitalized. On the second day, six more students were treated for asthma; during the following week or 10 days several more asthmatic students were seen, one being hospitalized. Records of those students previously tested showed that all of them reacted to linseed or alternaria.

The possibility of a relationship between air pollutants from the grain industry and the asthma problem at the University of Minnesota can be better understood by referring to Figure 1 which is a map of the area around the St. Paul and Minneapolis campuses. The figure shows the location of grain mills, processing plants, and relative student housing densities in relation to the campuses. It may be seen that the Minneapolis campus of the University in particular is almost surrounded by grain mills and processing plants. Approximately 50% of the students attending classes on the Minneapolis campus live within a two mile radius of that campus. These students have a more or less continuous potential exposure to the air pollutants present.

The handling, storage, and processing of various grains is a major industry in the Metropolitan Twin City area. The term "grain mill," although commonly used, is actually a misnomer in most cases, since the milling of grain is done in only a few plants. Other grain activities included the following operations and processes: (1) grain merchandising in which unloading, loading, cleaning, sizing, blending, turning, and separating may take place; (2) linseed oil manufacture and refining; (3) soybean oil manufacture and refining; (4) malt processing; (5) animal food preparation. Wheat represents about 40% of the grain received in the Twin Cities. Other grains stored or processed, listed in order of amount received, are barley, corn, flax, soybeans, oats, and rye. About 100 million bushels of grain were shipped to the plants located in the areas represented in Figure 1 during the past year.

Grain, brought into the Twin Cities by rail and truck and from several states in the Upper Midwest and Canada,

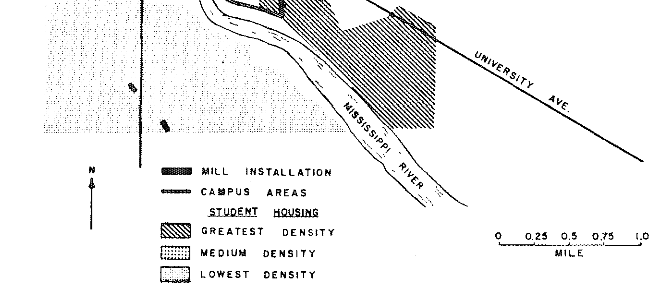


Figure 1. Street map showing the grain mills, processing plants, and areas of student housing in relation to the campuses.

by HAROLD J. PAULUS, *professor*
THOMAS J. SMITH, *graduate student*
School of Public Health

arrives in an unclean state directly from the farm and from country elevators. Air contaminants from the grain mill area have been found to include starch grains, grain bran, chaff, rust, weed seeds, various types of pollens, different insect parts, mists, and gases from oil and food processing.

Asthma Study

The occurrence of asthma at the University of Minnesota has been studied by a combined environmental clinical approach to determine whether grain industry emissions have a direct relationship to the frequency and severity of asthma attacks.

In order to qualify for this study the cases of asthma had to meet these criteria:

(1) the disorder was of allergic origin,
(2) there were recurrent paroxysmal attacks,
(3) there was a characteristic prolongation of the expiratory phase of respiration during the attack.

Environmental

The environmental phase of the study has been involved in determining the exposure component of the problem. By means of two weather stations, data were recorded on wind direction and speed, relative humidity, barometric pressure, ambient air temperature, and occurrence and duration of temperature inversions. Airborne particle concentrations and fallout on the campus and surrounding areas were being studied by means of a network of dust fall jars and the use of high volume and dust-spot samplers at three main sampling stations. Routine samples of sulfur dioxide and periodic samples of oxides of nitrogen and total oxidant were taken on the Minneapolis campus. Special gas samples were collected in the vicinity of certain grain operations by a freezeout technique. Analysis of airborne samples has shown the influence of the grain industry emissions on the concentration of particulate pollution. Compounds with allergenic characteristics have been isolated from airborne samples collected on the campus.

Incidence of Asthma

For eventual association with environmental factors it is necessary to evaluate the incidence of true allergic asthma in the University population on a daily basis. In order to accomplish this, all undergraduate and graduate students known to have asthma and willing to participate were enrolled in the study. To this group, the matriculating students with a history of asthma were added at the beginning of each new quarter. At the time of his entrance physical examination, each student with a history of past or present asthma was interviewed briefly by the allergist and given an appointment to attend the asthma clinic for completion of a detailed allergy history and initiation of appropriate skin testing. A number of these students came from farm homes and it was interesting to note how many of them indicated a history of sensitivity to grain dust and odors.

As an aid in collecting data each student in the study maintained an "asthma diary" in which each attack suffered was recorded in considerable detail. The diary asked for specific items concerning the onset of the attack such as date and time of day, exact location, activity at the time of the attack, and any unusual weather conditions or odors. An attempt was also made to estimate the severity of the attack by asking the patients to record medications required for the relief of symptoms. The asthma diaries were returned to the asthma clinic at the end of each month.

Results

The final report of the research project is now being written. A portion of the findings are presented in the following sections.

Incidence of Student Asthma

As an illustration of the amount of student asthma, the distribution of first day of asthma attacks for January and February of 1962, is shown in Figure 2. For the same period, a wind rose representing a frequency distribution of wind directions and speeds in 30 degree sectors is shown in Figure 3 and daily maximum and minimum temperatures in Figure 4.

During this two month period, January-February 1962, there was an average of five attacks per day and on six different days there were 10 or more attacks. It is of interest to note that on some occasions the number of first day attacks increased materially on Monday after being below average over the weekend. However in three cases, January 8, January 15, and February 5, the increase coincided with a severe temperature drop which may have precipitated attacks. On the other hand the temperature drop on Monday, February 26, was not accompanied by an increase over the weekend attack rate. Likewise, other severe temperature drops on January 5, 26, and 30 did not produce a rate increase. Although it is generally believed that cold air is a contributing cause of asthma the number of attacks during the coldest days in January and February, 1962 was not unusual.

It has been conjectured that low velocity winds from the

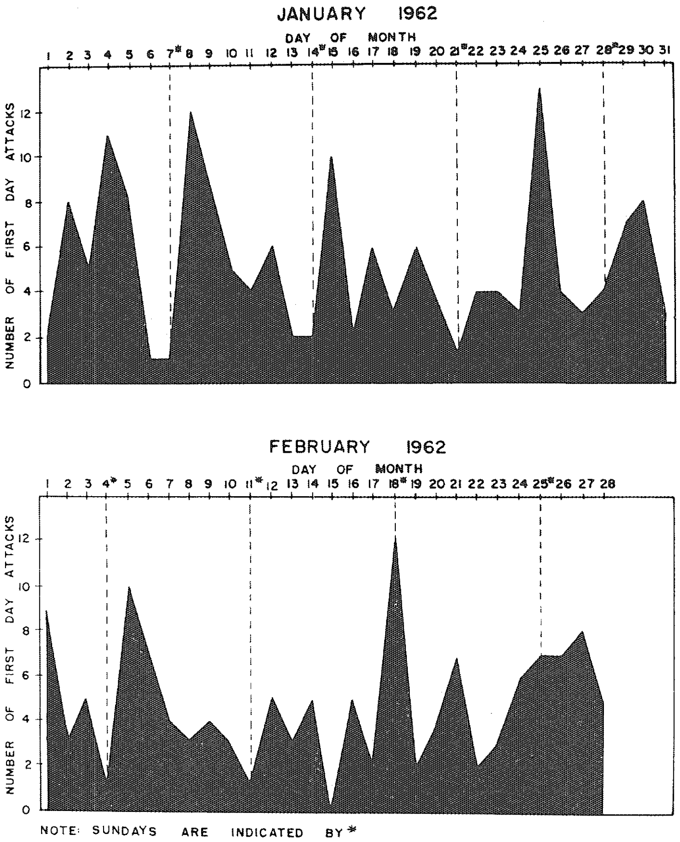


Figure 2. First day asthma attacks during January-February 1962.

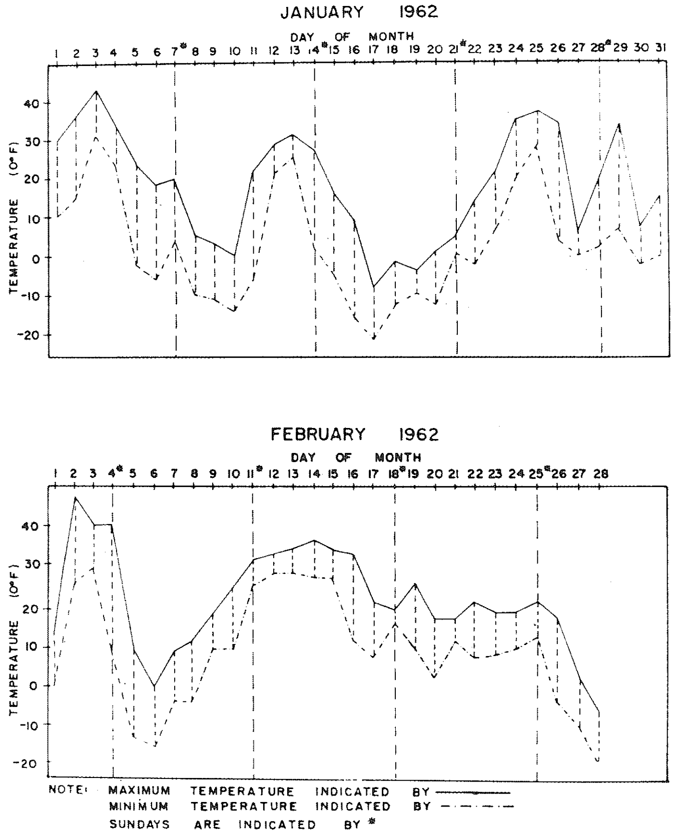


Figure 3. Maximum and minimum temperatures during January-February 1962.

grain handling district east of the Minneapolis campus would have the most adverse effects on sensitive persons on this campus because of potential contamination with grain mill dust. From Figure 4 it may be noted that only four percent of the winds during this two month period were easterly and less than five mph.

Asthma on January 25, 1962.

For January 25, 1962, there were 13 students reporting a first day of asthma attack.

The environmental data available for January 25 includes basic weather information and concentrations of sulfur

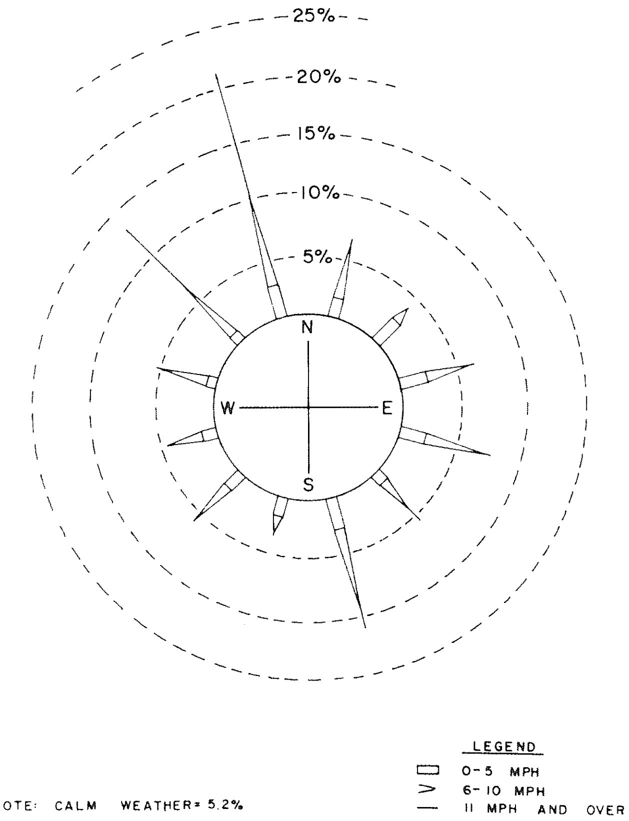
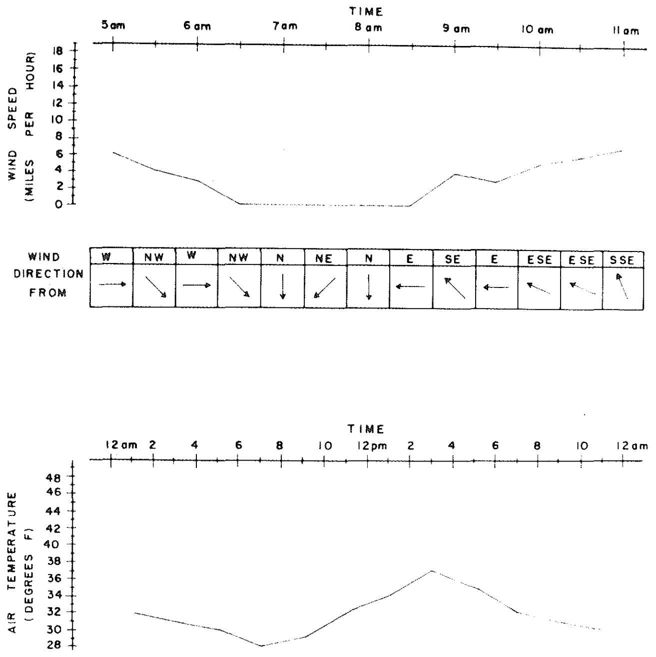


Figure 4. Frequency distribution of wind direction and speed in 30° sectors for January-February 1962.

dioxide and airborne particles on the campus. Figure 5 shows the wind direction and speeds for the calm period in the morning and the air temperature values for the entire day. Temperatures taken aloft up to an elevation of 500 feet indicated a weak ground temperature inversion lasting from about 5:30 a.m. to 9:00 a.m. Sulfur dioxide samples were collected every two hours starting at 2:00 p.m. on January 25. The concentrations of this gas were not unusual during this period, varying from six to 27 parts per billion.

A review of Figure 5 reveals low velocity winds for several hours in the morning. Since there was very little air movement and a temperature inversion present, there is a good possibility that air concentrations of different grain mill pollutants were increased. This increase is reflected in the dust spot values obtained with Dust Spot Samplers. These values showed a general buildup of airborne particles starting around 6:00 a.m. and continuing until noon. Light winds out of the eastern sector from 8:00 a.m. to 11:00 a.m. brought the pollutants to the campus area where the University population was exposed to them.

A review of the diaries of the 13 persons with first day attacks on January 25 showed that eight subjects reported



NOTE: VALUES SHOWN ARE AVERAGES OF CONTINUOUS RECORDED DATA.

Figure 5. Campus weather data for January 25, 1962, showing wind direction and speed from 5 a.m. to 11 a.m. and the air temperature throughout the day.

an onset between 8:00 a.m. and 12:00 noon while on or immediately adjacent to the campus. The remaining five subjects had attended class on the campus during the day and reported the onset of asthma in the evening. One subject, living in a campus dormitory, indicated that his attack started five minutes after opening a window upon arising a 7:30 a.m. Grain mill odor was reported as an associated item on some diaries.

It is quite likely that the 13 persons were exposed to the same air pollutants in the morning while residing, walking or attending class on campus. Although five of the attacks occurred several hours after such an exposure, this is not uncommon and could be attributed to the varying degrees of sensitivity of the subjects to the allergens. The identity of the causative agent or agents is not known but substances with allergenic characteristics have been isolated from airborne samples of particles collected on the campus. Grain mills in the campus vicinity handle all types of grains and because the grain is received, cleaned, or processed throughout the year, dust from most grains could be present in the air almost every day.

Other variables which might contribute to the onset of an asthma attack must be considered. It may be noted from Figure 5 that the air temperature for January 25 was unseasonably warm and there was no sudden change in temperature. This would rule out the effect of extreme cold and temperature change as a possible cause. Since the University of Minnesota operates on the academic quarter system, there were no midquarter or final exams associated with January 25; therefore, emotional pressures of this sort as the cause of asthma on this day can be dismissed.

Associations with Asthma Incidence

In the review of data representing five academic years the relationship of asthma incidence and environmental parameters has been determined. A partial listing of the results is shown in Table 1.

The strongest relationship found was between asthma and smoke spot air pollution index. All five years showed a positive relationship significant at the 5% confidence level. This variable was strongly related to asthma among students who had a positive skin test to grain mill dust. Asthma was also significantly related to the concentration of sulfur dioxide for three out of four years examined. Weight

TABLE I—RELATIONSHIP OF STUDENT ASTHMA TO ENVIRONMENTAL FACTORS CONSIDERING FIVE ACADEMIC YEARS

Environmental Factor	Number of Significant Years	Slope of regression Line
Airborne particles (Station 2)	2	neg.
Airborn particles (Station 3)	2	mixed pos. and neg.
Sulfur dioxide	3	pos.
Smoke Spot (Station 2)	5	pos.
Smoke Spot (Station 3)	5	pos.
Rainfall	0	—
Barometric pressure (mean)	0	—
Relative humidity (mean)	3	pos.
Relative humidity (daily range)	3	neg.
Temperature (daily range)	4	neg.

loading of airborne particles was only slightly related to student asthma. Data from only two years were significant for the two sampling locations, and most of the slopes were negative indicating an inverse relationship.

Weather variables were not related to student asthma with the exceptions of temperature and relative humidity. Temperature was found to be inversely related to the incidence of asthma. However there is also a strong inverse relationship between temperature and the atmospheric concentration of sulfur dioxide so the apparent asthma relationship may be anomolous. Relative humidity was positively associated with asthma. Both physical and biological reasons for this fact may be suggested, however they are somewhat tenuous.

Summary

A possible association of grain industry air pollutants with student asthma has been studied at the University of Minnesota for the past few years. Environmental data have been collected on weather parameters, on particulate pollution, and on certain gaseous concentrations in the campus vicinity. Clinical data are being gathered to determine the incidence of asthma and the possible development of new sensitivity to certain allergens in a group of persons with a history of asthma.

Detailed analysis of the data for January-February, 1962, and for the specific date, January 25, 1962, was made. Thirteen patients developed asthma on this date on which the weather and sampling data indicated an increase of air pollutants.

Positive associations were found between certain air pollutants and the incidence of student asthma but most of the weather variables have shown inverse relationships or none at all.

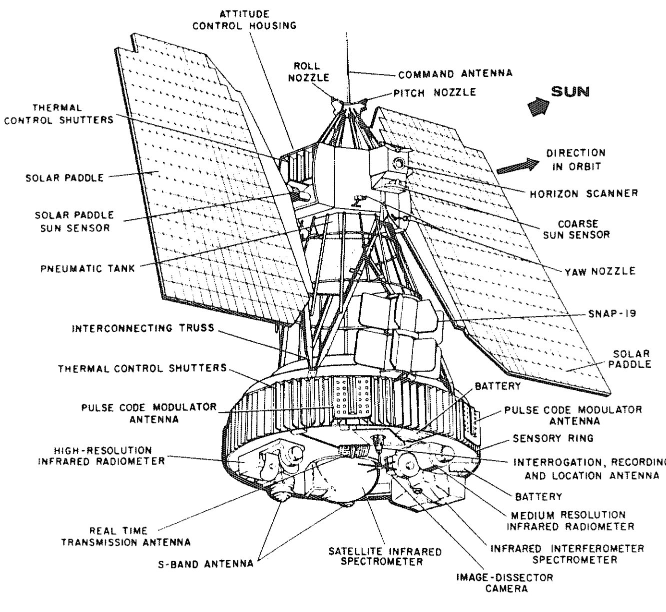
What's New in Science and Engineering

by JOANN HAWKINSON

Nimbus III

Estimates are that weather predictions five days in advance utilizing satellites similar to the GE-built Nimbus could result in annual savings to the United States of $2.5 billion for agriculture, $45 million to the lumber industry, $75 million in retail marketing, plus millions more for recreational activities.

NIMBUS III



The new Nimbus weather satellites, designed and built by GE's Space Systems Organization, have reduced the need for world-wide weather monitoring stations.

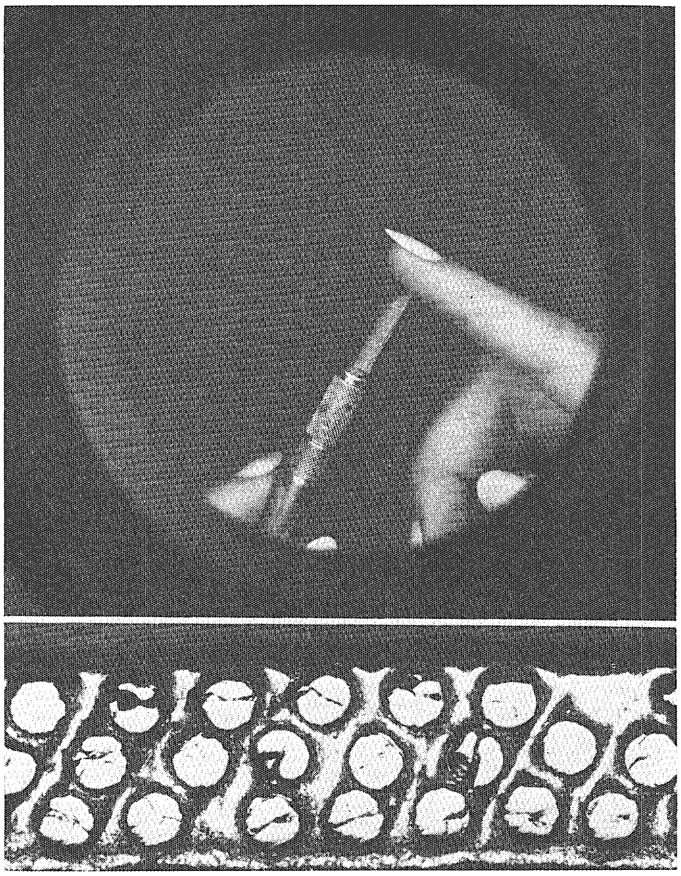
Since 1960, more than two million weather photos have been transmitted from all our meteorological satellites. Included are observations of practically every hurricane, typhoon, and tropical storm during that period. Such storms can now be spotted as much as two days sooner than previously.

Composite Welding

Composites, the glamour materials of the current era, cannot be welded easily. Fusion welding techniques either harden composites too much or break them down into the separate elements they were before they became composites.

Now, however, a solid-state welding method tested at the Boeing Company in Seattle not only promises to join composites, but can even be used to construct composite parts from scratch.

Boeing applied the techniques of diffusion welding to composites. This method combines relatively low heat, pressure, and time to bond materials together. Aluminum sheets with boron filaments were placed in a diffusion welding chamber under pressures of five tons per square inch at 950° Fahrenheit for 10 to 15 minutes. The re-



sult was a strip of welded composite sheet as thin as a knife blade nearly three times stronger than that of the original material. The knife's "blade," is actually a piece of the welded composite. The composite cross-section at the bottom of the photo, a view of the "blade" edge magnified 135 times, reveals three layers of material welded into one structure with the boron threads (large dots) aligned for maximum stiffness.

In a related experiment, Boeing put together boron and graphite layers and bonded these elements into a composite material under diffusion welding conditions. Although the hand-laid composite was not structurally perfect, it showed metal matrix composite manufacturing is feasible using solid-state welding techniques.

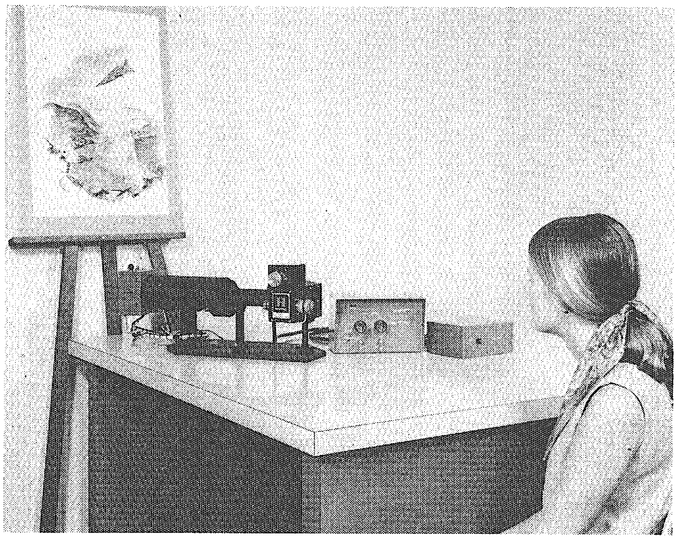
The Boeing-funded research work is aimed at proving the usefulness of composites for future spacecraft and aircraft.

Electro-Optics Invention

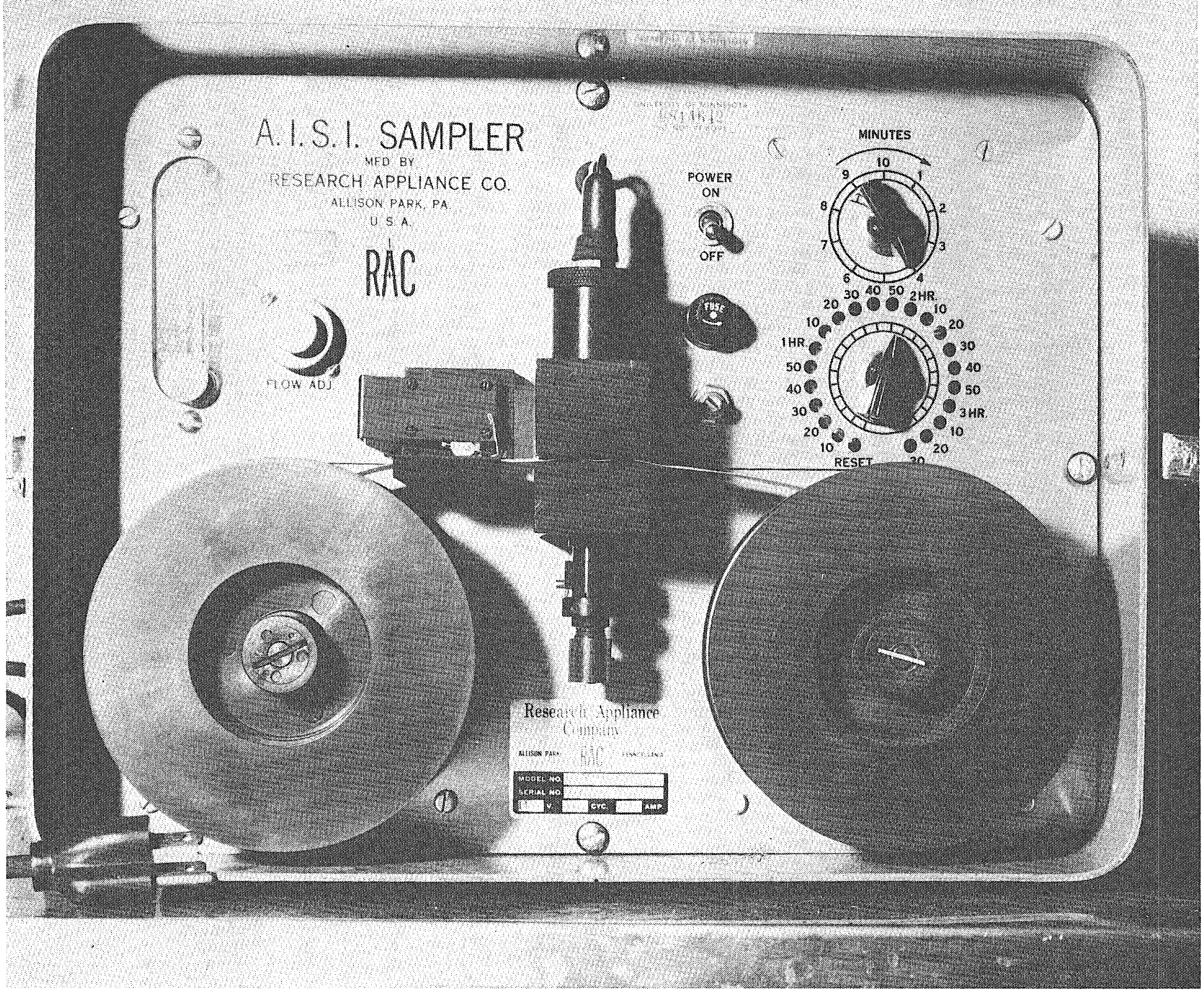
A remote oculometer developed by Honeywell's Radiation Center at Lexington, Mass., is measuring girl's eye movements as she looks at a picture. The eye-movement-tracing device may revolutionize American technology more than anything since the computer. The device projects a fine beam of infrared radiation, invisible and harmless to the eye, which is focused on the eye. Separate reflections bouncing off the retina and cornea inform an image dissector (electro-optic sensor) about all eye movements. The instrument was built to register just where the eye looks, accurately track and record its reaction movements, and do this from distances as far as three feet.

One use of the remote oculometer was shown in tests at MIT with a young girl studying French. When her eye lingered more than a fraction of a second on a word the oculometer relayed the delay to a computer which translated the world so the reading could continue almost immediately.

A diamond-trading firm in London is considering the unit for sorting rough diamonds by quality, incorporating the oculometer in a microscope. The quality is de-



termined by position and number of carbon spots and the color from blue-white to yellow-white. The same device may some day free astronauts from test wires and electrodes, which limit their movements.



Photos by BRIAN JOHNSON

Introducing . . .

The Air Pollution Lab

by JOANN WERNER

The environmental health department, on the eleventh floor of the University Hospitals, runs experiments on air and water pollution. Dr. Harold J. Paulus, advisor for the graduate students working on pollution, is head of the air pollution lab. Tests on the organic and inorganic matter in the atmosphere we breathe are done by a variety of devices. All of the testing is done on outside air, usually on that surrounding the campus. Graduate students take readings from the instruments and use this data to measure the concentration of a pollute in the air.

One such device is the atomic absorption unit or spectrophotometer used for measuring metal concentrations including lead, iron, zinc, sodium, and potassium. A filter is set up outside to collect the impurities in the air. The sample of captured impurities is put into a liquid solution and pumped into an aspirator. From there it is ignited with an acetylene flame. Light with a specific wavelength is radiated through the flame and the amount of light absorbed is measured. Different wavelengths are used to determine the concentration of each metal. The output of the spectrophotometer is a direct readout of the concentration on graph paper. This is done by sending a pre-measured concentration of the metal through the atomic absorption unit and using this as 100% concentration. Then smaller concentrations are measured relative to that.

The amount of soiling or soot in the air can be measured by a smoke spot sampler. In this device air is filtered through a tape and the soot collects on a "spot." Every two hours the tape is advanced so that a new sample may be taken. Passing light through the spots on the tape indicates the amount of soot in the air. Comparisons can then be made between any two-hour periods and the time of day when peak soiling occurs can be found.

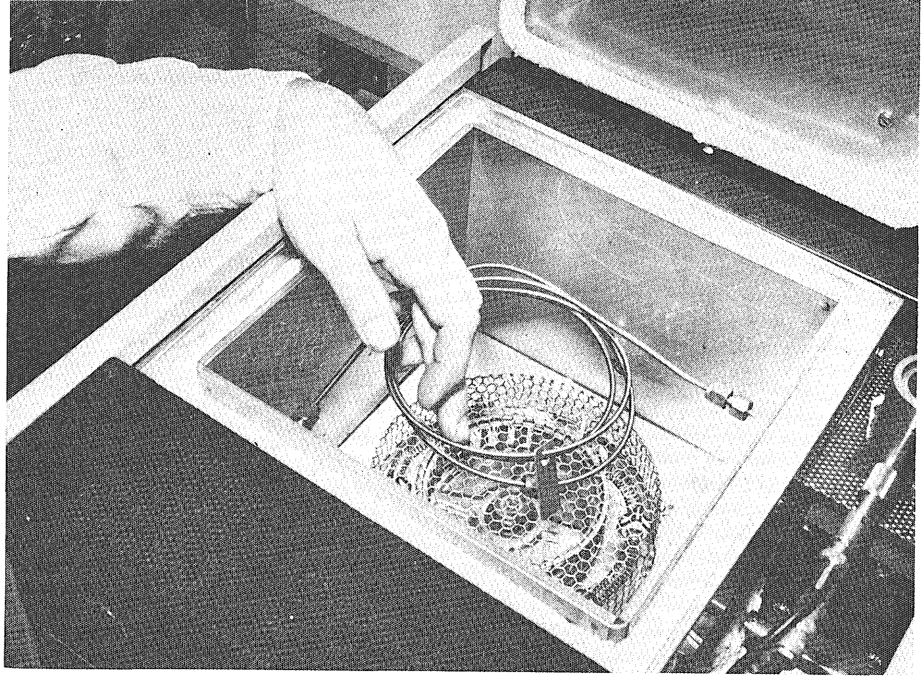
Concentrations of other organic and inorganic matter in the air are indicated by other instruments. The lab owns a gas sampler and a gas chromatograph, both of which give the concentrations of known gases in the air (or other gas mixtures where the components are known). Another device that burns the collected impurities, leaving only the inorganic components, records the amount of organic or inorganic material in the air.

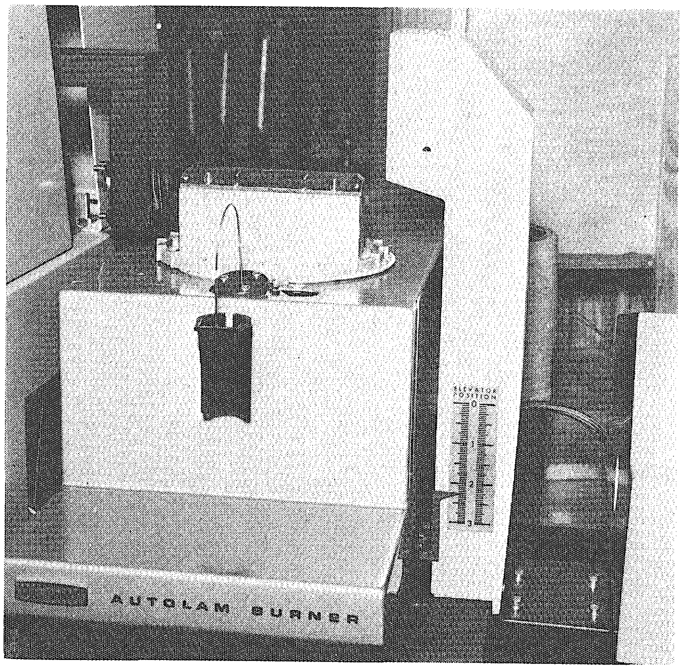
Opposite: Smoke spot sampler used to measure amount of soot.

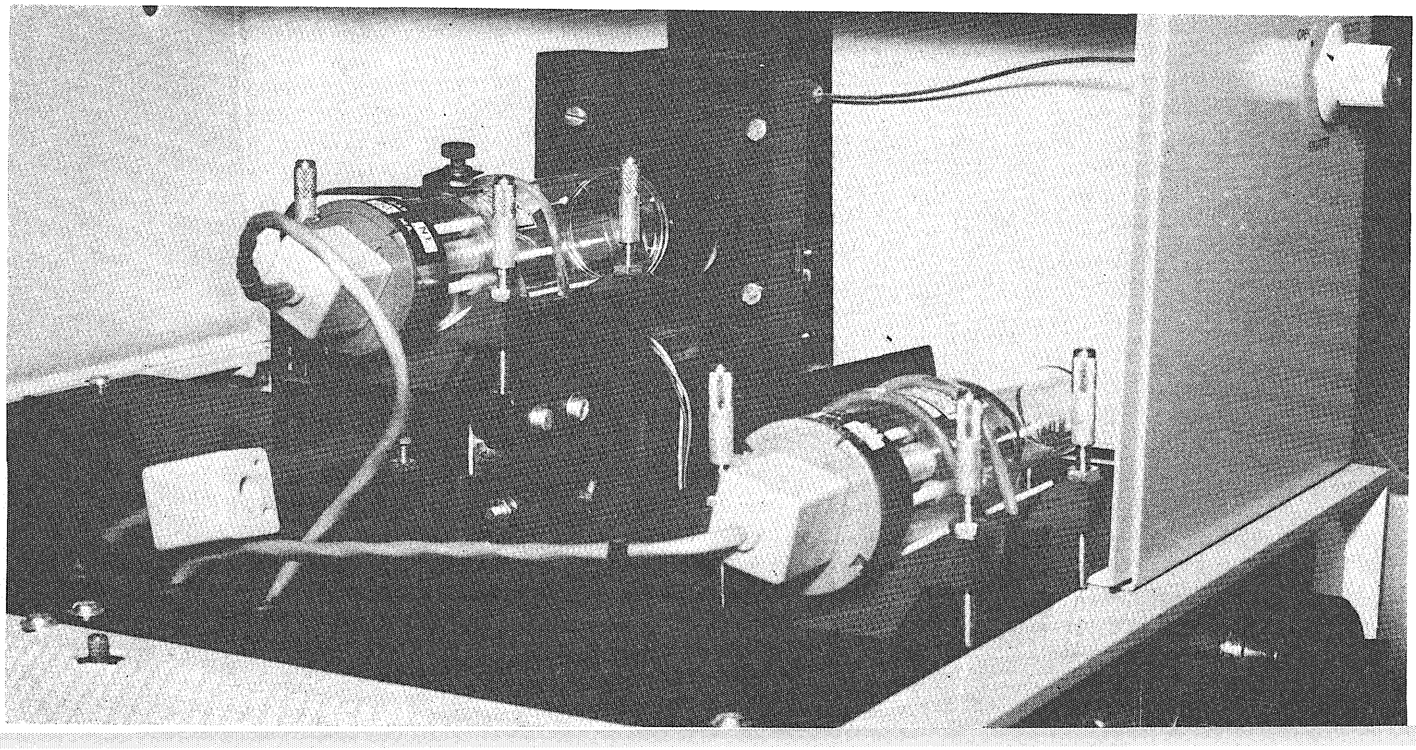
Above Right: Gas concentrations are found by gas chromatograph.

Right and Below: Metal concentrations are found by spectrophotometer. Solutions are burned in section at right.

Wave length emitter is shown below.





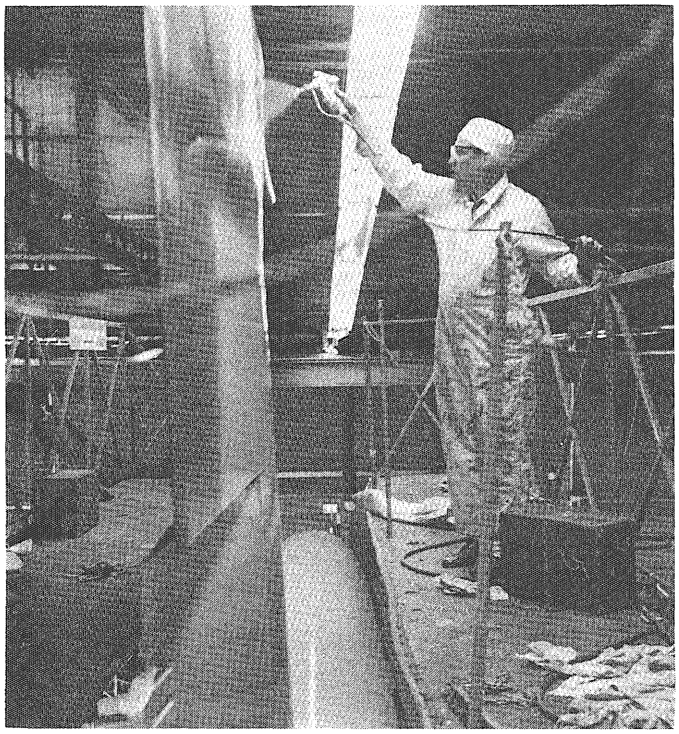


Engineers in Industry at . . .

GRACO

by KEN ROY

The distinctive "ching-chong" of Graco air-powered reciprocating pumps spraying paint, transferring fluids, pumping lubricants, and cleaning surfaces with high pressure spray can be heard around the world. And in the past few years, electric and hydraulic-powered pumps have moved into the picture, complementing the traditional line of air-powered equipment, and broadening Graco's need for engineering talent.



An application engineer prime coats the tail section of an airliner while doing development work on a spray system which would cut material waste and excessive fogging.

"What a Graco engineer does" can best be answered by telling what Graco customers need, for the Graco engineer is only a step away from the customer. Following are three examples that illustrate the Graco principle of engineering involvement with the customer:

A Great Paint, But We Can't Apply It

3M Company developed a revolutionary new paint for highway marking that dries in an amazing three seconds. But getting it from the drum and onto miles of highway in the form of uniform, precise stripes was a problem. It had to be spray-applied at 250° F, at a uniform pressure and in volumes sufficient for the marking truck to maintain good speed. In addition, spraying bursts had to synchronize with truck speed to maintain a constant stripe length.

Using standard Graco equipment, buyouts and specially-designed parts, Graco engineers went to work with 3M chemists and the truck fabricator. Various systems were tested in the lab and on the highway. Finally an equipment design was developed to meet Graco standards and the customers' needs.

Today Graco road striping systems are used by highway departments across the country, and the familiar red traffic cone is fading into the past.

Pump It, We Can't Even Spread It!

A large eastern bakery was noted for the buttery richness of its mouth-watering products. And with good reason, they purchased butter in 450 pound drums and used it liberally in their recipes.

But the butter had to be used at 45°F. to assure its freshness and it was time-consuming to scrape the cold butter from drums, weigh it, and batch it. Because the drums were so difficult to empty, there would usually be some butter remaining when the drums were thrown away.

Could Graco pump butter so cold that bread ripped when you tried to spread the butter?

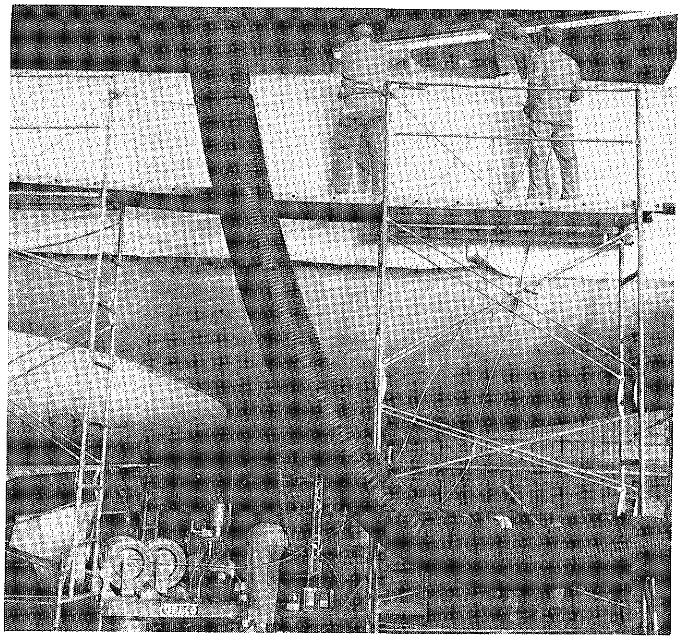
After considerable engineering research, an air-powered ram was adapted to hydraulic power and used to force the pump intake into the butter for effective priming. A drum-sized wiper plate on the ram scraped drum sides clean as the butter was pumped. By putting the entire pumping unit on a scale, it was easy to measure the exact weight of butter required for each batch.

At $35 a Gallon, We Can't Waste a Drop

Northwest Airlines solved part of their maintenance problem when they switched to an extremely durable polyurethane paint for repainting their airliners. The other half of the problem was how to apply it, and they asked Graco's help.

A chemically-cured material, the polyurethane's base and catalyst had to be precisely mixed before application. If there was a delay in application, the whole batch would cure in the pail, costing Northwest $35 a gallon. And when they started to spray, the billowing fog polluted the hanger and mechanics working on the airliner overhaul had to walk off the job.

A Graco-engineered Hydra-Cat unit solved the problem. Base and catalyst are precisely proportioned as they are pumped from individual shipping containers and are not mixed until they enter the spray hose. The only material lost is that remaining in the ⅛ in. ID spray hose when the painting is done.



Hydra-Cat airless spray unit supplies paint through 150-ft. hoses to painters on top of the fuselage. Three painters operating from the one unit can prime the entire plane in less than an hour.

Because the paint is atomized by high pressure rather than by injecting an air stream, fogging is minimal and engine overhauls are carried on only feet from the sprayed area with no problems.

And All the Others

Not every equipment installation is as involved as some of the above. Most of the needs of painting contractors, service stations, car washes, car dealers, maintenance departments, and manufacturers can be satisfied by off-the-shelf equipment. It is the responsibility of Graco *product engineers* to develop new products to fulfill these market needs and up date the old products. *Research and field test engineers* work closely with Product Engineering to improve the art. *Manufacturing engineers* plan efficient ways to produce the desired products. *Application engineers* incorporate standard equipment into complete designed systems to fit the customer's plant and then supervise installation. Where standard equipment alone won't do the job, *special products engineers* put together a package of off-the-shelf equipment, buyouts, and specially-frabricated parts that will.

A Company of Contrasts

And what type of a company is Graco?

It's old enough to have forty years of continued growth under its belt, yet young enough to have made its first public stock offering just the past month.

It's big enough to have sales and manufacturing facilities the world over, yet small enough that everyone calls the president Dave.

It's a company where the individual engineer won't be lost in the shuffle and where he stands in a position to contribute greatly to accelerated Graco growth, and thereby benefit himself.

TECHNICAL COMMISSION

Statement of Receipts and Disbursements

1968-1969 Academic Year

RECEIPTS	
Allocation from M.S.A.	$125.00
Office Furniture Donations	
I.T. Alumni Association	200.00
Minnesota Society of Professional Engineers	100.00
Return from Engineer's Day Account	100.00
Reimbursements for Telephone	26.80
Voided Check (Statute of Limitations)	6.00
Interest	2.14
TOTAL RECEIPTS	559.94
DISBURSEMENTS	
Allocation to Engineer's Day Account	$125.00
Office Furniture	290.00
Telephone	106.85
I.T. Orientation Coffee Hour	49.20
Gifts to Office Girls	18.25
Publicity	15.12
Office Supplies	4.90
Miscellaneous	1.40
Service Charges	3.35
Audit Fee	2.00
TOTAL DISBURSEMENTS	$616.47
Final Bank Balance	$ 86.38

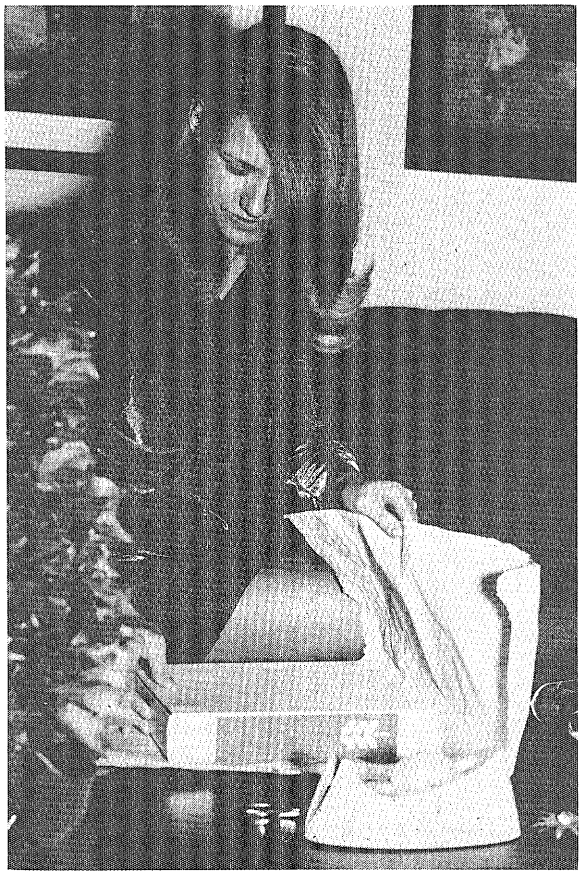
MISS

Carol Hawkinson

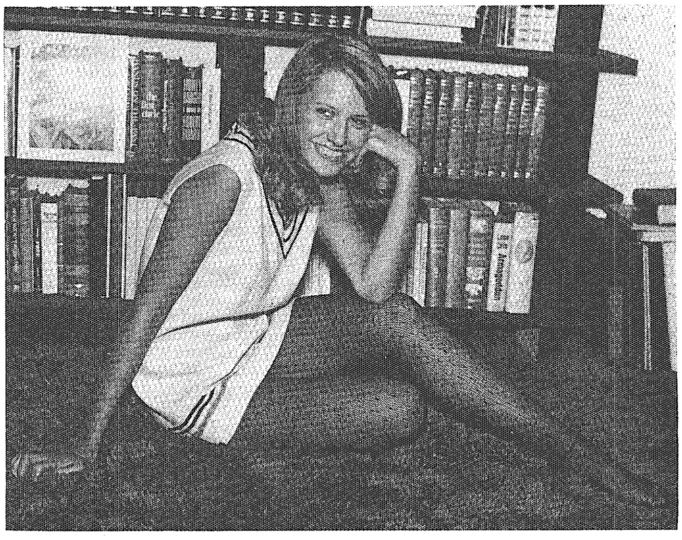
Our Christmas Carol, whose twenty-second birthday is New Year's Day, not only graces these pages, but also our regular staff. Carol applied her artistic ability to the cover of this month's magazine. She appeared in our office last spring when she transferred to the U from Macalaster College. The U of M, she claims, offers more variety in the technical aspects of art—her major.

Aiming for a career in advertising, Carol is also playing with the idea of illustrating children's books. But her main concern is with the amount of "trashy" advertising thrown at the public. Advertising, she feels, should be aesthetically pleasing, but not so weird that the message is lost.

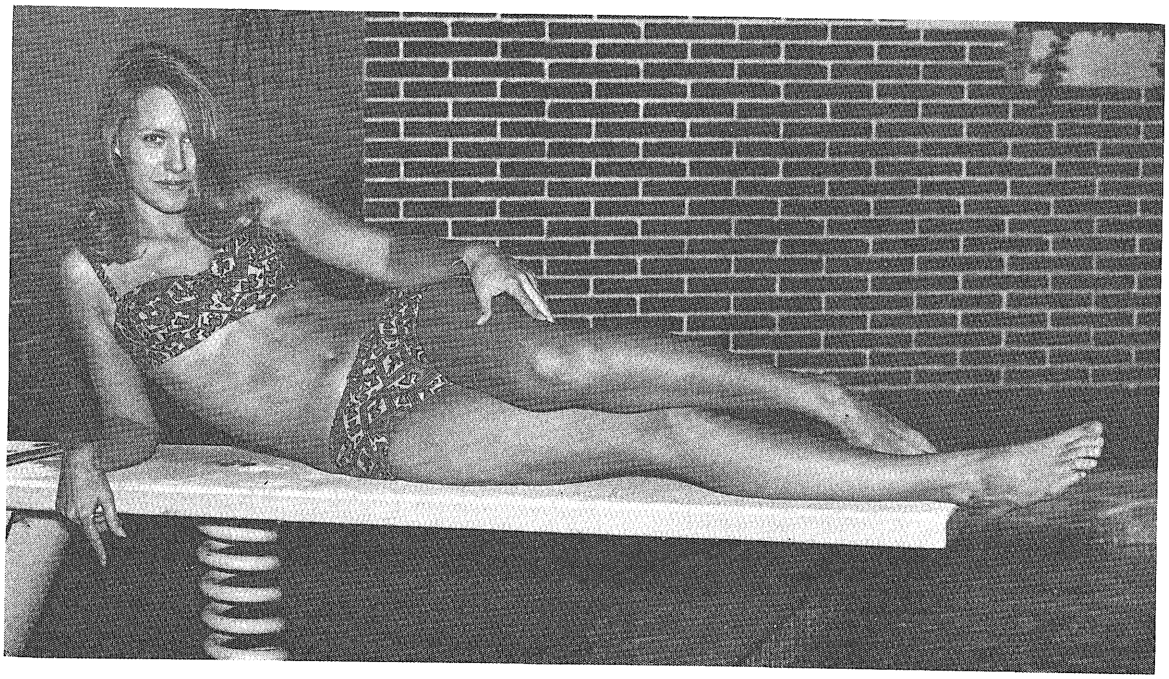
Just for fun, Carol thrives on skiing and horseback riding (though she is allergic to horses) and, of course, sketching. We consider her a real find.

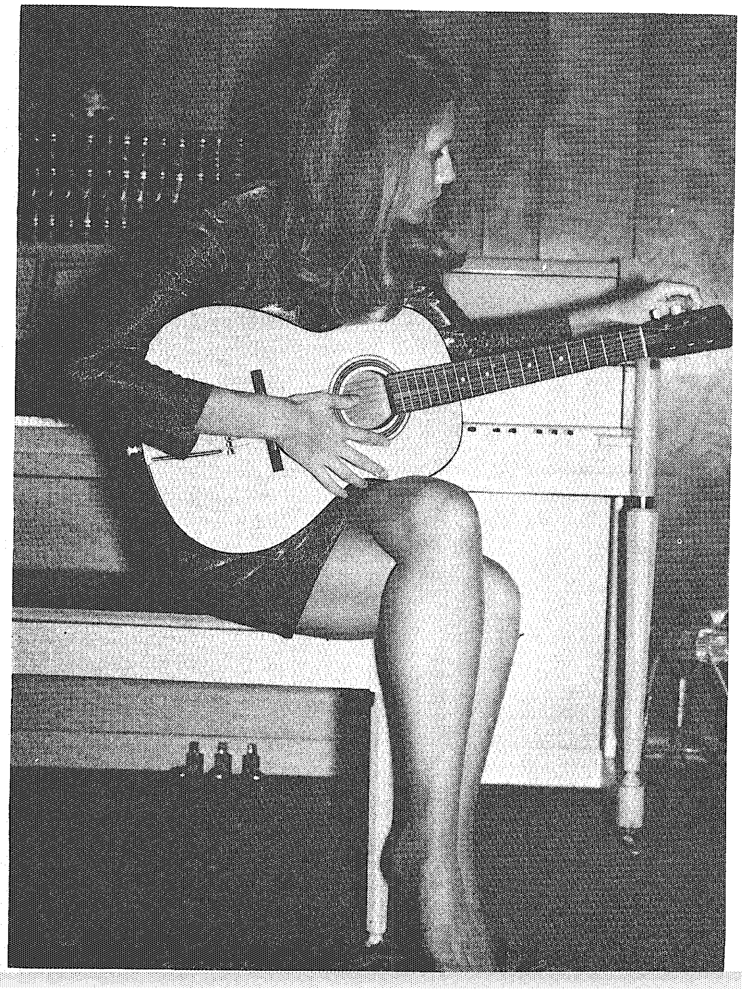


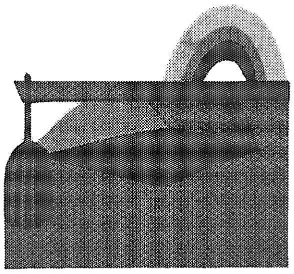
photos by MARLIN REKOW



DECEMBER







To the grad who wants more than a fat paycheck

Your science, engineering or technical degree commands more than money from Control Data. Sure we offer an attractive salary and fringe package. But more important, you'll find yourself among imaginative people in a young, aggressive, challenging environment.

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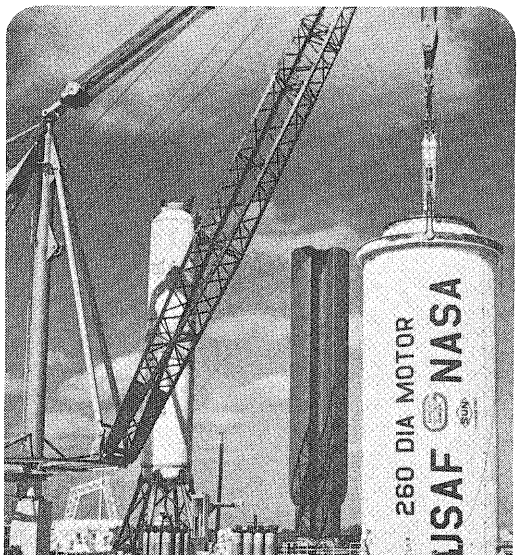

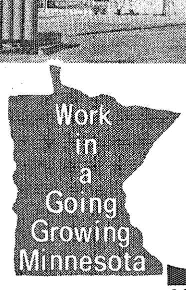

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C-81

SPLINTERS From the Log

by CLIF OLLILA

—vilitas et crudus semper eternam

An elderly banker sold out his business for several million dollars and took up farming in a mild but expensive way. One of his costlier purchases was two hundred female pigs and a prize boar.

The next time he visited New York, he told his old associates that the pigs hadn't been on his property ten days before he noticed a peculiar thing. The boar wasn't paying the slightest attention to a single one of the sows.

"Luckily for me, however," continued the banker, "a highfalutin vegetarian came along and suggested that I mix some special new vitamin pills in that boar's diet. And from the day he started eating them, he hasn't given those sows one moment's peace."

An ex-partner asked, "What's the name of those new vitamin pills?"

"I don't remember their name," confessed the banker, "but I'll tell you this. They taste like peppermint."

* * *

A young woman was distributing sample boxes for a candy company, when at the end of her day, she ran into an old friend.

"Is it true that you're getting married next month?" her friend asked.

"Yes, Jane."

"Well, what are you doing in the meantime?"

"Nothing much," she admitted. "Just giving away free samples."

* * *

At Alcatraz, a convict frantically summoned a guard, pointed at the rain pouring through the roof, and snarled, "This pen leaks."

A Russian Commissar was touring a collective farm, checking up on the year's production.

"Tell me, Comrade Farm Director, how large a crop of potatoes have you raised this year for the People's Republic?"

"Why, my dear Commissar, we have raised so many potatoes that if they were placed in one large pile they would reach up to God!"

"But, Comrade Farm Director, our scientists have proven that there is no God!"

"Yes, Commissar, and there are no potatoes either."

* * *

The judge pointed a finger at the defendant and thundered, "You admit that you drove over the victim with a truck?"

"I do, Your Honor," said the defendant.

"What defense have you to offer?" asked the Judge.

"I had no idea it was loaded!"

* * *

Did you hear about the new pill on the market that is a combination of the Birth Control Pill with LSD? It's for those who want to take a trip without the kids.

* * *

Then there was the little boy who was interrupting his busy mother. "Mommy, do you know what Daddy and the hired girl did last night while you were bowling?"

"No, son, what did they do?"

"Well, first Daddy took off all his clothes, and . . ."

"Hold it right there, Johnny. Remind me about this when Daddy comes home for supper."

Later that night: "What was that you were telling me this morning about Daddy and the hired girl?"

"Well, first Daddy took off all his clothes, and then the hired girl took off all of hers, and then they did what you and Uncle Joe did when Daddy was out hunting last month."

Did you hear about the Sioux City beauty who treats her lovers like dirt? She hides them under her bed.

* * *

A column on fishing in a Portland daily contained this Freudian slip: "For sheer tricks, fight, and stamina, give us a small-mouthed lass any time!"

* * *

Then there was the Dallas model who refused to marry a senile millionaire. She dreaded the thought of old age creeping up on her.

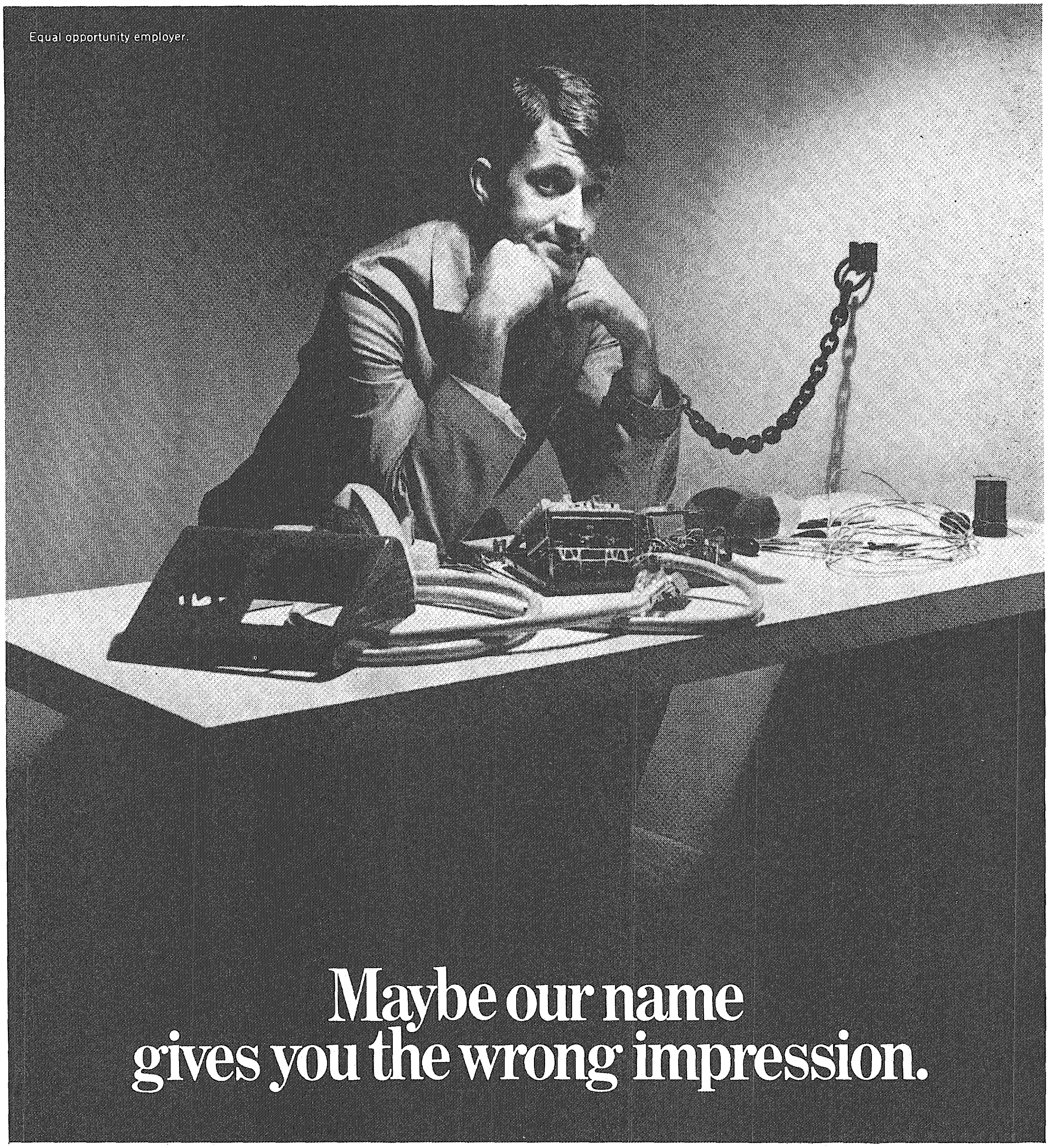
* * *

A farmer whose income depended entirely upon the size of his potato crop ran afoul of the law and was sentenced to sixty days in jail right in the planting season. His furious wife wrote to tell him: "Now you're in the clink, I suppose you expect me to dig the field and plant the potatoes. Well, I ain't going to do it."

He answered: "Don't you dare dig up that field. That's where I hid all the money and the guns."

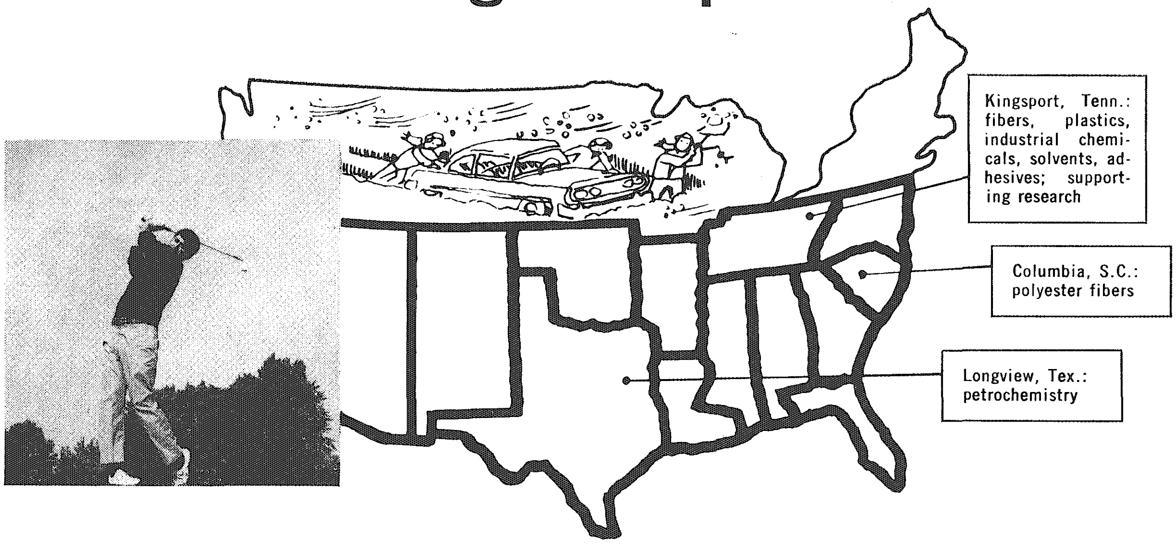
A week later she wrote again: "Somebody at that jail must be reading your mail. The cops were here and dug up the entire field. What do I do now?"

Back from the contented prisoner came his final message: "Plant the potatoes."


Equal opportunity employer.
Maybe our name
gives you the wrong impression.

Some chemical engineers prefer the North

Some chemical engineers prefer the South



Unlike our peers in industry, our major U.S. chemical manufacturing is done in only four communities. Therefore chemical engineers who join us run less risk of being suddenly uprooted from a community they like.* Subjects to occupy their thoughts between breakfast and dinnertime:

What CHEMICAL ENGINEERS do at Kodak

Photographic coatings and processes must be designed to balance perhaps seven critical diffusion and reaction steps necessary to form a color image in "chemical reactors" as thin as 1/10,000 in.

In photography and beyond, we work with surface diffusion of chemisorbed species; rheology of non-Newtonian fluids; solid-phase polymerization; high-temperature vapor-phase pyrolysis; liquid-phase air oxidations; desalting by reverse osmosis; new fiber yarn configurations. More general: design of plant and equipment from laboratory data through mathematical modeling and dynamic simulation; drying operations for fibers, plastics, and chemicals; study of transport phenomena—mass, fluid, heat; waste disposal and pollution control; on-line manufacturing problems.

*If you happen to be a very serious-minded person and consider geography an unsound basis on which to choose engineering employment, we had better not mention the whippersnapper young chemist who admitted that he had picked us over another company because he liked the sound from Rochester radio stations, but admitted this only after moving into a spot where he was responsible for the work of some 5,000 people.

For some chemical engineers this line of persuasion just wastes ink. Getting tied into one town is precisely what they wish to avoid, and the spouse, if any, may feel the same. For them we offer lively duty in marketing. This consists of working out a match between what's needed by our far-flung chemical customers and what's created by the root-loving engineers.

Drop a line about your preferences to:

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Business and Technical Personnel
Rochester, N.Y. 14650

An equal-opportunity employer

Kodak

Why would any good engineer go to work in a factory?

That's sort of like asking why a banker goes to work in a bank.

A guy goes to work where the best work is. And some of the best engineering work around today is in and around factories.

What would you say to designing the numerical control system for an automated steel mill?

Or developing quality control procedures for the world's most powerful airplane engine?

Or managing a production team responsible for delivering power generation equipment to utility customers?

And what would you say to a General Electric program that puts you right to work on jobs like those?

We figure if you're ready for our Manufacturing Management Program, you're ready for that kind of responsibility. Right from the start.

So our program packs about ten years of manufacturing experience into about three years of work. And the work will take you all around the country.

Ask GE's top management people what they thought about starting out in a factory. Many will tell you it was the best decision they could have made.

And where will you find those managers today? Running our factories, of course.

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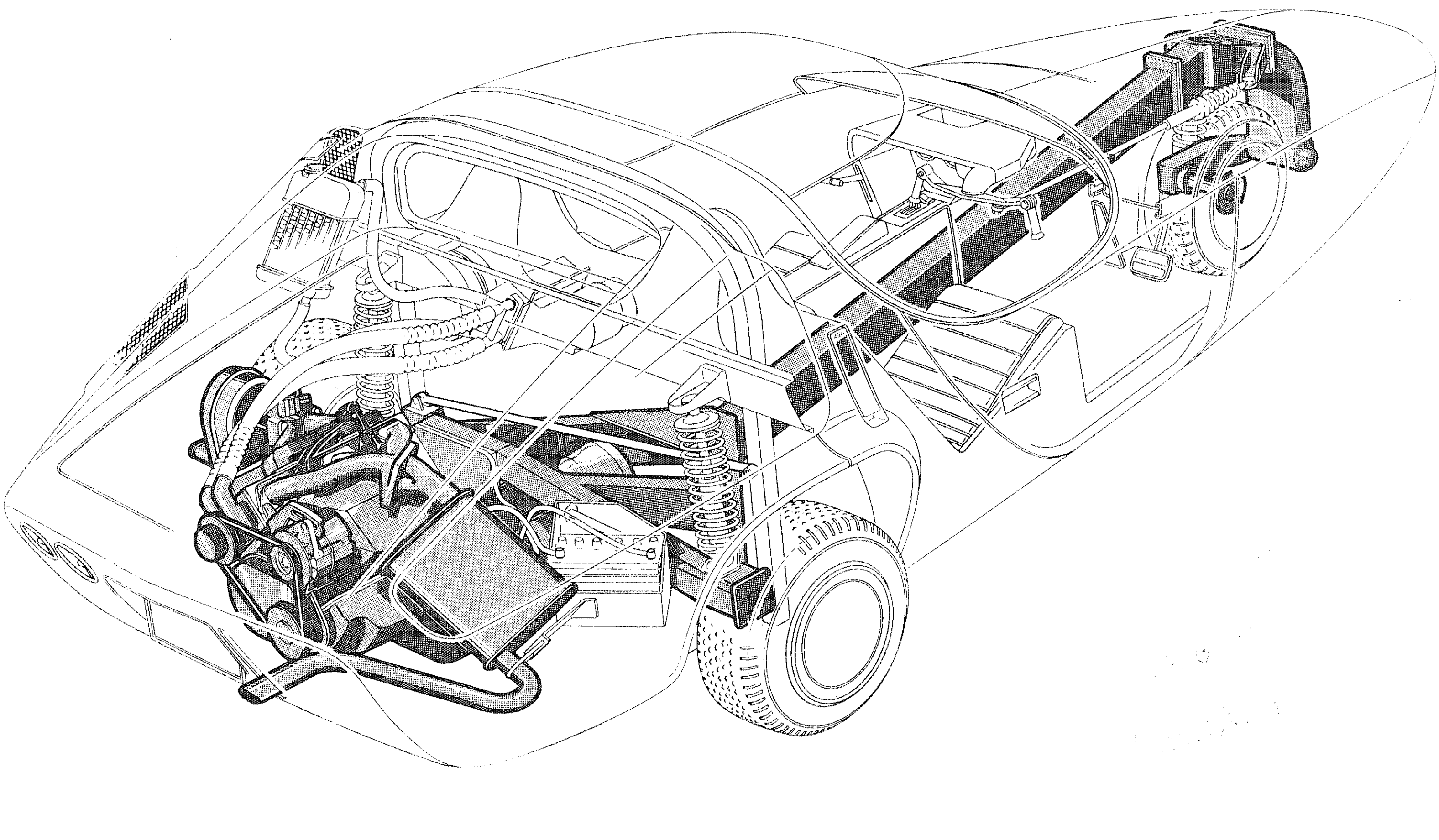
For more information about manufacturing engineering at General Electric, please write to Educational Relations and Recruiting, Room 801M, General Electric, 570 Lexington Avenue, New York, N. Y. 10022

TECHNOLOG

JANUARY, 1970

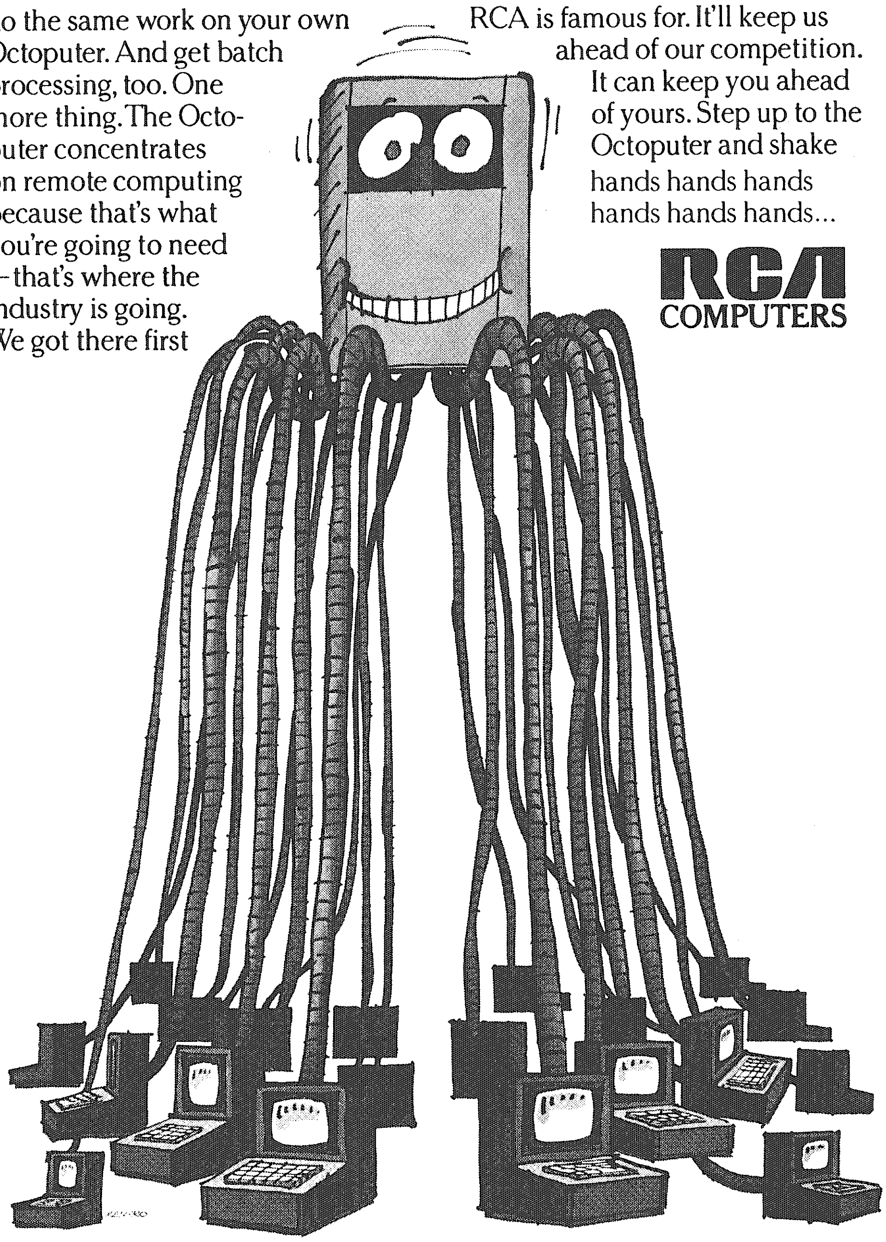


The Octoputer

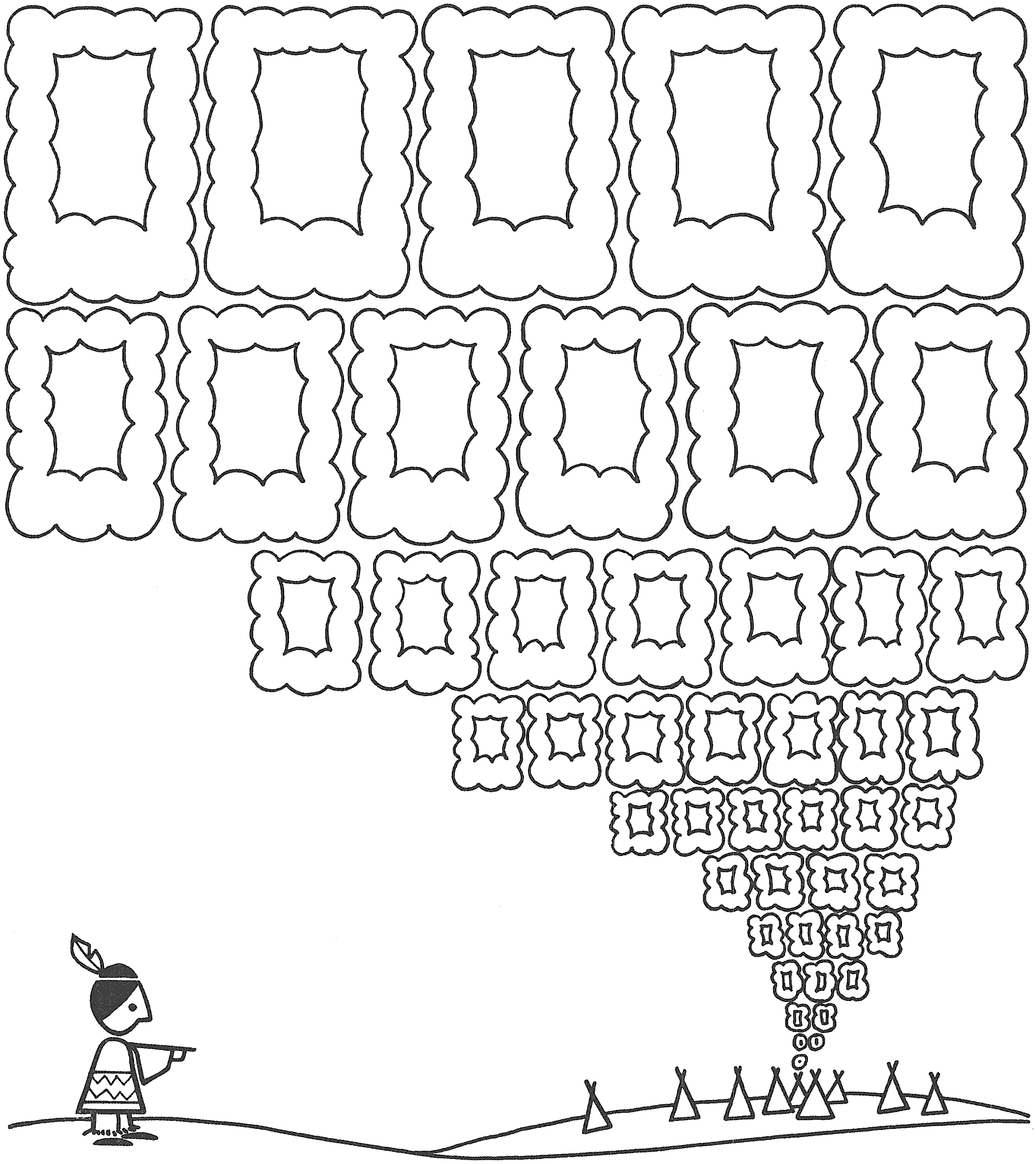
RCA's many-tentacled computer does time sharing plus regular computing. It's a generation ahead of its major competitor.

Once there were only monster computers that did big batch jobs like payrolls.
Then came the whirling dervishes of time sharing that let a lot of people work at once.
Now there's a new kind of creature that does time sharing and batch work together. So lots of people can use it—efficiently.
It's the Spectra 70/46. The Octoputer. There's nothing else quite like it on earth or under the sea.
The Octoputer's arms are long and strong. It sits in the middle of your company and reaches helping hands out in all directions. Suddenly, your company works harder. More of your people use the computer—solving more problems, finding more facts, writing more programs.
And it does your big batch jobs in its spare time.
The Octoputer does a real armload of work for a handful of change. Check the bills from your time-sharing services. See if it's not more efficient to do the same work on your own Octoputer. And get batch processing, too. One more thing. The Octoputer concentrates on remote computing because that's what you're going to need—that's where the industry is going. We got there first because communications is what RCA is famous for. It'll keep us ahead of our competition.
It can keep you ahead of yours. Step up to the Octoputer and shake hands hands hands hands hands hands...

RCA
COMPUTERS



For career information visit your College Placement Office.



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COVER: General Motors' 511 experimental gasoline commuter vehicle. Photo compliments of General Motors.

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Speaking with the Dean about • • •

Automobiles

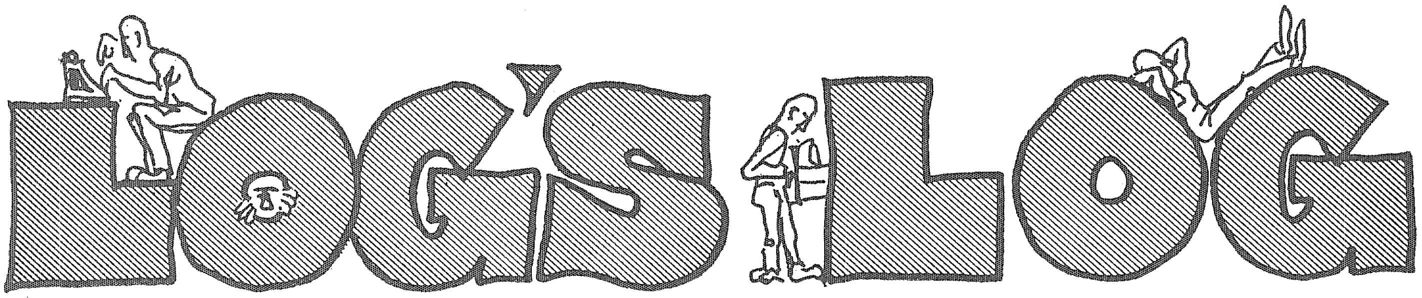
The automobile is the most characteristic and visible symbol of American civilization. It represents not only the achievements of American technological genius but also the lack of concern in America for the natural and the physical environment created for us in the form of communities (cities, towns, etc.) by our predecessors. The latest TV advertisements for the Ford stress the concept of an automobile as an escape mechanism, a metal cocoon to shield the occupant from the cares of the day, i.e., the real world. What Ford (and General Motors, Chrysler, etc.) does not stress is the price we all pay for this escapism. The destruction of the natural countryside and the physical and social fabric of our cities by ribbons of concrete is all too apparent to merit much comment here. The demise of other very adequate but less escapist forms of transportation, the railroads and public transportation systems, is attributable to the automobile.

The internal combustion engine is a major contribution to air pollution. The present concern of our public institutions with the development of less pollutant forms of propulsion is certainly a step albeit belated in the right direction. However, even if automobile manufacturers could be convinced of the desirability of an alternative to the internal combustion engine and could develop such a substitute, we would still be left with the automobile itself—a vehicle which destroys human lives as well as the environment in which we live.

Is it too late to take major measures to stop the ravagings of the automobile? Our major cities have been restructured to accommodate the automobile. It may be that the commercial structure of our communities is founded so basically on the personal mobility provided by the automobile that we can no longer find viable alternatives.

The major challenges provided by the automobile are no longer technological. At least the first steps have been initiated to solve the pollution problem. However, do we have the strength within us to reject the glittering and eventually clean symbol of our technical expertise? It was once comforting to believe that the reason that American society became so dominated by the automobile was the newness and fragility of our traditions and our institutions. Anyone who has lived or travelled recently in Europe where living patterns and institutions have been developed through many centuries will have noted that few if any values of society can withstand the automobile. It is certainly ironic that we spend hundreds of billions of our tax dollars on crusades throughout the world to provide an environment in which our political institutions might thrive. At the same time that these crusades are pitifully unsuccessful abroad and are slowly destroying these political institutions at home, the automobile is embraced by all cultures. There is some glimmer of hope: the new cities being developed in England exclude the automobile from the core—these cities are planned with the pedestrian and public modes of conveyance as dominant features—but simultaneously that masterpiece of English urban development, London, is suffering the same fate as New York, Boston, and eventually Minneapolis-St. Paul.

Warren B. Chester



The Engen-Kehrberg Report

Introduction: The arrival of a new year and a new decade is always marked as a time for scholars to make statistical summaries, bystanders to make instant generalities, and fools to make impossible promises. By way of statistics, the Engen-Kehrberg Report would like you to note that 1970 is the sixth continuous year of publication of the Log's Log **and the beginning of a second decade. The New Year also marks the second decade and the fifth anniversary of the founding of the Engen-Kehrberg Report itself (excepting of course a 3 year lapse, more or less). Our bystander's instant generality of the year now past comes jointly and spontaneously from Raquel Welch and Nancy Sinatra who confessed—that those guys always seem to be on top of everything. Humbly we must admit they're right. But now as to our impossible promise: 1970 will be the year that sees Engen-Kehrberg Report go international.**

As you probably have already guessed, Minnesota and later the United States as a whole, were soon found too small for talent as large as Dan's and Dave's. Duplication of effort both before the typewriter and in undercover assignments was soon the result. The situation seemed hopeless until Dave, browsing through an Ancient History text, learned that the world was round. It only took another week of diligent thought to decide that one of the notorious team would have to go abroad. Dan, with his knowledge of Czech mating plus his immunity to German measles, was the obvious choice. But since Dan is not the picture of virtue, it was decided to add a second member to the E-K Report International Team. David O'Brien, a campus goody-goody, was hired on as staff photographer. (In case Virtue ever wanted her picture taken with Dan.)

What all this amounts to is that the E-K Report International Team is off to Europe and their first stop, London. Meanwhile Dave, the victim of office politics, has been assigned to the Home Team. Which may not be as cherry as Europe, but as Christine Jorgenson once said, "Once you've been a broad, you don't ever want to go back."

Four on the Floor

That (the title) has a lot of meanings. Like, it could be a double date. Or, a dropped contact lens. But to most of us it means the automobile. The Big Three. That used to be wine, women and song. Now it's: racing stripes, 8 mpg and 36 months to pay.

But lest we forget the humble beginnings of the modern automobile industry, Detroit is around to remind us. According to official industry propaganda, it all began when Henry Ford completed production of his first Model A. You remember Henry, he was George and Martha Ford's unexpected idea. But then you can't correct for three minutes of whoopee with nine months of labor.

Returning to the "Greatest Story Ever Told" (in countless small offices of countless automobile dealers), we shall take a little journalistic license and skip right up to the firing of Seamon "Bunkie" Knutson by the present Mr. Ford.

To refresh your memories, here's how the plot developed. "Bunkie" Knutson was a GM vice-president. So was Ed Cole. Then, the presidency of GM found itself in need. Ah ha, thought Bunkie. Oh no, thought the GM Board of Directors. All hail President Cole. "They can't do this to me," said Bunkie. But they did. Enter wily Mr. Ford, also in need of a president. "Would Mr. Knutson like to come and work for Mr. Ford's concern?" "Where do I sign?" Bunkie demured.

And so the months passed and Mr. Ford's concern grew and grew but unfortunately not his profit margin. But Bunkie knew Henry wouldn't do that to him. And so it came to pass that the strains of "Goodby, Bunkie, Good-by" were heard at FoMoCo. And seeking to avert his first gold record, Bunkie moved quickly to become the president of the American Can Company. He just had been, don't you see.

No Contest

We are at this time announcing a Mouth-to-Mouth Resuscitation Rally. Originally we were going to do a little private recruiting at some of the singles bars but then Washington heard about our plan. Now you say, why would the government be interested in the social activities of the Engen-Kehrberg Report? Well since you ask, it seems that college students have been a little annoying recently and the Administration would like to divert them from their political activism. Or as Sec. Laird puts it: "We've got to get those f - - - - - - kids back to swallowing goldfish!"

And so desiring to do the patriotic thing and our thing besides, we agreed to widen the scope of the Rally. And then too, the government said something about undercover activities in the hotbeds of radical students. Yeah!

Now the rules require that you have a mouth. It is also required that you be able to compete without becoming emotionally involved. We are also banning French majors. But if you are disqualified by the last two regulations, the E-K Report is amenable to a personal appeal in our bachelor pads (or our smoking jackets. Or our jammies). And see if that doesn't take your mind off the war.

But seriously, we are announcing the First Annual Log's Log Limerick Contest. You all know, like poetry (aabba). The E-K Report has talked to the business side and they have turned loose real American dollars to award to the winners (who will also get their names and limericks printed in the Log's Log). We will pay $10 to the first place winner, $5 for second place and $5 for the most unusual entry. We request that all the Limericks be on some IT connected subject (like science, math, slide rules, ME's, physics' labs, thermocouples, etc.). All entries, needless to say, must be original, clean enough to print and become the property of the *Technolog* (and our copy-right). And if nobody comes up with any good ones, we'll give the money to Hubert. So write! Entries must be received by February 3 (at *Technolog* office, ME 2). Two examples of limericks are included below (and note the rhyme scheme):

Once when apathy was meek
Activities, the IT student did seek
Then along came E-Day
But an egg it did lay
And now there is an IT, weak.

OR

There once was an EE named Ron
Whose brain went off and then on
He suspected a short
And to doctors did resort
Who merely confirmed his opinion.

(Ed Note: And let's hope you do better than that.)

Born Free

As you have no doubt all gathered by now, both Dan and Dave are single. This is unbearable, at least to our (married) friends. They seem apalled that two such winners such as E and K are still making their way (and very well, thank you) without the love and companionship of a wife. Well this constant, subtle, and not so subtle pressure has led to this commentary in which we shall play the devil's advocate. Not really out of any deep conviction but more with a view toward balancing the ledger. Below follows a dialog between them (married) and us.

Them: Marriage is a great institution.

Us: Yeah, but then so is Sing Sing.

Them: There's nothing like a good woman.

Us: Unless it's a bad woman.

Them: Woman is God's gift to man.

Us: The way we heard it, she was a rib transplant. And we all know how successful transplants have been.

Them: You never know what true happiness is until you're married.

Us: And then it's too late.

Them: Are you prepared for the loneliness of old age?

Us: Haven't you ever heard of dirty old men?

Them: Who's going to iron your shirts?

Us: Haven't heard of permanent press either, huh?

Them: Well, what about, well, you know?

Us: The spice of life, baby, the spice. Parsley, sage, rosemary—ah Rosemary, if you've got the thyme . . .

Them: You two are, are, are . . .

Us: The word is free.

Vicious Rumors

What is life? It is many things happy and sad but mostly it is expectation. And so responding to this very stirring, the E-K Report has put its ear to the wall, eye to the keyhole, and nose to the grindstone. All of which has resulted in an aching back but also in the First Annual Log's Log Flour and Vicious Rumor Mill. The grist and the gist are as follows:

VR—Richard Nixon can't stand pat.
VR—Raquel Welch has two big things going for her: Dan and Dave.
VR—George Wallace buys Klan brother, hood button.
VR—Ed Sullivan has no armpits.
VR—Jack Nicklaus plays around.
VR—Rosemary's baby is having a devil of a time.
VR—Fred Cox is having trouble kicking the habit.
VR—The Statue of Liberty is carrying a torch for the Jolly Green Giant.
VR—Isaac Newton is living in the past.
VR—U of M medical department needs psychiatric help.
VR—Herb Alpert blows his own horn.
VR—Joseph Stalin is in a communist plot.
VR—Mao Tse-Tung is yellow.
VR—Brigitte Bardot does not French Canadians.
VR—Spiro Agnew is not potty trained.
VR—Two members of the U of M zoology department are bird brains. (And we're suspicious of two others in the physics department).

But the most vicious roomer of all (according to Ma Brown, house mother at Theta Tau) was Mike Hunt, pledge, who put termites on all the slipsticks, just before final week.

Civil Liberties

Just to show all you civil types that the E-K Report is way ahead of everyone in your field, we are unveiling our revolutionary new highway construction plan. Under the current system concrete highways are providing the platform for automobiles rolling on rubber tires. We believe this basic concept to be in error and fostering the gigantic mess we have today.

So throwing out logic, reason, and *Robert's Rules of Order*, the E-K Report has come up with the following novel solution. We feel there should be a changeover to rubber highways and concrete tires. The advantages of this system are immediately obvious, no more icy concrete, no more blowouts at 70 mph, no more costly

(Continued page 12)

Ever Hear a Mosquito Cough?

PHOTO: ERNEST BRAUN

Thanks to more effective bug sprays, mosquitoes all over the United States are coughing their last—in public places, fraternity houses, swamp land.

Ten thousand other pesky and destructive pests are also being wiped out.

And the thing that's knocking them dead is a chemical agent derived from the fragile Pyrethrum daisy found on the equatorial plateaus of Ecuador and Africa.

The extracts are pyrethrins. With these we make *Pyrenone*®, now found in nearly every major brand of aerosol. *Pyrenone* is one of more than 300 chemicals manufactured by FMC Corporation.

Thanks to *Pyrenone,* you can give your room a spritz at exam time. And put all the mosquitoes out of their misery, without putting you out of yours.

You might gather from all this that we're a chemical company.

Well, yes and no.

As one of the nation's top 70 corporations, we're one of the largest manufacturers of chemicals in the U.S.

But we also make synthetic fibers, power shovels, harvesting machines, marine vessels, food processing equipment, lawnmowers, fire engines . . . altogether over 10,000 different products vital to our way of life.

We have a stake in the betterment and well-being of people the world over. If that's your goal, too, we have something in common.

For our descriptive brochure "Careers with FMC," write to FMC Corporation, Box 760, San Jose, California 95106. We are an equal opportunity employer.

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Putting ideas to work in Machinery, Chemicals, Defense, Fibers & Films

replacement of tires every 20,000 miles, and no danger of juvenile delinquents slashing your tires.

Now with any new idea there are bound to be skeptics; jealous backbiters who spurn what they cannot understand. All we are going to say to these poor souls is that the E-K Report has guided its surfboard onto the wave of the future and is hanging five.

Whistle While You Work

Over the years many journalists have made intimate and personal case studies of the criminal mind. One recalls reporters who investigated and/or championed the causes of criminals like Carol Chessman, the Boston Strangler, the kissing bandit, the Birdman of Alcatraz, etc. The most recent example close to home has two years ago when the *Ivory Tower* suddenly began a series on the midnight jaywalker. Which says a lot about their league. As for the Log's Log, the E-K Report has over the last three years gained the confidence of one of Minnesota's most unwanted men. That's right, *un*wanted. Loneliness is responsible for the social abberation we all have come to know as the Whistling Rapist.

The Whistling Rapist is now semi-retired and living in Columbia Heights. He is currently working on his memoirs and has kindly permitted the E-K Report to print some of his comments and feelings.

Well, it's a fascinating story. He began his fabled career full of the idealism of youth and seeking to remake the world, piece by piece. Then the Great Depression hit. The bottom fell out, especially for W. R. Nobody felt like taking walks in the park anymore. But somehow, W. R. survived. He doesn't like to talk much about these "dark days." In the only flashback to this era we can recall, and it was more a brag, W. R. told of getting a job with the W.P.A., laying side walks, especially through dark corners of the park. "A concrete investment in the future," puns W. R.

Well soon the dark clouds of the Second Great War hung over Europe and almost as soon American men were on their way "over there." And a lot of their girl friends were taking long walks in the park, on WPA sidewalks.

And it was during WW II that W. R. added whistling to his repertoire. "It all happened by accident," W. R. said. Which sounds like a line out of a paternity suit but W. R. really said it. It seems W. R. was on his lunch hour and was taking a stroll in the park. (Blows your mind, doesn't it!) As he was walking, he was whistling a popular song of the period, "I Can't Give You Anything But Love." And as he passed a pretty riveter, also on her lunch hour, she spoke up and said, "That's fine with me, big boy."

Well the horizons became suddenly very bright and for the duration of the war they remained so. But all good things must come to an end and so did WW II. But W. R. had faith in the American system and he kept that faith as U. S. foreign policy entangled us in Korea and in the present war in Vietnam. And those times saw many a dainty foot on WPA sidewalks.

But there came a day when the scratches and the hickeys were too high a price to pay. And that was the day W. R. retired. Or as he himself puts it, "When you can't run away from the ugly ones, and you don't catch the pretty ones but only rarely, and when you do catch them, all the blood is in your head . . ."

Official Daily Bull

As sort of a helpful hint we thought we'd let you in on a little bit of Alaskan folklore. And since winter in Minnesota is the closest thing to Alaska any of us will ever (care to) see, the connection is obvious. And as far as we can ESP, the E-K Report is unique in relating the first thing an Eskimo mother tells her child: "Don't eat the yellow snow."

There have been several complaints from a few IT co-eds about the treatment they have been receiving at the hands of the E-K Report. (But if you wouldn't struggle girls!) Well, never let it be said about the E-K Report. But just to be cotten candy, the midway, and the hippodrome (i.e. fair), we offered any IT co-ed who cared to respond, space in the Log's Log. As of this date, nothing. But then, we all know how difficult it is to get an IT co-ed to respond.

Which leads, if you don't really think about it, to the Log's Log Mind Masher of the Month: "All right Stokely, if black is beautiful, just who the H. (Rap Brown) is Moms Mabley?"

Jan. 16-31

16—French Dressing Day (Does this mean Brigitte too?)
19—1372—Minnehaha slips on ice and Falls Day.
22—95% of all streetwalkers are litterbugs. Help keep Minneapolis clean Day (and Night).
27—Join the Otis Co. Get the shaft Day.
31—Molasses salesmen report slow month.

Feb. 1-15

1—National Restaurant Month. Eat out.
1—National Toilet Paper Week. Wipe out.
4—Cleveland Indians sign real Indian to play the infield. Him not make out at first. Do better at home.
9—Ill Eagle Day. Drop a little on the campus cops.
14—Valentine's Day. Don't forget to give your draft board a card. They gave one (A) to you.
15—Warm Body Day. IT co-eds need not apply.

Conclusion: There's nothing that ends a Brotherhood Week wife-swapping party like good old American race prejudice. And it does a fairly decent job at closing down the Log's Log. But since the LBJ Ranch and its upper forty-nine is not the only country to practice discrimination, we thought to examine Chinese racial attitutes to get, if excused for our occidental syntax, a different slant. The Chinese explain it like this. When God was making man he did it by cooking him in a large pot. He pulled one out and the man was white. God looked at him and said, "Not done enough." God waited awhile and then pulled another man from the pot. This man was black. And God said, "Done too much." So God pulled yet another man from the pot and this time the man's skin was yellow. And God said, "Ah, done just right!" Cy chen.

Iceland on the Rocks

——A Log's Log Action Insert——

Introduction: We all remember, no doubt, the old saw about "getting there is half the fun." This special action insert is about the E-K Report International Team and their "half of the fun." Or as Dave put it, "I may not be going to Europe, but then neither is Dan's girl friend. And she's always good for at least half the fun."

ICELAND . . . Population: 200,000. Area: 39,800 sq. miles. Government: Democracy. State religion: Lutheran. National Bird: Blowfish. National Anthem: Sunshine Superman. National Product: Fish and fishy goods. National Smell: Fish. Mean Average Temperature: Winter—minus 45. Summer—minus 45. Natural Resources: Ash, Pebbles, Stones, Boulders, and similar such by-products of rocks.

In an effort to save the IT student's money, the business staff reached the decision that we, the International Team, should fly to Europe utilizing the cheap, off-season rates of Loftleidir Icelandic Airlines. Through gross ignorance and misinformation this decision immediately met with our approval. We left and enjoyed a non-eventful flight across the Atlantic. In fact, the trouble didn't really begin until Loftleidir's new Sopwith Camel landed in Iceland for refueling. Our story begins here, in somewhat censored form.

Landing in Reykjavik, Iceland, the capital and only airport, we were immediately impressed with the fact that everybody spoke a funny language. After Kehrberg unimpressed the natives with his brilliant command of Icelandic baby talk, our University training proved invaluable. We recalled, under this intense pressure, that mathematics is a universal language—but only among engineers. Undaunted, we sought out an Icelandic engineer who might be loitering around the air terminal probably out of work—this too is universal. Our intuition paid off. With the language of mathematics and our engineer, we deciphered our tickets. The next plane to London was scheduled for December 28—only, said the engineer, a four month layover. As we now well know, Loftleidir is just a small, struggling airline but they run a prosperous boarding house and diner in Reykjavik. Somehow, we suspected the *Log* knew this all along.

Full realization of the situation struck us shortly. We were marooned in Iceland for the first four months of their 11½ months of winter. We did the only practical thing two grown men and college graduates could do—we cried. Next we checked into the hotel and set upon learning enough of the language and customs to get us by. Kronur is the Icelandic monetary unit. Our pooled $3.27 got us 200 Kronur. Then we learned the most essential terms for any international traveler stopping in a strange country for a time greater than 10 minutes: We learned that Konur means Women's, Kralar means Men's and W. C. is a place specially adapted to handle both. Now we were set.

Morning came early. At dawn in fact. We spent half our kronur on two Icelandic hot dogs made of sheep and whale meat. Then, unwilling to believe the whole circumstance was part of an evil plot, we set about doing our story for the E-K Report. It was on this second day that O'Brien captured some photographs which, unfortunately, the editor censored and it was this day that Kehrberg researched the facts presented herein. Quite a profitable day, huh?

We were taken everywhere as ugly Americans, even though they didn't find out we were Americans until after we spoke. Yet we made friends. Kehrberg had a long talk with a statue of Leif Erickson while O'Brien chased a stray cat. Reykjavik, as a city, possesses many exciting places of interest. There is the 100% efficient hospital composed of two wards: maternity and gerontology. There is an outdoor swimming pool and an indoor ice skating rink. And of course we couldn't miss the Ford dealer and the Coca-Cola bottling plant.

No report on Iceland would be complete without mention of their women. My. They are of Italian construction with one minor deviation: their Scandinavian Ancestry. They have blond hair, blue eyes, and pleasant Viking warrior dispositions.

Our last stop of the day was at an English bookstore. Logical thought and reasoned deductions had convinced us that we were out of coin. Our only resort—live the next 4 months off the land. Our visit to the bookstore yielded just the outdoor manual we needed. Raquel Welch's new book: "Nature's Ways." Armed with this reference and poverty's determination, we moved to the country. A two block hike.

"Nature's Ways" turned out to be no help at all. Nothing in there about how to build an igloo, and the 69 ways to prepare delicacies, outlined an igloo, and the 69 on Gastronomy, were useless because we were unable to obtain the major ingredient.

Alone, broke, cold, disheartened, we saw the approach of the long Icelandic winter night. We read ourselves to sleep with Raquel's book—possible only if it is 45 below outside—and set the alarm for December 28.

Log Line

Pollution In Retrospect

A large portion of the December issue of **Technolog** was devoted to a problem which is increasing proportionally with our rapidly growing Technology: pollution.

For many of you who were concerned enough to read these articles and wish to learn more of the impact of technology on environment and society, a short bibliography of related books, magazines, and articles appear below.

The bibliography is courtesy of J. E. Anderson, Associate Professor, Mechanical Engineering.

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Bruce D. Nelson

E-Day—1970

Engineers! Here's your chance to get even with that favorite professor, the administration, or anyone else you may have a grudge against. This year we're going to liven up that dull E-Day picnic by allowing any groups of students or faculty to put on a skit on the rear steps on Main Engineering. You can slam anyone or anything! No holds barred, but try to keep it clean, please!

If it's beginning to sound like IT Week this year is going to be a lot more fun than it has been in the past, you're right! This is just one of the new goodies we're planning, but we need committee men now to make the arrangements. Sign up within the next two weeks and get in on all the fun, and earn all-par points for your organization too.

If you have any questions about the skits or committee positions, stop in E-114 or contact the following chairmen:

E-Day Office: 114 Main Engineering
373-7729

General Chairman: Bill Lange
331-5701

Publicity: Jim DeBennedet
331-7931

Assistant: Joe Stusnick
331-7969

Seminars: Paul Olson
331-5951

Assistant: Bruce Nelson
331-7662

Parade and Knighting: Warren White
822-1044

Queens: Don Marpe
825-7793

Buttons and Tickets: Dave Harmann
373-7038

Picnic: Pete Hovde, Bill Monsen
331-7969

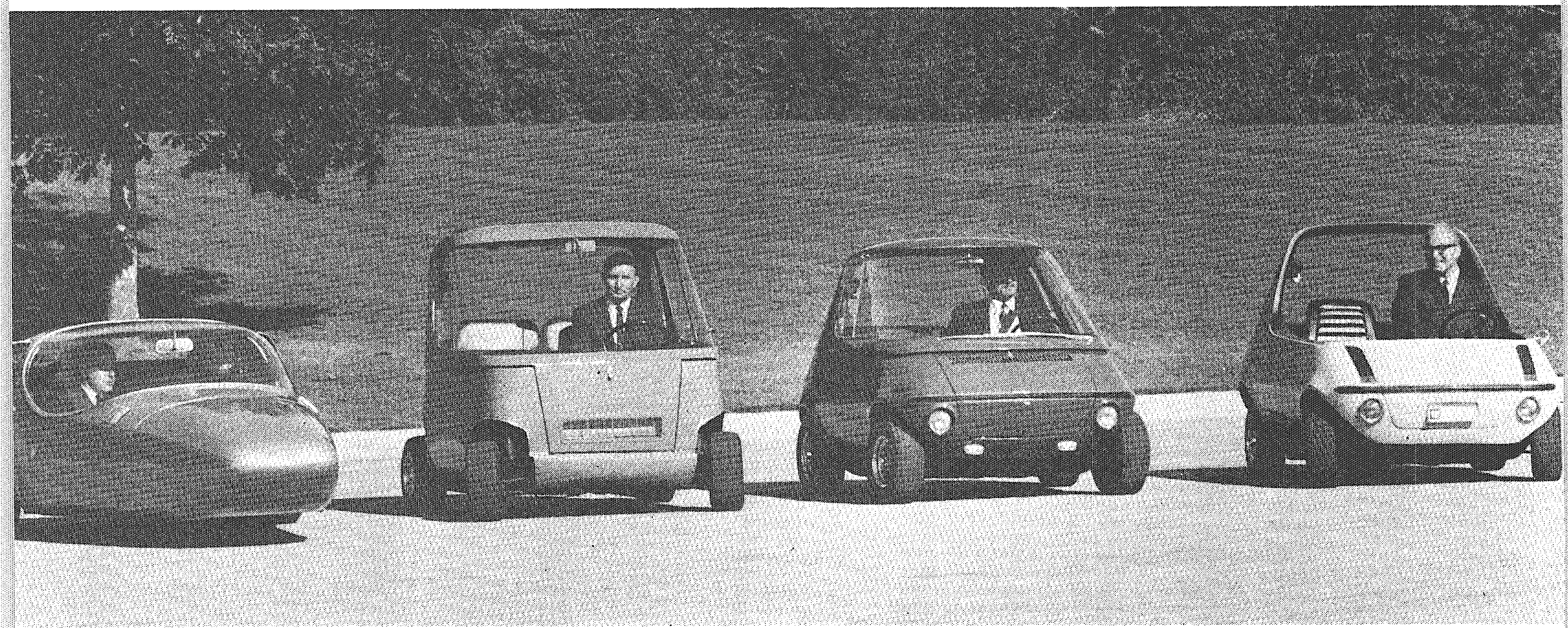
Tournaments: Doug Cozad
331-5951

Gale Nordling
331-7931

Dance: Pat Hines
376-6101

Assistant: Chris Christenson
331-7931

Road Rally: LeRoy Nyhus
822-8783



EXPERIMENTAL CARS from General Motors

by MARLIN REKOW

In May 1969, General Motors presented a comprehensive display and demonstration of various possible forms of automotive power. Included in that display were special vehicles utilizing steam, electric, and hybrid systems. Other vehicles had experimental piston engines with reduced air pollutant characteristics. None of these cars are yet ready for production; considerable additional development is needed first. However, they are a start toward the solution of the perplexing problems of too many, too dirty automobiles on the roads today.

Steam Cars

The steam-powered vehicles being tested by General Motors include the SE-101 which is a modified 1969 Pontiac Grand Prix and the SE-124 which is a 1969 Chevelle sedan with a specially built power plant.

The SE-101 is the first steam car with complete power accessories, including air conditioning. It was designed to evaluate a vapor cycle engine in a passenger car with a reasonable degree of reliability, performance, economy, and passenger comfort.

The entire power plant—including the expander, combustion chamber, steam generator, and condenser—is housed under the hood. Starting functions are automatic and the SE-101 can be operated easily by a layman after a brief instruction period. To operate the vehicle, the driver turns the key, waits 30 to 45 seconds for adequate steam pressure, then drives away.

While the drive of the SE-101 is waiting for a full head of steam, several automatic operations occur. First, an electric pump fills the boiler with water. When the proper level is reached, a sensor energizes the electric motor which powers the combustion blower and fuel pump only during startup. Fuel is sprayed into the combustion chamber where it is ignited by a spark plug. When the steam generator reaches operating temperature and pressure, a conventional automobile starter engages the expander; steam is introduced and it accelerates to idle. Further acceleration is accomplished by the foot pedal in the usual way; the pedal operates the throttle valve which controls the amount of steam admitted to the expander.

The four-cylinder expander is similar to an in-line internal combustion engine. It has a 101-cubic inch displacement and develops about 160 horsepower maximum. Steam enters through poppet valves at the top of each cylinder, forces the piston downward, then exits through cylinder ports at the bottom and is piped to the condenser.

A continuous spray of atomized fuel is supplied to the two turbinetype combustion chambers where it is mixed with air supplied by the engine-driven blower and the mixture is ignited by a spark plug. Blower and fuel pump output vary directly with expander rpm. Preliminary tests of the combustion system indicate low concentrations of hydrocarbons, carbon monoxide, and oxides of nitrogen in the exhaust products.

The steam generator consists of several sets of small steel and stainless steel tubes (total tube length is about 430 feet) arranged in a staggered array. This increases the turbulence of the combustion gases flowing over the tubes. Wherever possible, the tubes are finned to increase the heat transfer from the gases. These factors, plus the low water inventory (a few pints), facilitate rapid startup from a cold boiler to a full head of steam—800 psi and 700 degrees (F).

The condenser is a plate-fin construction which is externally similar to a standard car radiator. However, it is about three times as large (22 x 40 x 5 inches) and its special brazed aluminum construction, with extended heat-transfer surfaces on both the inside and outside of the tubes, will withstand both vacuum and pressure. It has sufficient capacity to handle all of the steam required for normal highway operation. Extended operation at higher loads results in some loss of water in the form of steam.

An experimental toric transmission developed by General Motors, the 250-TT, is used with the SE-101. Its advantages include automatic transmission operation with out step shifts and operation of all accessories such as air conditioning and power steering when the vehicle is stationary. (Without a transmission, an additional power source would be required to drive the accessories.) In addition, the toric transmission provides the wide range of torque required to cover all operating conditions.

As in the SE-101, the driver of the Besler-powered steam car SE-124 turns the key, then waits for about 30 seconds for a full head of steam. Under the hood, an electric pump fills the boiler. A sensor energizes the combustion blower and the burner is ignited by a spark plug. When the boiler reaches operating temperature, and pressure, steam is parted to the expander and it begins to idle. The drive now operates the car; the amount of steam introduced to the expander is controlled by the accelerator pedal.

The reciprocating V-2 expander of the SE-124 has a displacement of 124 cubic inches and develops 50 horsepower maximum. Steam from the boiler is expanded twice to increase efficiency; it is first ported to a smaller high pressure cylinder (2.5-inch bore), then to a low pressure cylinder (4.25-inch bore) for further expansion. The expander is double acting—steam is ported alternately to the top and bottom of each cylinder.

The steam generator consists of a continuous steel and stainless steel tube (total length is about 275 feet) arranged in spiral pancake patterns stacked atop one another. Hot gas from the combustion chamber flows over the coils. Low water inventory (a few pints) and high tube surface area contribute to rapid pressure buildup. Maximum steam temperature is 700 degrees (F) and maximum pressure is 600 psig. Steam is piped directly from the boiler to the throttle valve which controls expander speed.

Fuel is sprayed into the vortex-type combustion chamber where it is mixed with air supplied by an electrically powered blower; the mixture is ignited with a spark plug. The system operates on an off-on basis similar to a home furnace, running only when the boiler needs heat. Combustion of the fuel is virtually complete and exhaust emissions are very low.

The plate-fin condenser is externally similar to a standard automobile radiator. However, it is over twice as large as a conventional radiator and its special brazed aluminum construction is designed to handle either vacuum or pressure operation. It recovers most of the water exhausted from the expander for reuse.

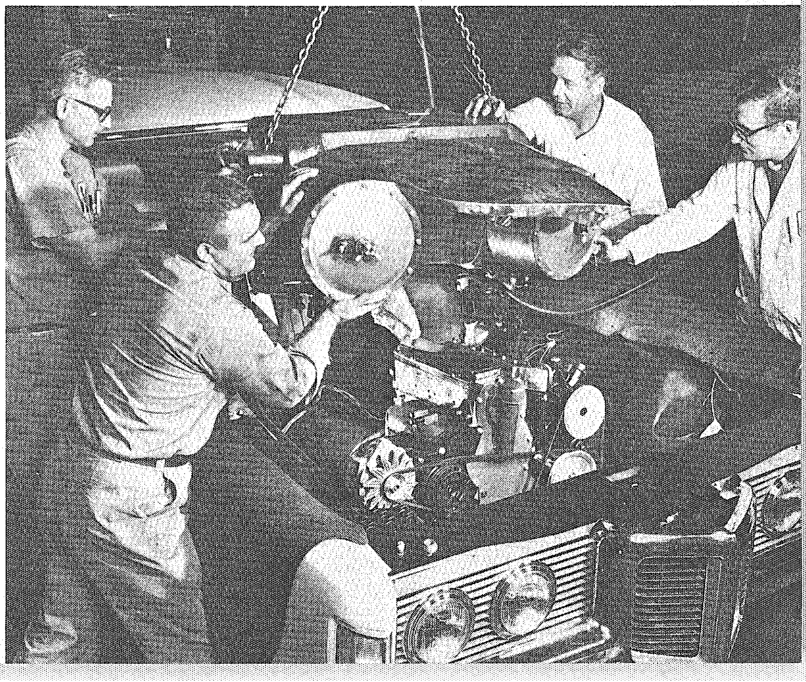
The Chevelle's standard three-speed transmission is retained for use in the SE-124. Use of a transmission with a steam vehicle permits operation of accessories during engine idle and provides the range of torque required for acceleration, gradeability, and road-load operation.

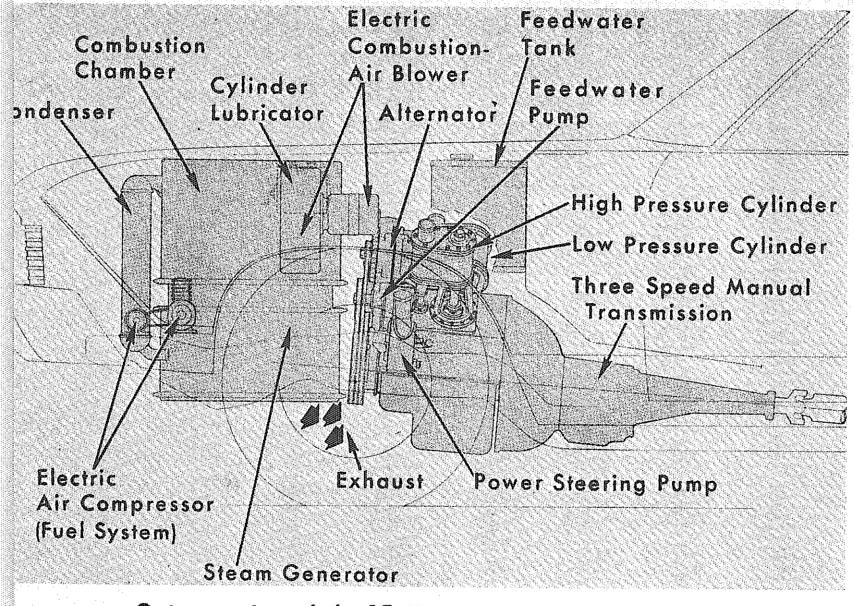
Advantages of the SE-101 and SE-124 include low air pollutant characteristics, low noise level, and good torque characteristics (which may minimize transmission requirements).

Problem areas include power plant size and weight, cost, water consumption, freezing, and lubrication. Added components (combustion system, steam generator, larger condenser) make a steam power plant bigger and heavier than a comparable internal combustion engine. For example, the SE-101 system is 450 pounds heavier than the

LEFT (from left to right): The 511 commuter, a three-wheeled gasoline car; the 512 hybrid gasoline-electric; the 512 electric; and the 512 gasoline vehicle.

BELOW: Researchers install a combustion steam generator in the SE-101, a modified Pontiac Grand Prix. The 160 horsepower, 4-cylinder expander is already mounted. The SE-101 was developed to evaluate a vapor cycle engine under actual operating conditions.





Cutaway view of the SE-124.

power plant it replaced in the Pontiac Grand Prix but the SE-101 system provides less than half the horsepower.

No cost comparisons are yet available for steam and standard internal combustion engines.

The engine compartment poses severe restrictions on condenser size, thereby preventing complete recovery of water under adverse operation conditions such as full load or hot weather.

Water has the best overall combination of properties of any vapor engine working fluid known. However, freezing is a serious problem. An automatic startup control, designed to prevent freezing when the car is parked, is being investigated for the SE-101. It would activate the combustion system whenever temperatures approach the freezing point.

Adequate lubrication is difficult since the lubricant must be mixed with steam at high temperatures and pressures. However, the oil must be removed before the condensed water is returned to the boiler to prevent carbon deposits from reducing boiler efficiency.

Whether or not a practical steam engine automobile can be realized in the future still remains an unanswered question. New engineering materials and technology and the possibility of new fluids replacing water as the working medium in the cycle make the steam engine a contender that must be carefully evaluated along with the other proposed low-emission power plants.

Special Purpose Vehicles

General Motors has produced five special purpose vehicles as a part of three separate projects. One was the three-car 512 series powered by gasoline, electric, and hybrid system. The other, the 511 car, featured a three-wheel suspension—single wheel in front and two in the rear—with a conventional four-cylinder engine. The third project, the XP-883, produced a special purpose two-plus-two passenger commuter vehicle to accommodate a hybrid gasoline-electric power system with front wheel drive.

The three types of 512 cars, with top speed of between 30 and 40 miles per hour and limited acceleration, need either a paved road system of its own or it could operate only in reverse lanes of existing roads. The small cars of the 512 series could not safely mix with today's freeway or boulevard traffic; the 512's are designed for short trips in central city areas, for errands, or school transportation. The 511 and the EX-883 were designed to be commuter cars, capable of travel from suburbs to downtown at urban freeway speeds.

The 512 Hybrid Gasoline-electric vehicle has a 50-inch wheelbase, 66-inch length, 56-inch height, and 52-inch width. The curb weight is 1,250 pounds. Construction is a combination of aluminum panels and tubular steel frame. For easy access, it has a front canopy door and two-passenger bench seat. A small luggage compartment is accessible either by way of the fold-down right front seat back or lift-up back light.

The hybrid's power system consists of a 12 cubic inch gasoline engine coupled with a series of d-c electric motor through an electro-magnetic clutch. With the clutch energized, the gasoline engine and electric motor both operate at the same speed and are coupled to the differential and axle through reduction gears. Electrical energy is supplied by a 72-volt power battery pack with an additional 12-volt accessory battery which supplies power for the low-level electronic system, cooling blowers, and brake lights.

The car operates in either an all-electric or hybrid mode. In either, it is accelerated from standstill by the electric motor. In the hybrid mode, the gasoline engine is engaged at 10 miles per hour and the gasoline engine alone drives the car at steady speeds. Acceleration power is provided automatically by the electric motor operating together with the gasoline engine.

When operating on the gasoline power, a 90-volt Delcotron recharges the batteries. As a driver operation, when the car is at a standstill, the gasoline unit may continue running to charge the batteries. In addition, the hybrid has an onboard charging unit that can be connected to a 115-volt household outlet.

In the hybrid mode, the peak horsepower is 13.8, top speed is 35 miles per hour, and the car accelerates from 0 to 30 miles per hour in 16 seconds. Its range at 30 miles per hour in the electric mode is 5.2 miles and approximately 150 miles in the hybrid mode with three gallons of gasoline.

The exterior body of the 512 electric vehicle is fiberglass with a steel chassis floorpan and rollbar. The car can be driven in fair weather with the canopy front raised and back light retracted, giving it a unique convertible appearance, or it can be driven as a roadster with canopy removed.

The side-pivoted single front door allows easy access to the bench type seat. Luggage or package space is accessible through the back light or the fold down right seat.

Wheelbase of the 512 electric car is 52 inches, overall length is 86.3 inches, and the width is 56 inches. Curb weight is 1,250 pounds. Power is supplied by an 84-volt power battery pack. The power plant is a d-c series Delco-Remy motor with solid state controls; it utilizes special Delco-Remy lightweight lead-acid batteries.

The coaxial drive motor, integrally mounted on the rear axle, makes possible a compact planetary gear drive that passes one axle shaft through the center of the drive motor.

The car's accessories (heater-defroster, head and tail lamps, turn signals, windshield wiper, horn, and cooling blower) are powered by a separate 12-volt battery, supplemented when necessary by the main power pack. Heating and defrosting are combined with motor and control cooling. If heat is not needed, the system circulates incoming fresh air for passenger compartment ventilation.

A built-in battery charger simultaneously recharges both the main power plant and accessory battery. Complete recharge from a 115-volt household outlet requires 7 hours. The car's range at 25 miles per hour is 58 miles. At 30 miles per hour the range is 47 miles. As more advanced batteries become available the range mileages should increase. Acceleration from 0 to 30 miles per hour is 12 seconds.

The 512 gasoline vehicle is a roadster with integral plastic construction. Its wheelbase is 52 inches, overall length is 86.3 inches, width is 55 inches, and height is 51.9 inches. It weighs 950 pounds.

The 512 gasoline car has a side-hinged front door and the belt line sweeps up behind the passengers to provide rollover protection. It has minimum accessories because of its open styling.

The power source for this car is a 19.6 cubic inch two-cylinder 12-horsepower aluminum engine with an 11:1 compression ratio. It is adaptable to future emission controls and is equipped with an experimental catalytic converter and air injection system. A distinguishing feature of the power train of this vehicle is an automatic transmission operating on the variable ratio V-belt principle with a centrifugal clutch.

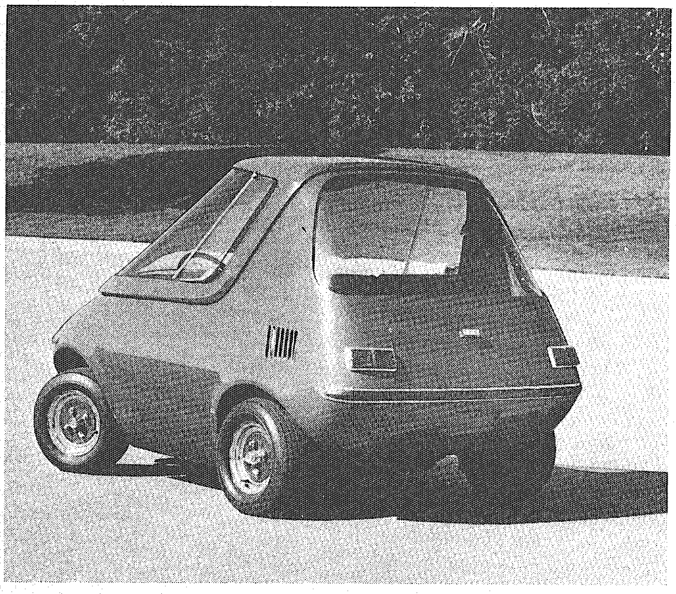
Top speed is 45 miles per hour and the car will accelerate from 0 to 30 miles per hour in 18 seconds. With four-gallon fuel tank, its range is approximately 280 miles.

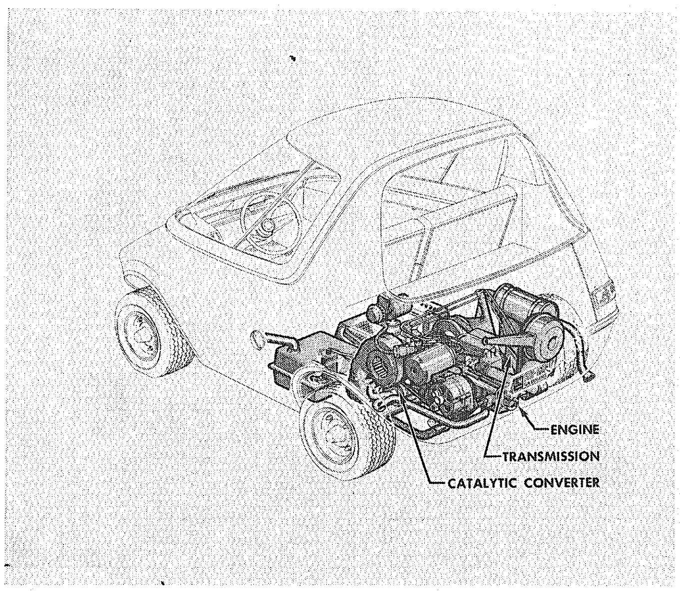
The 511 commuter vehicle, with its three-wheel suspension, is a departure from conventional automotive practice. It is designed to transport two people from suburbs to downtown offices at freeway speeds. The three-wheel design provides excellent stability and maneuverability, it reduces weight, simplifies steering, and allows for an uncomplicated backbone type of frame, making a streamline shape possible. The low center of gravity, only 13.5 inches off the ground, offers exceptional lateral stability and cornering ability.

Two steering systems are being tested in the 511. One system has a simple handle bar with a 2:1 ratio and the other has a more conventional steering wheel system with a 9:1 ratio.

The 511 has a rearmounted engine which is a four-cylinder 66 cubic inch Opel capable of 67 horsepower at 6,000 rpm. The transmission is a three-speed automatic torque converter type unit. The commuter can accelerate the 511 from 0 to 60 miles per hour in 16 seconds; top speed is 80 miles per hour. In city driving, it averages 30 to 35 miles per gallon.

The chassis consists basically of two major subassemblies: a fiberglass body and a steel chassis. It has a single hinged and counterbalanced canopy for easy exit and entry. Its contoured bucket seats are semi-reclining and built into the body along with the head restraints. Because the seats are fixed, control pedals are electrically adjustable. The chassis consists of a steel Y-frame, the three wheels, and rear power train. The power train and rear wheels are mounted solidly to the frame so that the drive axles are simple one-piece shafts and the entire mass is essentially unsprung. The frame backbone passes through the tunnel of the body to support the single front wheel in the tapered front section.





The 512 electric car. Built on a 52-inch wheelbase, it is 86.3 inches long. The 1,250-pound car is operated by an 84-volt power battery pack and has a 12-volt battery for accessories.

Other 511 specifications include an overall length of 149 inches, wheelbase of 86 inches, rear tread of 54 inches, overall width of 63 inches, height of 40 inches, ground clearance of 4.5 inches, and weight of 1,300 pounds.

A special purpose commuter vehicle, the XP-883, is designed to accommodate a hybrid gasoline-electric power plant with front wheel drive. Presently the car is in mockup condition. The XP-883 has a two-door fiberglass body and will seat four occupants—the driver and one adult passenger in front and two children facing the rear in a back seat. The backs of the passenger seats

(Continued on Page 36)

for the one billion underfed people of the world."

Nickel helps other metals resist heat, cold, impact, pressure, abrasion, corrosion... to advance engineering in vital fields—power, desalination, electronics, transportation, aerospace.

We're doing everything we can to produce more nickel. Searching around the world—Indonesia, Australia, Guatemala, Canada. We've found ways to extract nickel from ores thought too poor to mine a few years ago.

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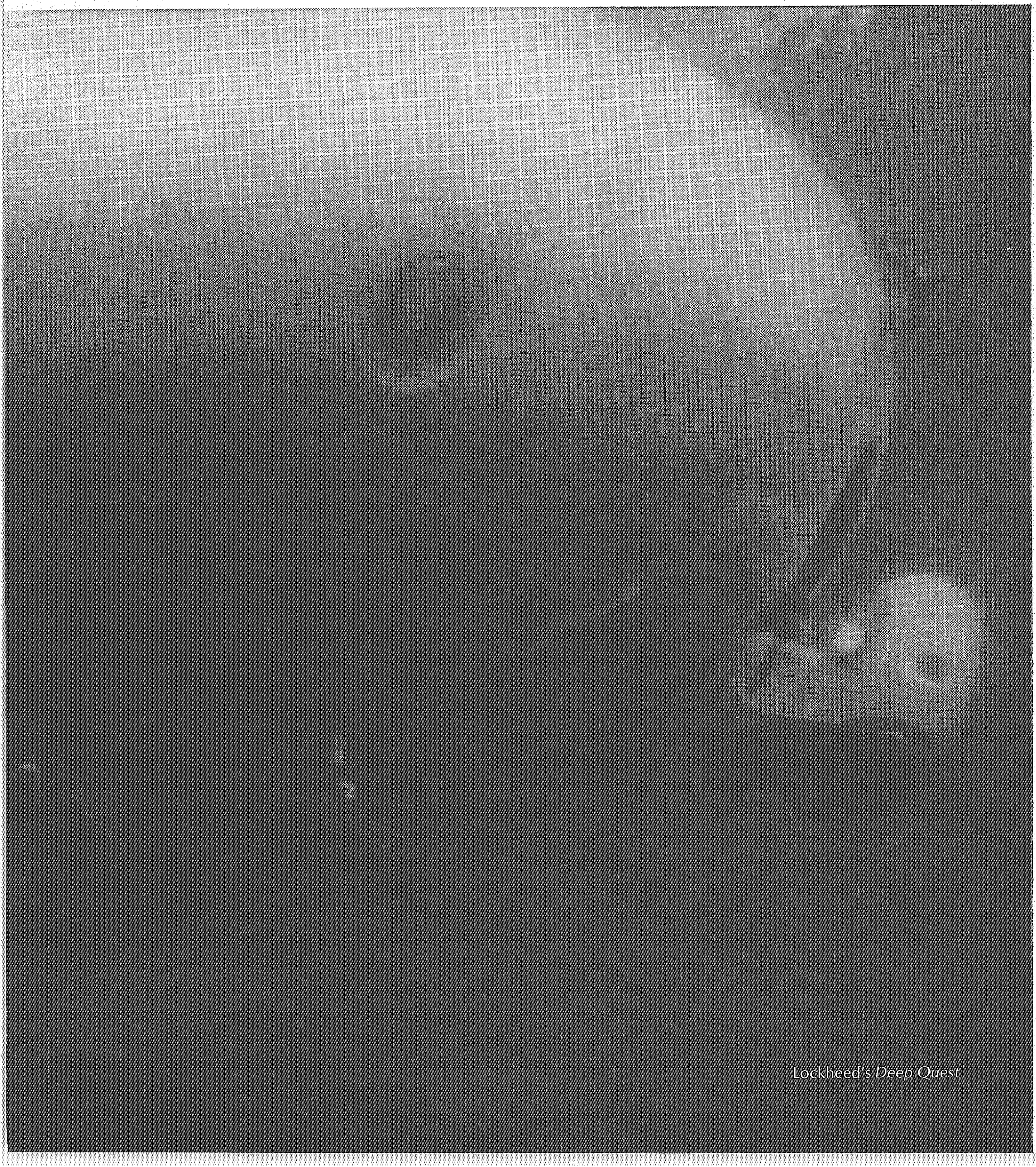
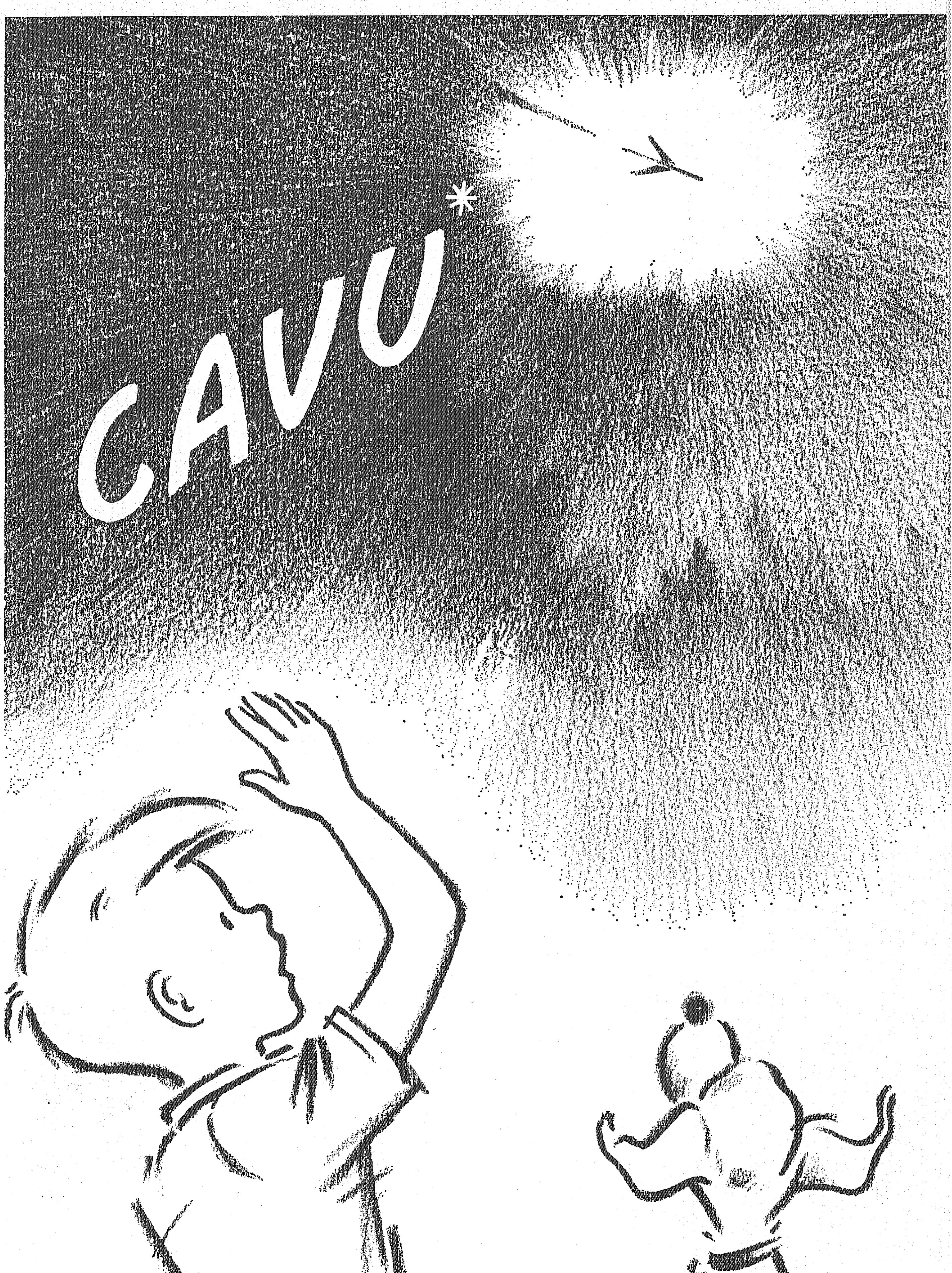
INTERNATIONAL NICKEL



Lockheed's *Deep Quest*


CAVU*

IAESTE—

Practical Training on an International Basis

by RANDY GORT

Last year was a very important year for some students . . . for they were fortunate enough to experience a "Grand Tour of Europe" as part of their education. The program that made this possible was IAESTE—the International Association for the Exchange of Students for Technical Experience.

Founded in 1948 at Imperial College, London, IAESTE was an attempt to build international ties after W. W. II and now actually places students from some 800 colleges and universities in traineeships with approximately 4,000 industrial firms and educational institutions around the world. With the close of the 1968 program, over 120,000 students of engineering, architecture, and the sciences had participated in the program and received a practical supplement to their academic education. Also very important, they had an opportunity for initial contact with the industrial techniques, research methodology, and operating philosophy of their professional counterparts in another country.

These students are products of an age of impatience—an age in which the pace of change; technological, economic, societal, and environmental, has been very rapid and its scope very vast. Yet, few of the students are content. This unprecedented economic growth has been clouded by hostile dissatisfactions, by ghettos, and by other displays of human misunderstanding. People everywhere are demanding a higher quality of life, an opportunity to attain a fuller measure of their potential, but IAESTE students are doing something about it. Through IAESTE, attempts are made to give each student the capacity to understand many different individuals and situations and to at least be aware of, if not to understand, why each culture develops different motives, fears, hopes, loves, and hates. Communication barriers have to be broken and understandings have to become prominent—these are IAESTE's goals.

IAESTE in the United States

Through the initial efforts of a student group at MIT, the United States became an associate member of IAESTE in 1950 and a full member in 1951. In 1955, Maynard Boring of the General Electric Company led a nationwide reorganization of the program. Secretarial services were provided by the Institute of International Education along with the assistance given by many leaders in international education. In 1959, the Engineers Joint Council became the program sponsor. The need for a more formal and independent organization was realized as IAESTE/US developed and expanded, and in 1963 the program was incorporated as a non-profit, non-political, educational organization in the state of New York. In March, 1966, separate and independent offices were established and the final step was completed.

IAESTE/US is now administered by a permanent professional staff under the guidance of a 28-member national committee with a six-man board of directors. The program is financed by an application fee paid by each participating student and an administrative fee paid by each firm accepting foreign trainees.

Program Operation

Participating countries solicit offers of training from their business firms, research institutes, and like organizations. The organization presenting the offer may specify candidate requirements and is asked to provide the trainee with a maintenance allowance for living expenses incurred during the training period.

Member countries exchange their offers during the annual mid-January meeting. Countries nominate candidates, matching student qualifications with offer requirements. The student and the firm both have an opportunity to review offer details and student qualifications before mutual acceptance.

The national committee of the receiving country makes arrangements for necessary documents, housing, and orientation materials and programs. The national committee of the sending country makes arrangements for health and accident insurance, additional orientation, and, frequently, reduced-rate transportation for its own outgoing trainee. Trainees pay their own travel costs and expenses for passports, free-time travel, and personal items.

There is quite a range of students participating in the program, both men and women, from those who have completed their sophomore year to those who only require a dissertation to complete a doctorate. The trainees' ages range from Belgium and U.A.R. students of 20 years to Columbia students of 26 years. The 1967 average age of U. S. trainees was 21 years.

Training assignments vary with the firm needs and the student's background. A typical description of the trainee's placement and comments on the student was contained in the report of the E. J. Longyear Company in Minneapolis on their trainee from Germany in 1967:

> "His technical training and practical shop experience contributed a great deal to the activities of the industrial engineering department. One of the outstanding contributions was the designing and followup of tooling for one of our more complex machines. This entailed the study of manuals and work on the drawing board using American drafting techniques and dimensions, and the project was handled exceptionally well with initiative and creativeness. He welcomes exposure to new ideas and has an inquiring mental attitude."

Another description is contained in a report by Jeff Schiebe, U of M student, who was on a traineeship in the United Kingdom. Jeff spent eight weeks working for the Central Electricity Generating Board during which time he worked in plant operation, control, research and development, and general engineering. Besides the practical knowledge he gained, Jeff emphasizes how much he valued his experience living and working with the English people.

Traineeships generally last for periods of 8 to 14 weeks during the summer vacation periods. Longer traineeships (3 to 12 months), however, are available, naturally offering an opportunity for significantly greater degrees of training in the practical application of the student's academic studies. IAESTE's expansion with developing nations will definitely increase the trend for long-term traineeships.

IAESTE and Developing Nations

With the direction of the General Secretary and support by UNESCO, IAESTE conducted a study of practical training across national boundaries and within developing nations. This report, *Training in Industry Abroad for Students of Science and Technology*, comments, "The lack of industrial development in many of these countries makes it necessary for many of their future scientists and engineers to make use of the opportunities for training abroad. . . ." IAESTE is presently considering ways of expanding its opportunities to students of developing countries including the creation of an international pool of training offers from industrialized countries for distribution to developing countries on a non-reciprocal basis.

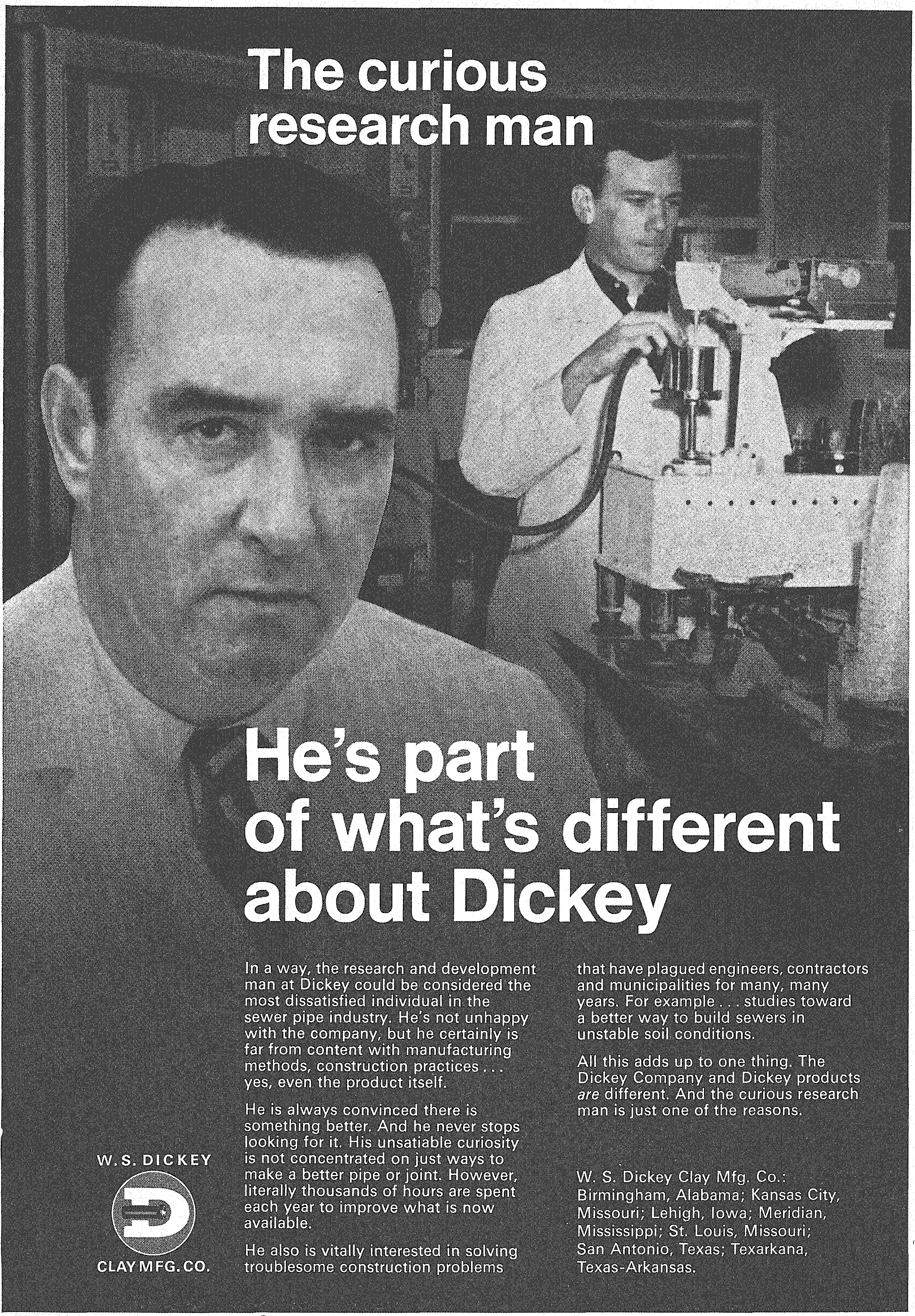
Conclusion

The concepts of a program such as IAESTE can only operate as long as there are industrial firms willing to accept trainees and offer a significant experience. In return, they receive an association with a bright, inquiring young mind from a different scientific or engineering background. Also essential for the program's operation is the financial assistance provided by these firms as well as those who don't feel large enough to offer a traineeship but yet want to promote the organization's goals.

The U. S. companies that have participated in the program are indeed satisfied, as their continued efforts have shown; and the number of positions they offer is growing. Since the program is reciprocal, such an increase will allow a larger number of openings in other countries available to American students as well. Thus, the students benefit, the temporary employers benefit with a competent addition to their staff, and the nations benefit from the increased understanding of another nation which their local students bring back.

IAESTE welcomes the support of organizations and individuals in promoting its program. Information concerning American student traineeships abroad and the sponsorship of traineeships by American firms can be obtained by writing:

Randall J. Gort, IAESTE-MINN.
133 Main Engineering, U of M.
Minneapolis, Minnesota 55454


The curious research man
He's part of what's different about Dickey
In a way, the research and development man at Dickey could be considered the most dissatisfied individual in the sewer pipe industry. He's not unhappy with the company, but he certainly is far from content with manufacturing methods, construction practices . . . yes, even the product itself.
He is always convinced there is something better. And he never stops looking for it. His unsatiable curiosity is not concentrated on just ways to make a better pipe or joint. However, literally thousands of hours are spent each year to improve what is now available.
He also is vitally interested in solving troublesome construction problems that have plagued engineers, contractors and municipalities for many, many years. For example . . . studies toward a better way to build sewers in unstable soil conditions.
All this adds up to one thing. The Dickey Company and Dickey products *are* different. And the curious research man is just one of the reasons.
W. S. DICKEY
CLAY MFG. CO.
W. S. Dickey Clay Mfg. Co.: Birmingham, Alabama; Kansas City, Missouri; Lehigh, Iowa; Meridian, Mississippi; St. Louis, Missouri; San Antonio, Texas; Texarkana, Texas-Arkansas.

SPECIFICATIONS

General Dimensions

(in inches unless otherwise indicated)

Wheelbase	120.0
Length — Overall	209.7
Width — Overall	80.0
Doors Open—Max. Width	134.0
Height — Overall	51.2
Tread — Front	66.0
— Rear	66.0
Minimum Running Clearance	5.5
Curb Weight (lbs.)	4,745*

*(55.6% front)

Chassis Details

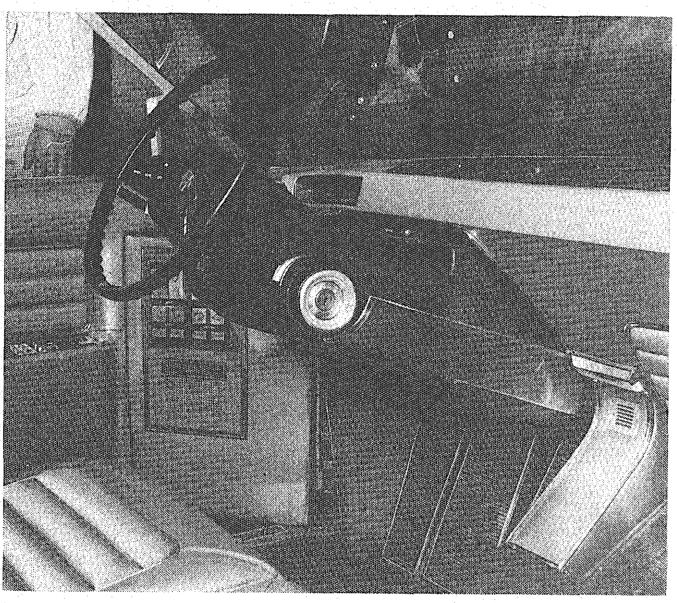
Type of Construction	— Bonded and Welded Body Sections on Torque Box 3/4 Length Perimeter Frame
Front Suspension	— Independent, Short Long Arm (S.L.-A.) with Lower Compression Strut
Rear Suspension	— Four-link with Ausform-steel Torsion-leaf Springs
Steering	— 14.5-inch diameter Wheel with 20.4 to 1 Overall Ratio, Power-assisted
Turning Diameter (curb-to-curb)	— 42.8 ft.
Brakes	— Four-Wheel Single-piston Disc, Power-assisted, with Rear-wheel-caliper Mechanical Parking Brakes; Rear Wheel Skid-control System
Tires (Service)	— 215 R 15 Radial Ply
(Spare)	Space-saver — Inflatable

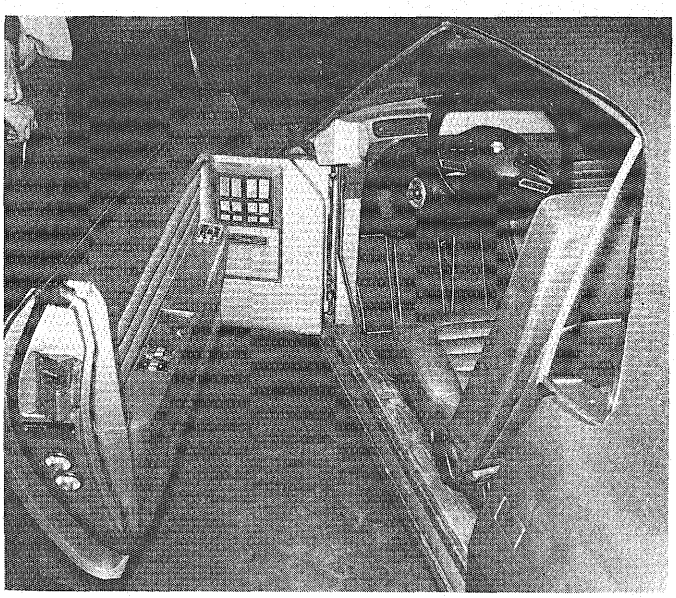
Features

- Canted engine and offset driveline
- Twin-core aluminum radiator with electric fans
- Four-wheel disc brakes
- Rear-wheel skid-control braking system
- Pillarless structural windshield
- Electric "quick heat" feature
- Trunk-mounted air filter and purifier
- Shoulder belt for middle front passenger

Powertrain

Engine	— 428 CID V-8 with Carter 4V Carburetor, Ford "Indianapolis" Distributor and Single Exhaust (Horsepower not rated)
Transmission	— Ford Three-speed Automatic with Experimental Integral Cooler, Lengthened Transmission Extension, and Electric Control (Engine and transmission are located 9 inches further forward than usual, at an angle of 6 deg. in plan view and 7 deg. 45' in side view)
Driveline	— Two-piece Driveshaft located 7.75 inches to left of vehicle centerline, with three Constant Velocity Joints
Rear Axle	— Conventional 2.25-inch Hypoid, 3.0:1 gear ratio Carrier, Housing offset 7.75 inches laterally left of vehicle centerline.



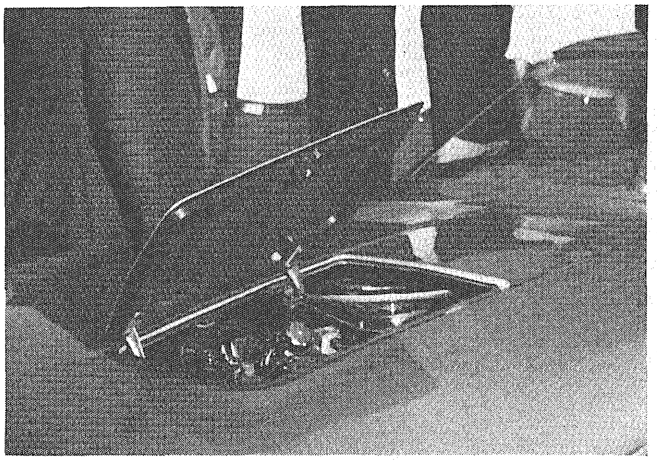


LEFT: Energy absorbing steering column with gear shift rings.

ABOVE: Parallel-hinged, six-foot long power operated door.

Techna

by Ford

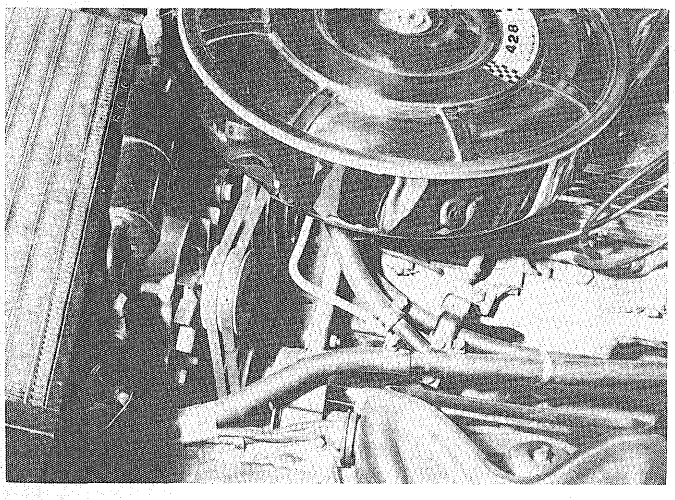


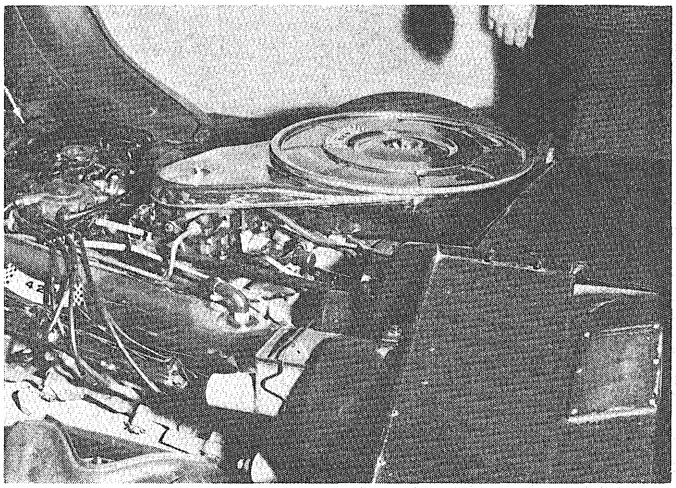
ABOVE: Small inspection hatch in hood for routine maintenance.

LEFT: Air conditioning compressor and alternator are located at rear of engine and are driven by a jackshaft.

BELOW: Engine with drop center manifold, shallow distributor, and reverse flow air cleaner.

Photos by DON NEAL





Introducing...

The Glass-Blowing Lab

By KATHY FROMMER

Ten years ago the glass-blowing lab in Physics 43S was equipped to do just what its title indicated—blow glass. Today the lab, the program, and its services have expanded.

Marvin Dynes, department head of Glass Technology Services, estimated that his lab was "one of the best glass blowing shops in the country, with one of the best qualified staffs."

The training program, which was designed and written by Dynes, and approved by the U of M Civil Service and State Department of Labor Apprenticeship Training, is divided into eight phases, within a 4-year period. Applicants are reviewed and selected on the basis of artistic background and hand coordination. During the program the employed students are also required to attend night school to gain knowledge in math, chemistry, physics and technical writing.

After the four-year apprentice program, the student must pass a written and oral exam before a board of review in order to qualify as a journeyman glass blower. A graduate program is then available.

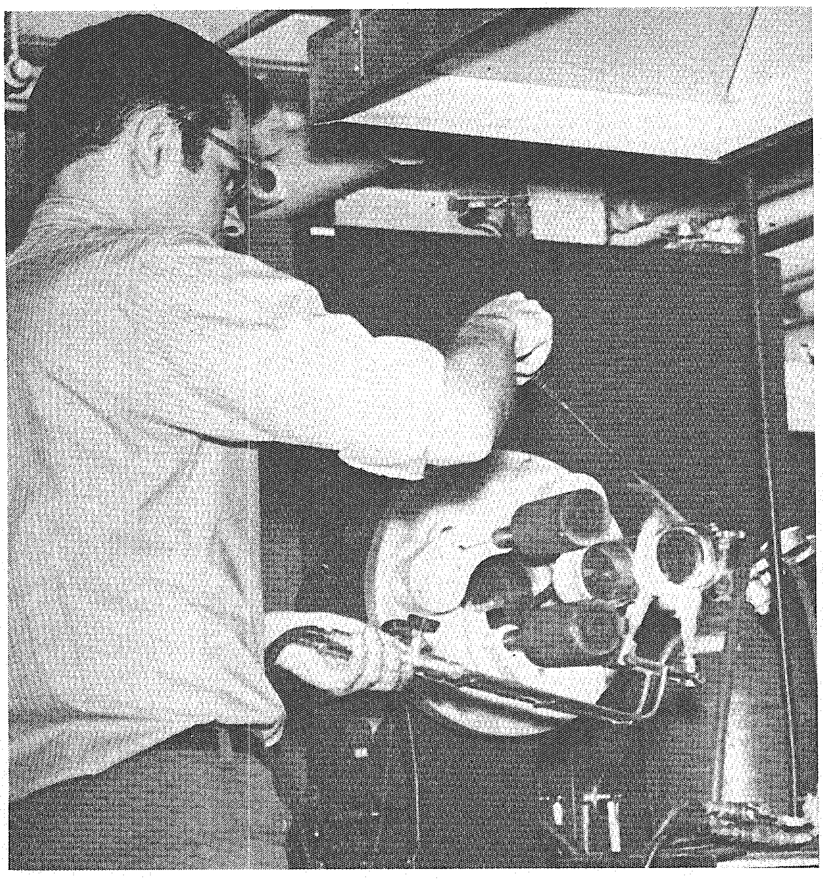
Dynes, a master glass blower, indicated that there is a tremendous demand for qualified glass blowers in the chemistry, physics, and optical fields.

The Glass Technology lab serves as the central division office for the entire four University campuses, Duluth, Morris, St. Paul, and Minneapolis.

As Dynes said, "the lab's major function is to help and service needs." The services rendered include the "designing, development, consultation, and engineering design of glass instrumentation."

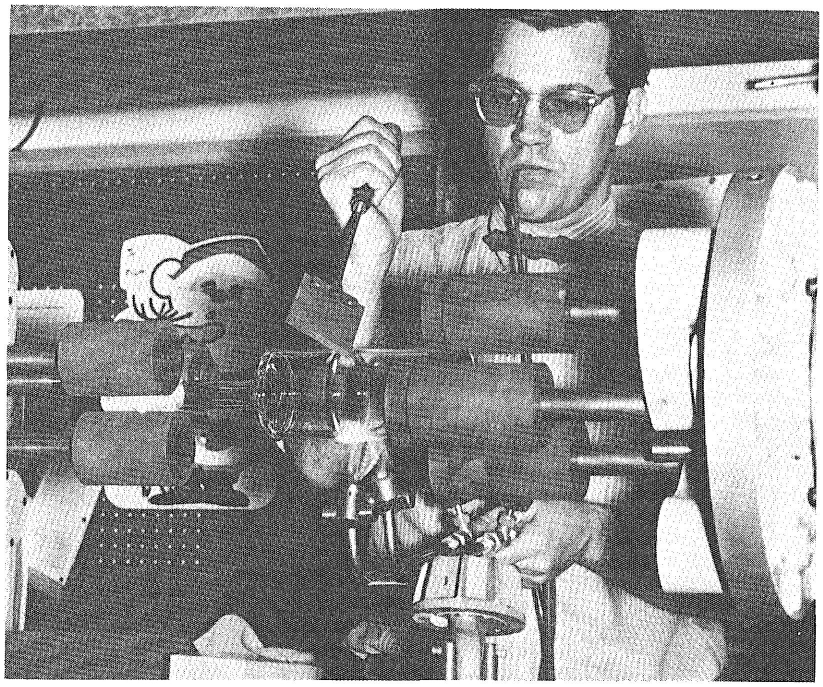
The lab has the capacity to do spot welding, electronic component assembling, construction of ceramic to glass, and fabrication of metal and glass seals. It is equipped for producing large glass dewar (thermos vessels) flasks for low-temperature work, and has facilities for rough grinding of glass or other irregular shapes. The lab's new equipment has the capacity for high velocity drilling and diamond drilling through glass.

Dynes said that new techniques are constantly investigated to keep trainees up to date. Today, a junior glass engineer with 8 years of training (undergraduate and graduate work) is capable of understanding, advising and working out any problem concerning glass. He is not just a glass blower anymore.

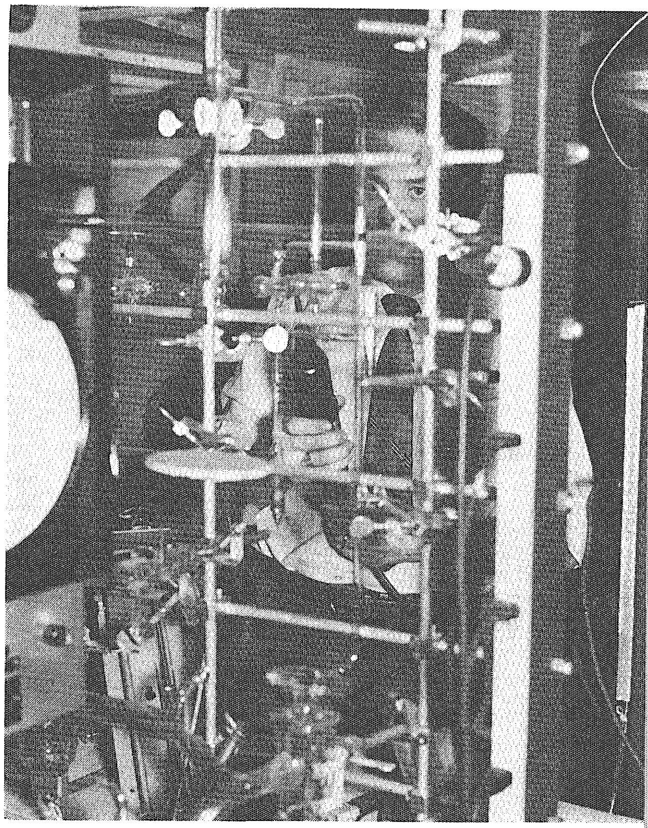


Jim Merrill wears special colored glasses which filter out the sodium light of the flame, enabling him to see the wall of the glass as he works.

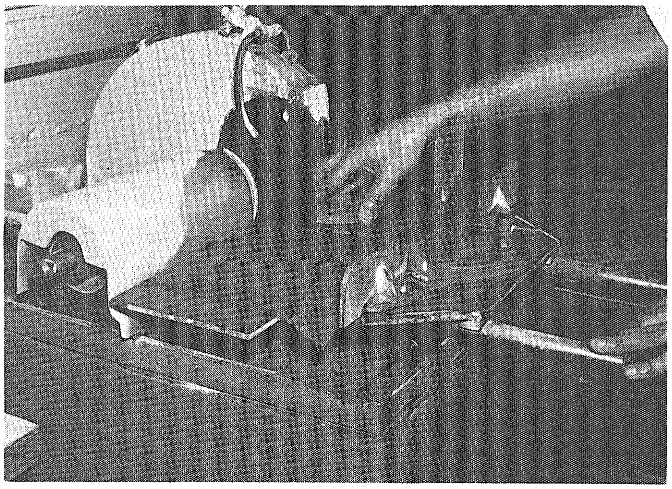
Photos by BRIAN JOHNSON *and* MARLIN REKOW



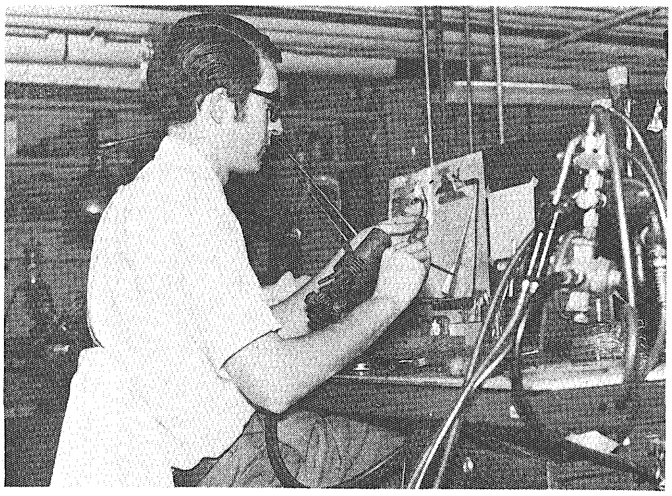
ABOVE: This diamond cutting saw is frequently used for blowing lathe. The lathe can handle glass tubing ranging Larson, an apprentice, works on lab equipment.

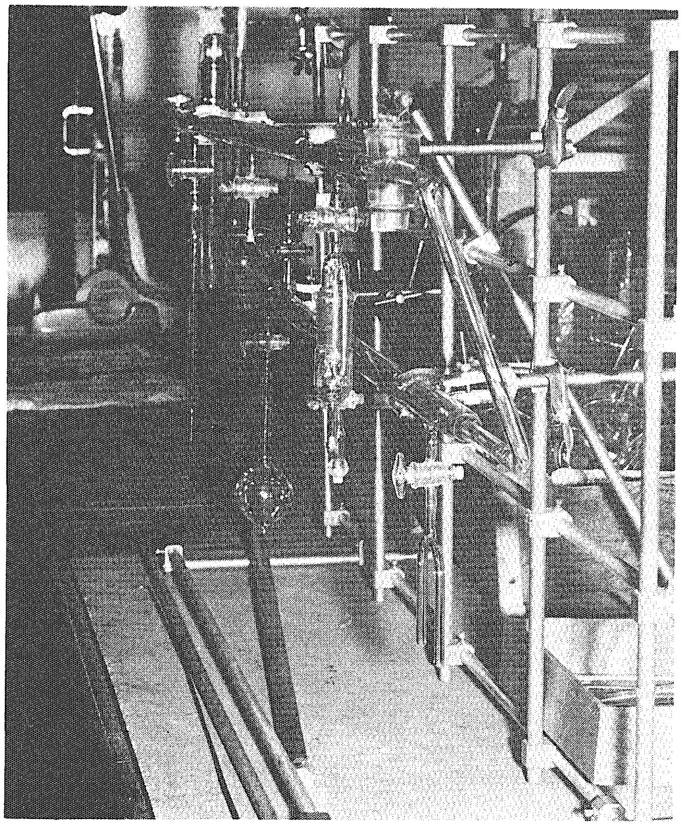


ABOVE: The vacuum pump functions in evaluating moisture and residual gases from dewar flasks. BELOW: An example of the intricate work done at the glass lab.



ABOVE: This diamond cutting saw is frequently used for slicing various glass and metal materials. BELOW: Gene Larson, an apprentice, works on lab equipment.





What's New in Science and Engineering

by JOANN HAWKINSON

Miniaturization

A miniature compressor, powered by a heat source and controlled by the body's own signals, may drive an implantable heart. The compressor and control system, proposed by Air Products and Chemicals, Inc., are being developed under a contract from the Artificial Heart Program, National Institutes of Health, U. S. Department of Health, Education and Welfare.

Air Products' original proposal, made to the Artificial Heart Program of the National Heart and Lung Institute, resulted in a contract to design and build a heat powered compressor and control subassembly to regulate output.

The compressor and its control will be the same size as those required for an artificial heart, to test the feasibility of the miniature system. If the concept proves successful, later models will be made of implantable materials.

Electric Trains

Trains propelled by electrical power from a wayside rail can reach speeds up to 300 miles per hour, according to two studies made public recently by the Department of Transportation (DOT).

One study, conducted for DOT by Westinghouse Electric Corporation, focuses on electric power systems, power distribution, power collection, and power conduction and is expected to be a valuable reference work for transportation engineers designing high-speed ground transportation systems during the next decade.

According to DOT, the high-speed electric ground collection phase of the report concentrated on sliding contact/diagonal stiff rail techniques. Their designs include:

—A multiple solid-shoe contact with a hydraulic control that keeps the contact pressed against the power rail.

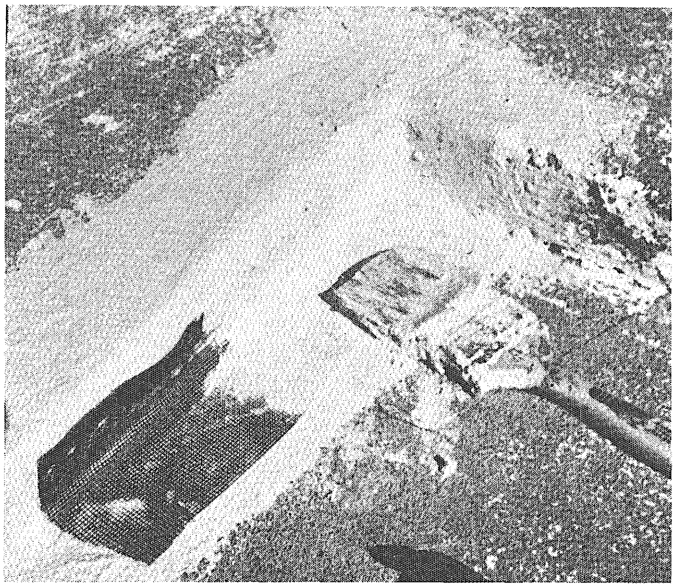
—A wire-brush shoe contact that uses a leaf spring to maintain pressure of the brushes on the power rail.

Through analysis of various methods of power distribution, a high-voltage (15 to 30 KV) alternating-current system was found by Westinghouse to be technically and economically the most attractive with existing technology. High-voltage, direct-current power could possibly be better at the power levels and distances studied, but its use would require the development of new circuit breakers and high-voltage choppers to handle the current and voltage of such a system.

High-speed trains could be powered by either a-c or d-c conventional motors or linear induction motors, with modern solid-state thyristor controls to apply power. The d-c power equipment would be lighter but bulkier than a-c equipment, provided that developments of circuit breaker and choppers for voltage reduction can be solved.

Nylon Roofing

A new roofing material, WEB-A-LON/FLEXLON is introduced by Flexlon Coatings Division, Flexco of Florida, Inc. This material is designed to save time, reduce costs of roofing installations and create a durable roof that is always flexible and waterproof.



WEB-A-LON/FLEXLON is a nylon compound and when used as a roofing material, it is easily applied with a brush, roller, or spray equipment to produce a durable flexible, waterproof roof. These materials are applied to any clean, dry, stable surface using ordinary tools and methods. Usage studies indicate that each coat of the compound (nylon, polymers, silicones, and asbestos) dries in about 12 hours and forms a tough, long-lasting, seven to ten year bond with unique penetration qualities on ordinary materials such as concrete, aluminum, plywood, asphalt, asbestos and even rusted metal to prolong its life from five to ten years. It also has a strong resistance to a wide variety of extreme weather conditions, detergents, fungus, mildew and temperature variations. As a joint filling compound, this material efficiently fills various angles, contours, and joints subject to structural movement and keeps them watertight for years.

High-Lift Hoist

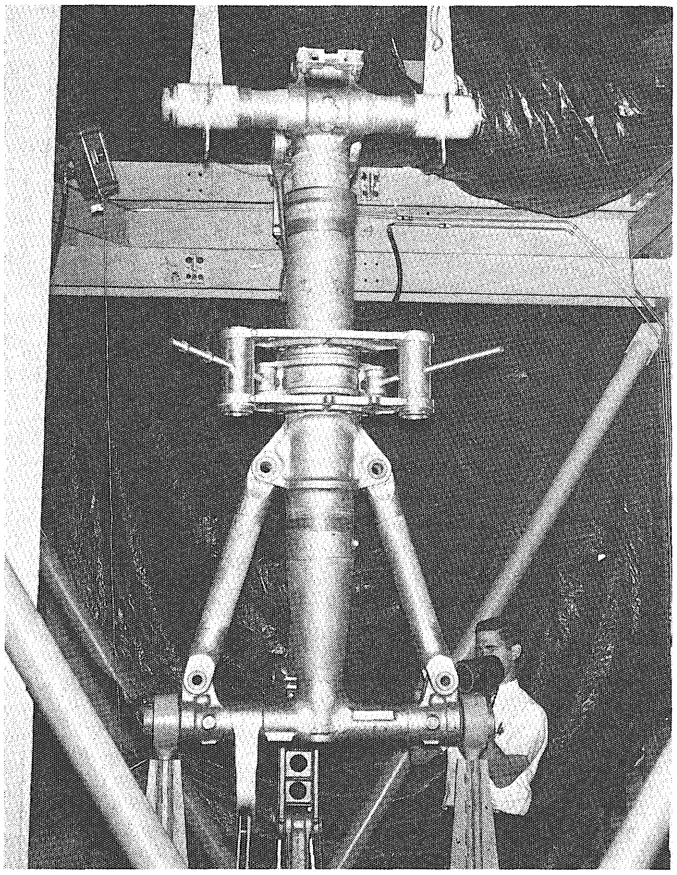
The new Koshihara "Mono-Mac" monorail high-lift hoist, introduced by Warn Industries, will handle up to 7,000 pounds at 40 feet per minute. It is available in four models, with lift capacities ranging from 1700 to 7000 pounds. All models are capable of two-speed horizontal travel. Lifting speeds range from 59 to 110 feet per minute. All Mono-Macs are equipped with two sets of reversible electromagnetic controls for hoisting and traveling. All are with a number of remote control options. In the Far East, Koshihara Mono-Macs are used for installing precast concrete, curtain walls, window frames, and moving various kinds of construction material. All units include a positive anti-fouling device for maximum safety.

ModelTech

ModelTech Corp. has been formed by the Boeing Company and Vishay Intertechnology to offer to industry at large, for the first time, an important Boeing-developed and proven stress analysis process. The technique does much more than sharply reduce the time and cost of making and stress-analyzing full-scale models of structures and components. Equally important, the physical shape of the model can be changed, on the spot, to determine optimum design (lightest yet strongest).

The process has been used in-house by Boeing for over eight years, to verify stress data and modify designs of, among others, the huge landing gears of the 707, 727, 737 and 747 jets, and helicopter components. Other industrial uses include design of pumps, engines, bridges, frames and vessels.

Effective immediately, ModelTech—owner of the process—will offer a complete range of services, from model making through testing, evaluation, and design recommendations. As a subsidiary of Vishay Intertechnology, a



world-wide stress analysis organization, ModelTech will occupy a portion of Vishay's present Malvern, Penna., complex.

A key to the new process is the use of specially developed plastics which not only simulate metal performance, but also permit material to be added or removed to modify design. This unique capability eliminates the high costs of making initial design prototypes of metal and further reduces the expense and long delays involved in changing the structure or component before reanalysis. Also, the cost of load simulation is drastically lowered by the use of much smaller forces than required for metal models.

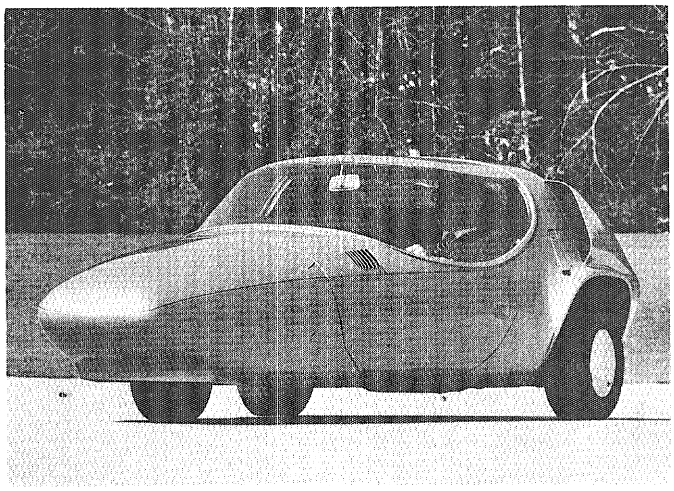
This full scale aluminum-epoxy model was used to perfect the landing gear for the Boeing 747 superjet. The model was employed to design the gear for both the 710,000-pound version soon to enter passenger service, and for the advanced 747B, which will weigh 775,000 pounds.

Experimental Cars . . .

(continued from page 19)

fold down to provide a cargo space 84 inches long. Access to the rear seat area is provided by an upswinging door at the rear of the car.

The XP-883 has a 68-inch wheelbase with an overall length of 122.2 inches. It is 57.3 inches wide and 46.3



The three-wheeled, gasoline powered 511 features exceptional stability, fuel economy, and maneuverability.

inches high. Both front and rear tread are 49 inches, front overhang is 27.5 inches, and rear overhang is 26.7 inches.

The basic concept for the XP-883 originated from the General Motors styling staff. Designers developed the vehicle as a small, commuter car capable of receiving any of several kinds of power plants (including internal combustion engine, electric propulsion, and hybrid gasoline-electric) to evaluate their potential in meeting the car's design purpose. Although all of these power plants are acceptable, the hybrid power plant was selected for further study. Engineers designed the two-cylinder engine-electric motor combination specifically for the XP-883. The design objectives for the car include a weight of approximately 2,100 pounds; maximum speed of 60 miles per hour; acceleration of 0 to 60 miles per hour in 28 seconds and 0 to 40 miles per hour in 12 seconds.

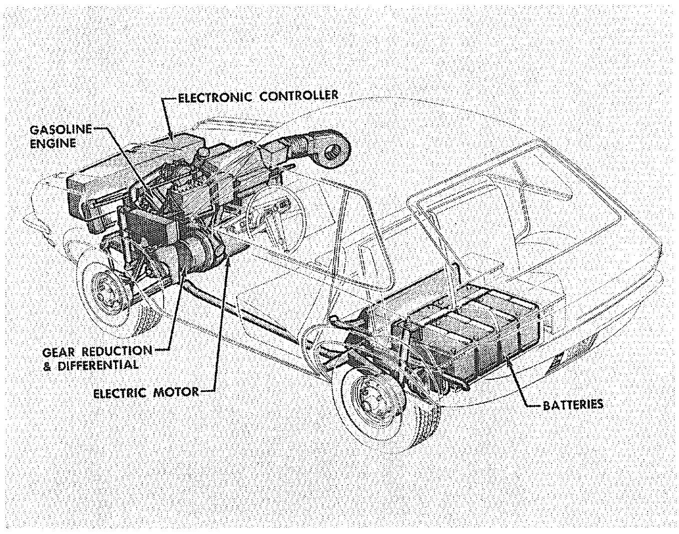
The hybrid power plant—now in the mockup stage—consists of a two-cylinder, opposed, water-cooled engine of 35-cubic inch displacement, a d-c series wound electric motor, a flywheel alternator for recharging batteries, six 12-volt batteries to provide a 72-volt system, an electronic control system, and an on-board charger that can be connected to an external 115-volt a-c source.

The transmission system consists of two gear reduction units, both providing a 5:1 reduction to axle speed. A planetary system transmits power directly from the coaxial electric motor to the drive shafts on the front wheels. Power from the gasoline engine is transmitted through the second gear reduction unit which is a worm gear arrangement.

The XP-883 operates in either an all-electric or hybrid mode. In either, it is accelerated from 0 to 10 miles per hour by the electric motor. At that speed in the hybrid mode, the gasoline engine starts and provides the power for steady speed operation as well as power to recharge the car's batteries. Both power plants are automatically combined for acceleration.

The vehicle has an independent rear suspension. The battery system is located in a box beneath the rear passenger seat and between the rear wheels. An inte-

The non-running model of XP-883 commuter car is designed to carry two adults in front and two children facing the rear. The vehicle could utilize gasoline, electric, or hybrid gasoline-electric power systems.



grated heating and engine cooling system uses a combined core for low-speed operation. For high-speed engine cooling, a ram core radiator is provided in the front of the engine compartment.

Limited Emission Vehicles

General Motors has also designed some experimental automotive air pollution control systems. Designed to lower hydrocarbon, carbon monoxide, and nitrogen oxide levels in exhaust emissions, the systems are now being evaluated. Studies are being made on the effects of high temperature exhaust manifolding, catalytic conversion, and exhaust recirculation. All of these techniques appreciably reduce pollutants and the experimental systems confirm that the internal combustion engine can harmonize with its environment. But the experimental systems also pose fundamental problems that preclude their use in production vehicles—such problems as material availability, serviceability, durability and performance, fuel consumption, and cost.

The experimental exhaust manifold reactors (installed in 1969 Cadillac, Oldsmobile, and Chevrolet engines) basically are large-volume insulated exhaust manifolds two to four times the size of conventional manifolds. Their effectiveness depends on heat generated and retained by increasing residence time of the exhaust gases with additional air in the enlarged reactor volume to promote oxidation. This is sometimes described as an afterburning technique and it reduces hydrocarbons, carbon monoxide, and nitrogen oxide emissions to very low levels as compared with uncontrolled engines. But reactor effectiveness is offset by a number of problems including:

1. Operating at temperatures that may go as high as 2300 degrees (F), which melts ordinary materials, reactors require high alloy stainless steels, ceramic, or other expensive high-temperature materials. Otherwise, durability is severely limited by temperature extremes.
2. At least in two instances, their effectiveness involves enrichment of the air-fuel mixture, raising fuel consumption from 16 to 23 percent. Even in one system utilizing lean carburetion, consumption is 8 percent higher than in a comparable standard engine.
3. Retarded spark timing increases fuel consumption and engine heat and the systems generally raise tailpipe temperatures from 500 to 1300 degrees (F).

The experimental system in the Cadillac utilizes engine coolant to heat the intake manifold. It has a high capacity system for injecting air into the exhaust manifold, requiring two air pumps. It requires rich carburetion that adds to fuel consumption (increase of 23 percent as compared with the standard Cadillac engine).

The reactor system in the Chevrolet also uses engine coolant to heat the intake manifold and operates best with a carburetor which has an over-rich calibration. A high capacity air injection pump sustains luminous oxidation of hydrocarbons and carbon monoxide.

The experimental system on the Oldsmobile features lean carburetion with a smaller reactor than the other two cars and does not require an air pump. With a lean air-fuel mixture, oxidation of pollutants is achieved by oxygen in the exhaust stream. Carburetor heat comes from an external exhaust crossover and the air intake is preheated from the exhaust manifold. Ignition timing is retarded. Although the fuel consumption increased by only 8 percent above that of the standard Oldsmobile engine, the experimental system imposed poor part-throttle response on the engine. An improved fuel metering system is needed to overcome this problem.

Catalytic control of exhaust emissions was installed on a 1969 Chevrolet with a 427 cubic inch V-8 engine equipped with a General Motors Air Injection Reactor emissions control system which includes an air pump to supply air to a point near the engine exhaust ports. The special Chevrolet also had a catalytic converter and its exhaust pipe is insulated to maintain high exhaust temperatures. The converter itself is similar in dimensions to a converter developed experimentally by General Motors in 1961. It is approximately 23 inches long, 10 inches wide, and 5 inches high. Its precious metal catalyst was supplied by Universal Oil Products.

Although the metal catalyst was very effective with unleaded fuel in reducing hydrocarbons and carbon monoxide, its development at this time is hampered by three unsolved problems:

1. The system required either non-leaded fuel or a lead-proof catalyst. Non-leaded fuel suitable for today's engines would require a more expensive refining process than the use of tetraethyl additives at the same octane rating. Presently no lead-proof catalyst has been developed.
2. Use of a precious metal catalyst precludes a large enough supply to meet the automotive demand at a reasonable cost.
3. The catalyst may be damaged by high temperatures and catalyst may be lost by attrition.

Another vehicle featured an experimental oxides of nitrogen control system, designed in a modified 1969 Buick engine. The system recycles about 2 percent of the exhaust gases through the engine intake at the base of the carburetor. This lowers engine peak combustion temperatures, resulting in less oxides of nitrogen formation in the combustion process. Although the system recycles reduced oxides of nitrogen, it has little effect on the reduction of either carbon monoxide or hydrocarbons and it poses several unsolved problems:

1. Control system effectiveness deteriorated rapidly.
2. Vehicle driveability was reduced because of unsatisfactory part-throttle response and cold engine idle.
3. Excessive carburetor deposits accumulate.

All of these General Motors experimental cars suggest that work is indeed being done on advanced concepts of the internal combustion engine and alternate power plants with environmental realities in mind. Automobile manufacturers are becoming concerned with emissions, improvement in urban congestion, and vehicle safety.

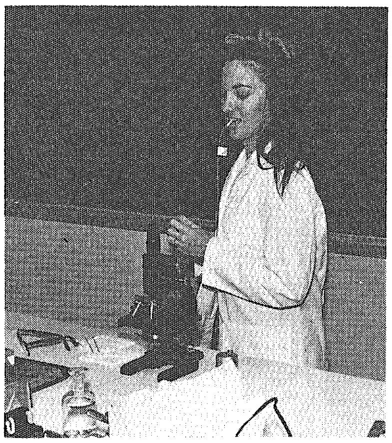
MISS JANUARY

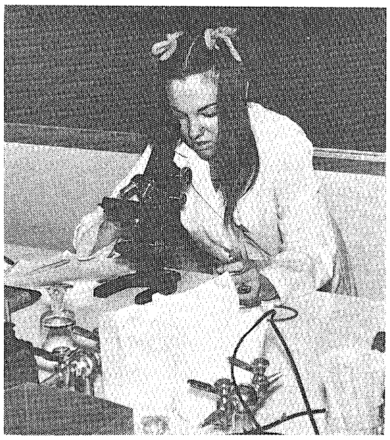
Ruth Hughes

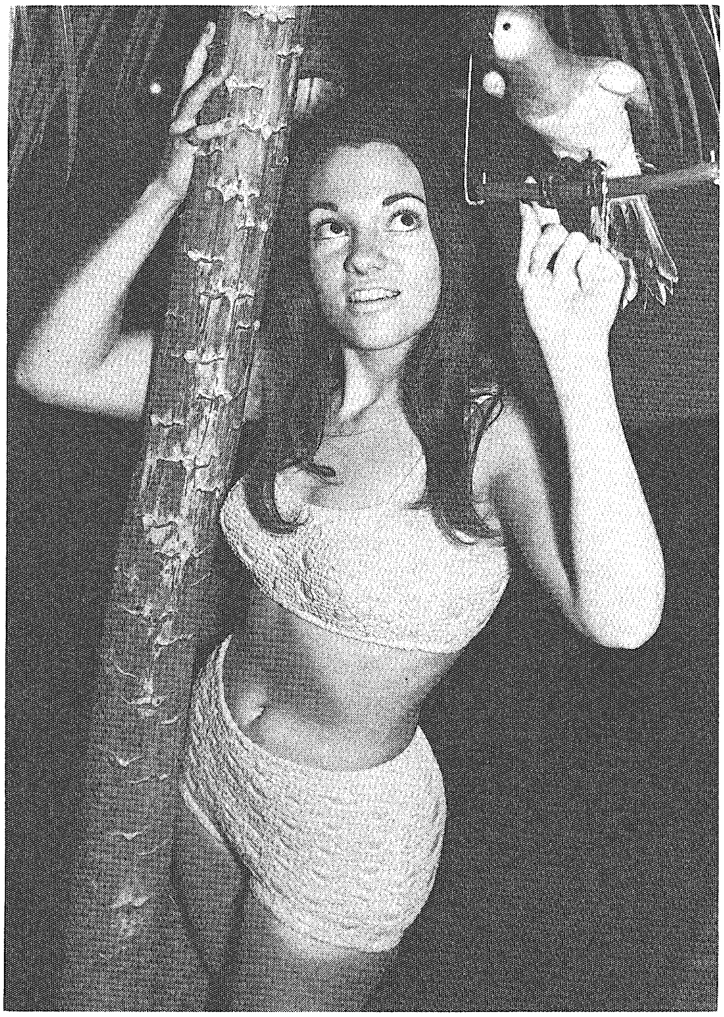
Ruth, a junior in medical technology, prefers to be called Sam. She was awarded this nickname when it was discovered that she can wiggle her nose like Samantha on "Bewitched", the television show. She can't perform magic yet, though.

Sam thrives on sport cars and rallies—when given the opportunity. She actually understands these sports so that she can knowledgeably "talk shop." But she's hardly all tomboy—cooking is one of her great pastimes.

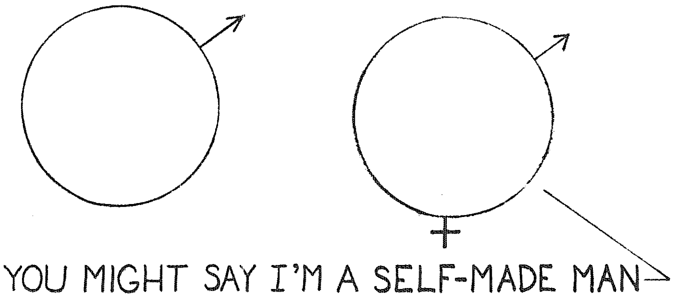
A member of both Kappa Delta, a professional organization, and Alpha Delta Theta, Sam hopes to apply her technical training in an Eastern hospital or private laboratory by the summer of '71. Until then the U of M can enjoy her presence.

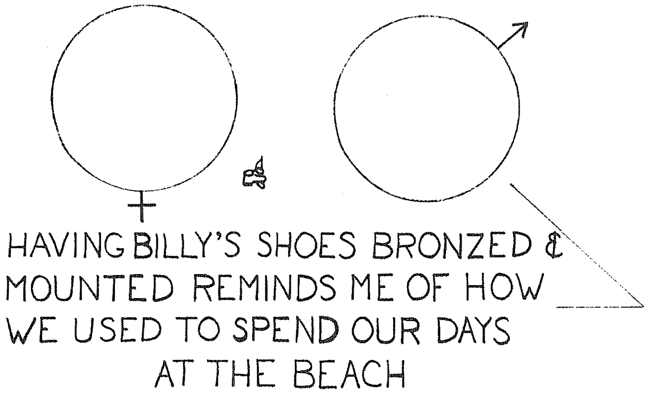


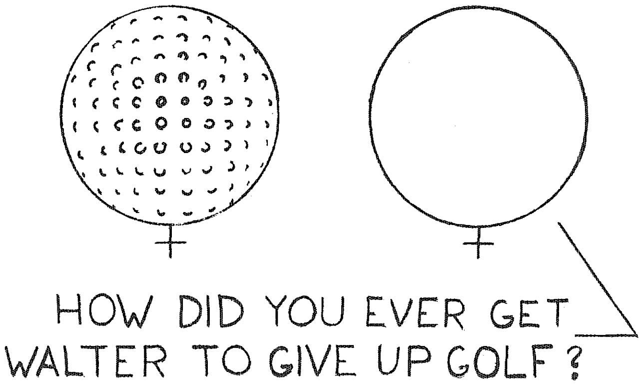




Photos by BARRY BRIDGES
and MARLIN REKOW

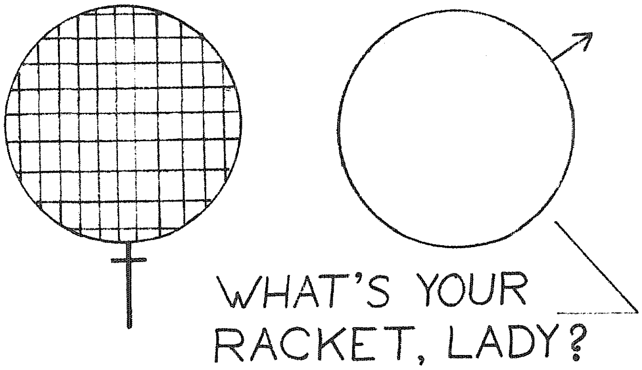


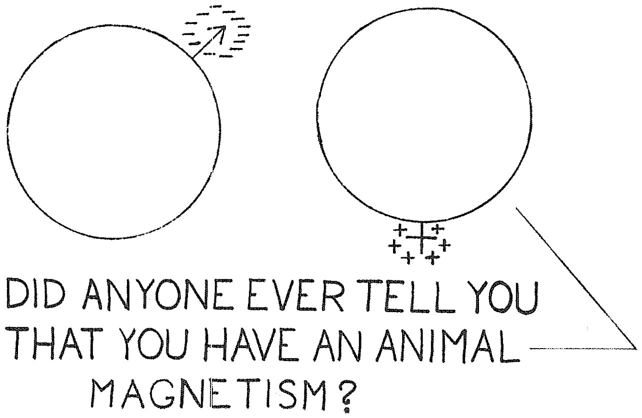




THE SYMBOL THINGS IN LIFE

by CLIF OLLILA





SPLINTERS From the Log

by CLIF OLLILA

—vilitas et crudus semper eternam

A computer saves a lot of guesswork. And so does a mini skirt.

• • •

Liquidate: Invitation to a cocktail party.

• • •

A counterfeiter is a person who gets into trouble by following a good example.

• • •

Nowadays the accent may be on youth, but the stress is still on the parents.

• • •

Then there was the coed who thought indifferent meant doing it a new way.

• • •

C.E.: "You know something, honey? I'm going to call you 'Jello' because you're so easy to make."

Coed: "That's all right, dear. I'll call you 'Oatmeal' because you're done in three minutes."

• • •

E.E.: If I told you that you had a beautiful body, would you hold it against me, Sexy?

• • •

Recently a campus Don Juan sported a button which read: "Deflower Power!"

• • •

A downtown night club marquee once read: "Good clean entertainment —every night except Monday."

• • •

Adman: "You do believe that advertising brings quick results, don't you?"

Businessman: "I should say it does. Why, only the other day we advertised for a night watchman, and that night the safe was robbed."

• • •

"Mother," said little Bobby, bursting into the house all out of breath, "there's going to be the devil to pay down at the grocer's. His wife has just had a baby girl and he's had a 'Boy Wanted' sign in the window for a week."

A shop in New York hit upon a brilliant advertising scheme—putting the names of the famous people who came in and what they bought. It worked like a charm, for the next day a certain Casanova came rushing in breathlessly and bought an expensive fur coat for his wife—just like the one he had bought earlier in the week.

• • •

There are a lot of Stone Age women running around campus, and the bigger the stone, the better they like it.

• • •

"It's not how **old** you are that counts," said the old lecher, "it's **how** you are old!"

• • •

Champagne: a beverage that makes people see double and feel single.

• • •

An old-timer is someone who remembers when it cost more to run a car than to park it.

• • •

A fellow with long greasy hair walked into a barber shop. Whereupon the barber asked, "Do you want it cut? Or do you just want the oil changed?"

• • •

The following correction appeared in a small town paper: "Our paper carried the notice last week that Mr. John Jones is a defective in the police force. This was a typographical error. Mr. Jones is really a detective in the police farce."

• • •

A young lady, with a touch of hay fever, took with her to a dinner party two handkerchiefs, one of which she stuck in her bosom. At dinner she began rummaging to the right and the left in her bosom for the fresh handkerchief. Engrossed in her search, she suddenly realized that conversation had ceased and people were watching her, fascinated.

In confusion, she murmured, "I know I had two when I came."

Smith was definitely neurotic and was generally a source of irritation at home to his wife and family. His wife attributed his difficulty to his excessive use of alcohol, but he insisted that that was not the source of his difficulty at all, and refused to listen to her counsel that he abandon it. She did, however, finally prevail upon him to see his doctor. He made an appointment with the doctor, and kept it. Much to his chagrin, the doctor told him just what his wife had told him—that the excessive use of alcohol was responsible for all of his difficulties. The doctor told him that if he hoped for relief, he would have to discontinue his drinking.

On leaving the doctor's office, Smith was terribly upset. He hated to go home and have to admit to his wife that she was right. That would merely make things even less tolerable for him than they had been. As he walked homeward, he kept trying to think up something he would be able to tell his wife without having to admit the truth. Suddenly he saw before himself a sign hanging in front of the entrance to a music hall. "Syncopation," it read. And here he found the answer to his problem. On his arriving home, Smith was asked by his wife whether or not he had seen the doctor, and if so, what the doctor had told him.

"The doctor says I have 'syncopation,' my dear."

"Syncopation!" she said. "What's that?"

"Well, I don't know how to tell you," he said, "but the best thing for you to do is to look it up in the dictionary."

His wife did—and there it was: "Syncopation — Intermittent progress from bar to bar."

• • •

English society was agog when a duke married a blonde from the Music Hall chorus. It was even more agog when a Bond street art gallery exhibited a life-size portrait of her in the altogether. The duke was furious.

"I don't know what's biting you," said the wife. "Believe me, there's nothing wrong. He did it from memory."

• • •

Headline in Oakland, California, *Tribune:* "TWO CONVICTS EVADE NOOSE; JURY HUNG!"

• • •

As Cleopatra said to Marc Antony, "Sir, I am not prone to argue."

A man picks a wife the same way an apple picks a farmer.

• • •

Mrs. Brown was complaining to her doctor that his bill was unreasonably high. "Don't forget," he reminded her, "I made 11 visits to your home while your son had the measles."

"And don't you forget," she countered, "that he infected the whole school."

• • •

A surgeon was taking a walk with his wife when a young and vivid blonde greeted him gaily. The doctor's wife eyed him narrowly.

"Where," she asked, "did you meet that person, my dear?"

"Just a young woman I met professionally," he explained.

"I see," she murmured. "Yours, or hers?"

• • •

A Hollywood agent came home unexpectedly and caught one of his biggest clients making violent love to his wife. The agent's denunciations made no particular impression on the guilty client.

"Stop sounding like a B picture, Joe," he said. "Let's treat this situation like adults. You love your wife and so do I. Let's play one game of gin rummy—and the winner gets her."

The agent considered for a moment and agreed.

"Okay," he said slowly, "but what do you say we play for a nickel a point on the side just to make it interesting?"

• • •

During the old days of New York newspapers, an editorial feud broke out between the *Sun* and the *Post*. One day the very proper and staid *Post* lost its temper and editorially called the *Sun* a yellow dog. The *Sun* replied in its starchiest manner: "The *Post* calls the *Sun* a yellow dog. The attitude of the *Sun*, however, will continue to be that of any dog toward any post."

• • •

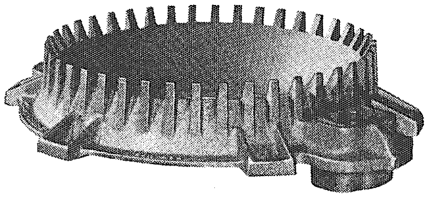
Women's styles may change, but their designs remain the same.

FREEDOM OF SHAPE...

One of the outstanding advantages of Malleable Iron Castings

Casting is the simplest and most direct way of creating form and shape with metal. Casting offers almost unlimited freedom to the designer. A cast design is not restricted by sizes or shapes of mill stock, accessibility of tools, withdrawal allowances for dies, or other limitations. Complex shapes, interior cavities, and streamlined contours, which would be difficult or impossible to create with other methods, are simple with a casting.

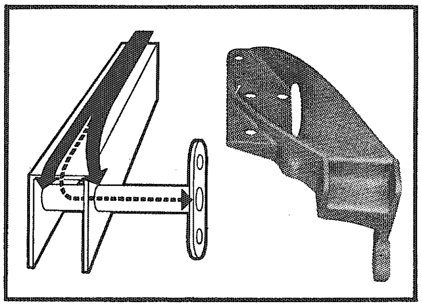
For instance, consider the complexity of creating the dozens of teeth, lugs, holes and collars on this pipe repair clamp. It would be prohibitively expensive to produce by any method other than casting. By using the casting process for economy,



and Malleable iron for strength and ductility, these clamps combine service and value.

The design freedom made possible by casting also helps to make parts stronger. Metal components tolerate loads better if they are designed to distribute stresses efficiently. Sharp corners or other abrupt sectional changes tend to restrict the uniform distribution of these stresses. The corner thus becomes a logical site of fatigue failure. In a casting, it is a simple matter to round out corners, blend sections and taper connecting members to achieve a design which will distribute stresses.

The illustration shows how stresses "set up" at sharp corners. A much smoother transfer of stresses was achieved when this part was switched to a Malleable casting (shown on the right).



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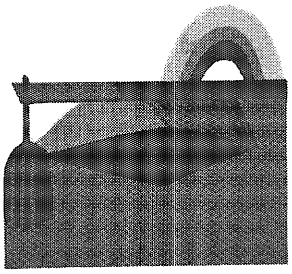
MALLEABLE FOUNDERS SOCIETY



To the grad who wants more than a fat paycheck

Your science, engineering or technical degree commands more than money from Control Data. Sure we offer an attractive salary and fringe package. But more important, you'll find yourself among imaginative people in a young, aggressive, challenging environment.

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We want engineers who want to get away from it all.

If you're the kind of engineering student who can't stand the thought of someday sitting at the same desk in the same office day after day, then you're one kind of engineer we want. The kind of engineer we want for a career in technical marketing.

Engineers in this field spend most of their time out in the field. Systems sales and application engineers are always on the go. Talking with customers, selling products and systems. Solving other people's problems.

To do that, you have to understand a lot more than engineering. You have to understand people and how to communicate with them. And that can be one of the toughest jobs there is.

Does it sound like a job you're up to? Then maybe General Electric's Technical Marketing Program has a place for you.

Or places, rather. You might start out in upstate New York. And move on to southern California. Or Atlanta. Or Minneapolis.

But wherever you decide to move with GE, you'll be learning the business. Learning in months what it takes some engineers years to learn.

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For more information about technical marketing at General Electric, please write to Educational Relations and Recruiting, Room 801T, General Electric, 570 Lexington Avenue, New York, N.Y. 10022

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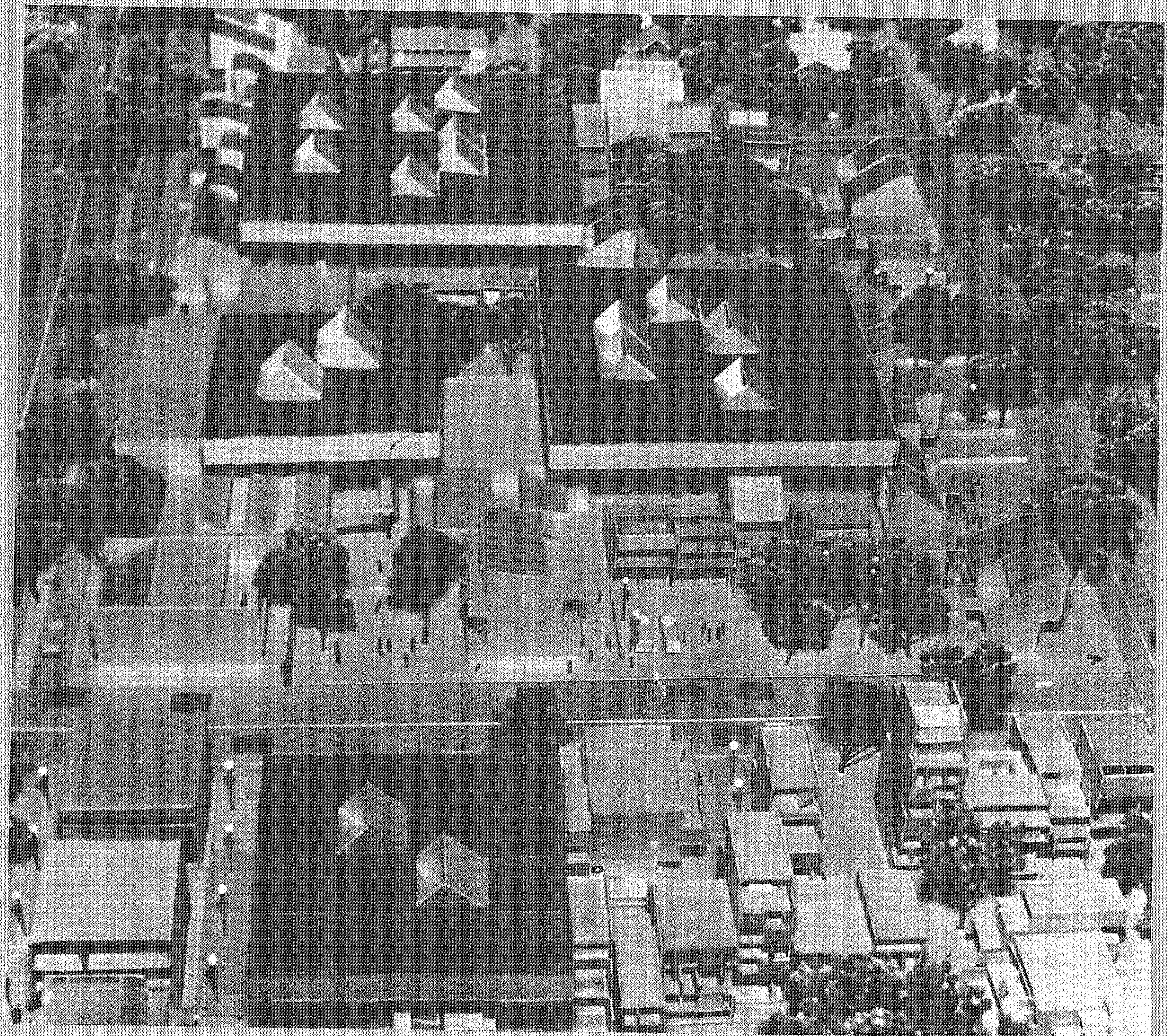
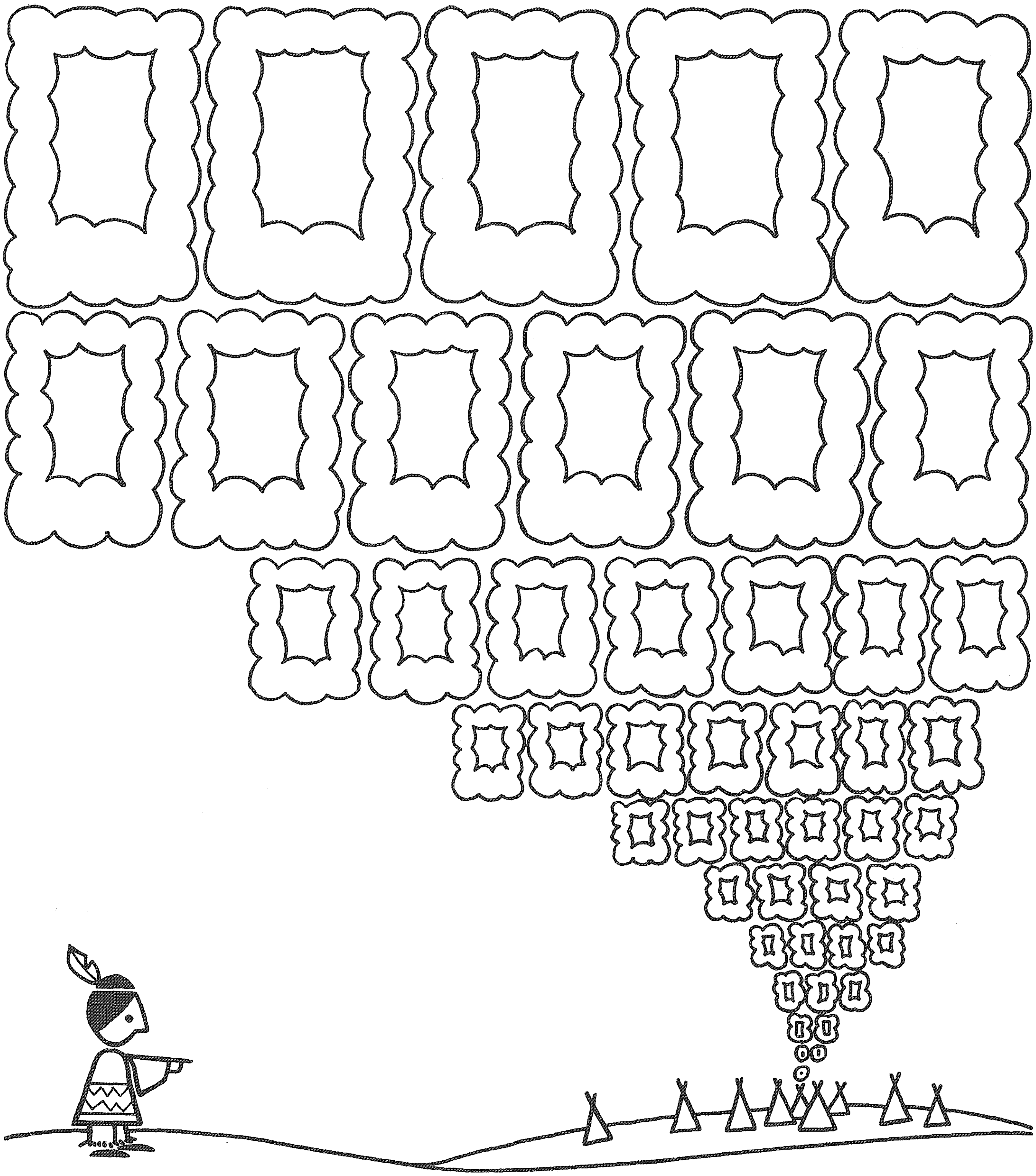
TECHNOLOG

FEBRUARY, 1970





Would you like to work for a real professional?

Would you like to work for a boss whose professional skill and judgment you can respect? That's the kind of boss you'll find at Rohm and Haas. Our managers reach their positions of responsibility and authority by demonstrating their professional knowledge, judgment, and ability to work and inspire others.

Rohm and Haas also believes in giving people responsibility for a project, along with freedom to plan and carry it out.

This freedom and professional, personal growth and achievement by Rohm and Haas managers is the primary reason for the rapid growth of our company. Rohm and Haas now has over 13,000 employees, sales of over $423,000,000 (double our sales just 10 years ago) and 7 major manufacturing locations in the United States making over 2,500 chemicals, plastics, fibers and pharmaceuticals. Additional plants in foreign countries also make many of these products.

Is there an assignment here for you?

1. ENGINEERING—Projects may include design and construction of facilities in USA and in foreign countries; preparation of process design including flow sheets and equipment specifications, estimates of investment and supervision of plant startup.

2. RESEARCH—Projects may include preparation of preliminary cost estimates and process analyses to assess the economic feasibility of a new product; pilot plant process studies; development of preliminary equipment designs; computer simulation. There are numerous assignments in applications research, investigating the behavior of new materials.

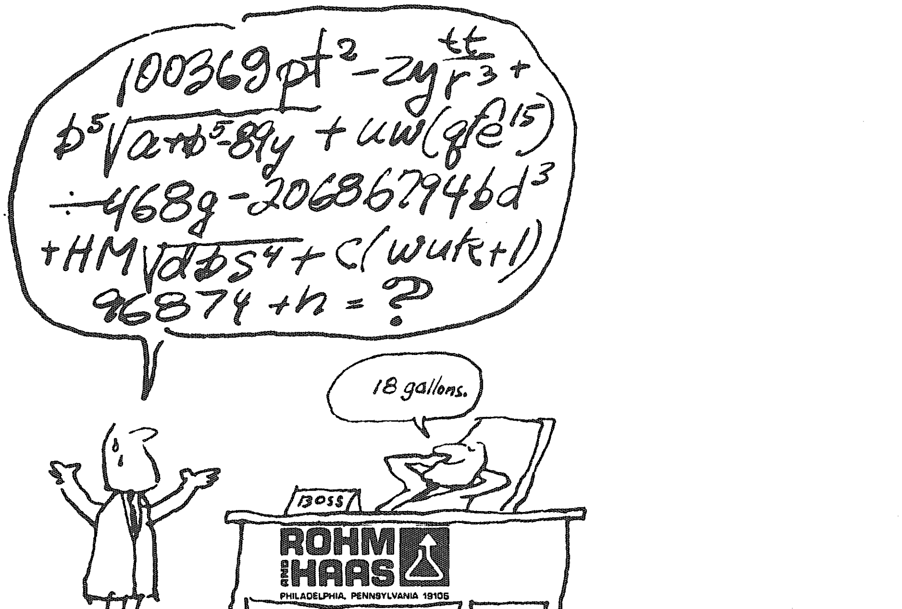
3. PRODUCTION—Technical assistance to production supervision with responsibility for technical aspects of all plant processes; optimization studies; process improvements to reduce costs and improve quality.

4. MARKETING—Sales representatives and technical advisors to customers; studies of customer processes to develop new markets and applicability of company products to a variety of industries.

Send us your resume, or talk to your placement officer. Better still, sign up for a campus interview. Indicate your area of interest and you will receive all the details you'll need for a proper evaluation.

If you write, address your letter to Manpower and Employment No. 10769, Rohm and Haas Company, Independence Mall West, Philadelphia, Pa. 19105.

Campus interview date February 24 and 25.



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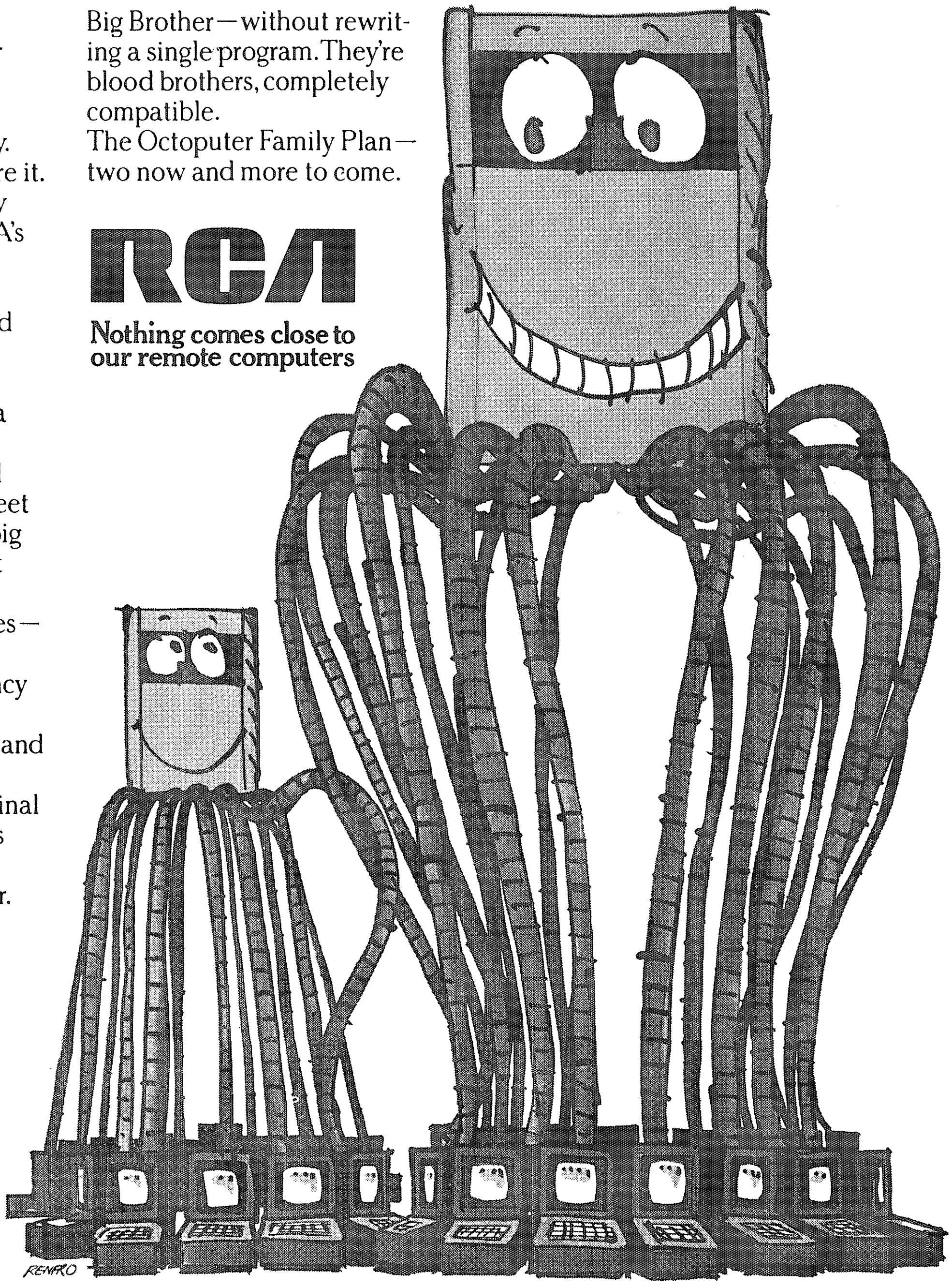
Big Brother to the Octoputer

Announcing Octoputer II. Now RCA has two remote computers that are a generation ahead of the major competitor.

Remote computing means working with your computer from wherever you are to wherever it is.
It can be yards or miles away. Hundreds of people can share it. It's the coming thing. The key to it is communications, RCA's middle name.
We started with Octoputer. It combined time sharing and regular processing in a new remote computing package. The Spectra 70/46 is first of a generation, and the best.
Once you've done it first and best, you can do it bigger. Meet Octoputer's faster, stronger big brother, Spectra 70/61. Call it Octoputer II.
Has all Octoputer's exclusives—like debugging power that boosts programming efficiency as much as 40%.
But it can tackle bigger jobs, and go three times as fast.
It can support over 350 terminal users, three times as many as Octoputer.
With a price only 30% higher.
Now you can choose the size you need. Or start with Octoputer and grow up to Big Brother—without rewriting a single program. They're blood brothers, completely compatible.
The Octoputer Family Plan—two now and more to come.

RCA

Nothing comes close to our remote computers



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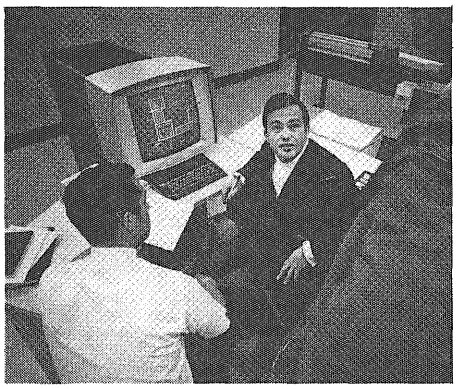
Here's what your first year or two at IBM could be like.

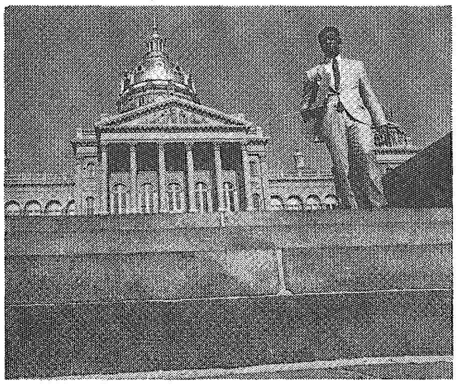
You'll become involved fast. You'll find we delegate responsibility—to the limit of your ability.

At IBM, you'll work individually or on a small team. And be encouraged to contribute your own ideas. You'll advance just as fast and far as your talents can take you.

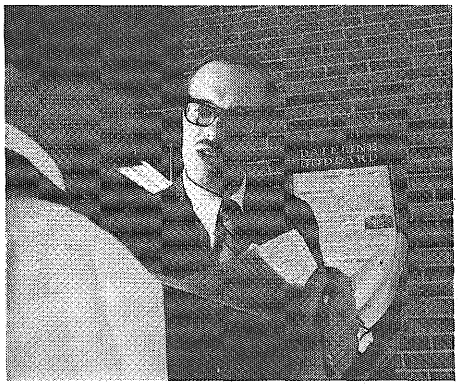
Here's what three recent graduates are doing.



Doug Taylor, B.S. Electronics Engineering '67, is already a senior associate engineer working in large-scale circuit technology. Aided by computer design, Doug is one of a five-man team designing integrated circuits that will go into IBM computers in the 1970's.



Soon after his intensive training course, IBM marketing representative Preston Love, B.S.'66, started helping key Iowa commissioners solve problems. Like how to introduce school kids to computers, without installing one. His answer: share one in Chicago by phone cable.



Soon after his IBM programmer training, John Klayman, B.S. Math '68, began writing programs used by a computer system to schedule every event in the Apollo tracking stations. And when the finished programs were turned over to NASA Goddard Space Flight Center, he was responsible for making them work.

For more information on what IBM is like, visit your placement office.

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COVER: This project for the St. Paul public schools was designed by a group of architects called "City Center for Learning" as part of an urban learning program. Photo by Marvin Vikla.

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Speaking with the Dean about • • •

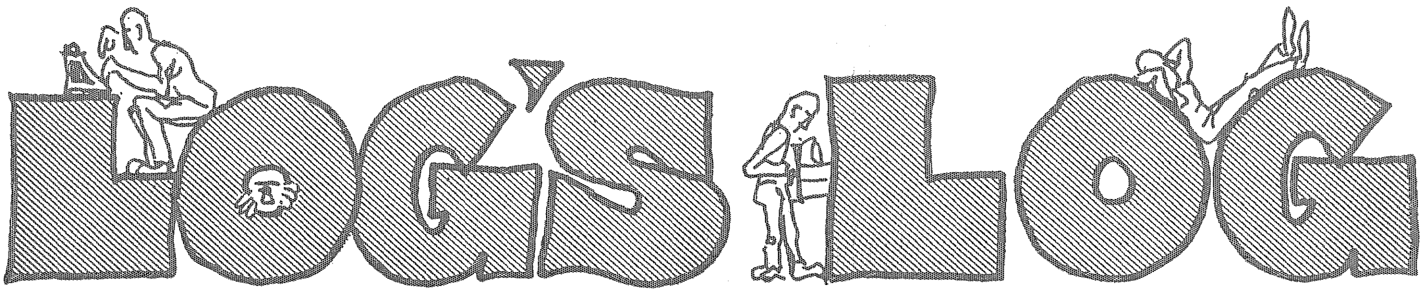
CITIES

Although most people live and/or work in cities, the major problem with American cities is that few people love them. How else can one understand the ugliness, the squalor, the general malaise affecting most cities? A city is primarily a place where the webs of our individual lives intersect and entangle with those of others. Out of these interactions grow the art museums, the theatres, the great churches and schools, even the professional sports teams (pace! Green Bay and Anaheim). These intersections produce our civilization. The civilization which we characterize as twentieth century American will not be remembered as the sum of well-tended suburban lawns or cabins in the woods but rather as New York, Chicago, Los Angeles, etc. Saying this, one also recalls that our duty is not to the future historians but to ourselves and those with whom we interact in the cities. Yet our own well-being depends on the realization that the sum of suburban dwelling places is merely a sum but the sum of urban dwelling places is a unity.

Noting the general subject of this issue of the *Technolog*, I can safely leave to others comments on the technological, sociological, and political aspects of the problems of the cities. I wish to comment only on the visual. Stated briefly, the reason most American cities are uglier and more culturally barren than their European counterparts is the lack of kings and princes. London (England) has its royal family who could commission a Christopher Wren and a John Nash to plan and produce those edifices and neighborhoods which give London its character. The French employed Georges Haussmann to plan a Paris which we now call the most beautiful city in the world. And our "Founding Fathers" had the vision to take those steps which guaranteed that the capital of our federal republic would be one of the beautiful urban concepts of the world: they hired Pierre L'Enfant to plan the city of Washington. (The sum of the architecture of federal Washington is not particularly distinguished; however, the unifying genius of L'Enfant overcomes the frailties of the architects of the individual buildings.)

The "City Fathers" of Minneapolis were faced with the same challenge as the commissioners of Nash, Wren, Haussmann, and L'Enfant when the decision was made to gut the center of downtown Minneapolis under an urban renewal program and begin rebuilding. These City Fathers failed to recognize the necessity of a unifying architectural concept and settled instead for a yellow anodized aluminum library, a three-dimensional IBM card, with the et ceteras too numerous to mention. Our democratic traditions and the need for intelligent planning of our urban centers are not mutually exclusive concepts.

Warren B Cheston



The Engen-Kehrberg Report

Introduction: By now many people have come over to ME 2 to ask what we are trying to do with the Log's Log. And would we please stop. We resent that. In fact, we more than resent it, we are indignantly displeased about it. For when it comes to writing, the E-K Report is a lot like sex. There is some that is good; some that is better; and some that is best. But there is no poor.

And then there was this friend of ours who got himself all emotionally involved with this girl whom he describes as a genuine noble savage. "Is she a Navajo?" we asked. "No," he replied. "An Arapahoe?" "No," he said, "she's a Dallas ho."

Meanwhile Downstairs . . .

The E-K Report was recently at a party where, when things got dull, the hostess suggested we all play a game. Well most of us, being game, adjourned upstairs but a few hard up souls remained in their chairs. We were informed later that they had spent the rest of the evening trying to guess the authors of famous quotations. And since we really can't tell you (in print) about our evening, we thought we may as well tell you about theirs. It's not as uninteresting as it sounds, it's more so. But for what it's worth here are some famous quotes and the people or events that caused them to be said.

Upon stumbling over an IT Co-ed: "Let sleeping dogs lie."

Upon running out of ice cream at the reunion of the Class of '69: "Let them eat cake."

Upon receiving a hearing before his draft board, Muhammad Ali said: "I'm a fighter, not a fighter."

Upon starting the tenth mile of the Bataan March: "These are the times that try men's soles."

Upon translating the Latin motto of the U of M med school: "God heals and the doctor takes the fee."

Upon Raquel Welch buying a smaller bra: "My cup runneth over." And as an aside, true happiness is Raquel Welch knocking on your door and asking to borrow a cup from your wife.

Twiggy recently revealed her chest to have been tattooed with this inscription: "This side up."

Upon becoming "qualified", the new eunuch had second thoughts about: "The unkindest cut of all."

Upon setting up a teepee of ill repute, the squaw mother said: "The buck stops here."

And finally, upon adopting a motto for their House, all the girls voted and their choice was: "The customer comes first."

The Old Pro

We figure about now it's time to say a few words about the world's oldest profession. But before you get all expected up for a spicy article on prostitution, it should be pointed out that while the prostitute is indeed a member of an ancient order, somebody had to sell her on the idea.

So the next time a guy comes around to sell you, try to recall the early beginnings of his profession. And when he turns on that electric vacuum cleaner for that amazing demonstration, just think of the product he used to sell and how much better that demonstration would be. And also pity the poor salesman. For the nature and mind of woman, eons ago, decided to cut out the middle man and hence men turned to the vacuum cleaner. Not the same, but at least it does do what you want it to, when you turn it on.

As for woman, she suddenly found the profit in her profession undercut by amateurs, so she too expanded operations. And so today we have the Avon lady. And to be Freudian for a moment, here's how Sigmund might have looked at her: She works the streets, rings your chimes, sells her wares in houses, and doesn't get emotionally involved.

As a concluding thought we would like to relate an incident from a recent salesman's convention held in St. Paul. And this really demonstrates the historical aspect of selling. Do you know what those salesmen did? They actually bought some of their original product! Or that's how they told it to their wives.

Yes or No Thyself

As a special treat the E-K Report is below presenting the amazing but true Know Thyself Questionnaire. And after testing these questions out on the highly touted I.T. faculty, we feel that all you undergrads really have a chance to come down solid. Just remember one thing. The only thing standing between you and your image as a swinger is faulty arithmetic. Or in other words, it matters not how you play the game as long as you can score. (Score the number indicated for each YES answer)

1. Ever gone out with a member of the opposite sex? 4
2. Ever been kissed? 4
3. Ever been French kissed? 4
4. Ever been kissed while in a reclining position? 5
5. Ever gotten or given a hickey? 3
6. Ever been kissed in your pajamas? 2
7. Ever kissed anyone against their will? 2
8. Ever parked for more than one hour? 5
9. Ever said, "I love you"? 3
10. Ever said, "I love you" to more than one person? 3
11. Ever gone steady? 4
12. Ever pinched a girl you didn't know? 7
13. Ever played strip poker with a member of the opposite sex? 5
14. Have you gone all the way? 10
15. Have you had the desire to go all the way but managed to keep from it? 2
16. Have you ever made a member of the opposite sex cry? 4
17. Has a member of the opposite sex ever made you cry? 4
18. Do you smoke? 2
19. Do you drink? 2
20. Ever passed out from drinking? 6
21. Ever lied to your folks about where you went or with whom? 8
22. Ever smoke pot? 7
23. Ever taken an LSD trip? 10
24. Ever been forced to leave the state? 10

Score Chart

9 or under .... Queer or something.
10 to 15 .... Pure as the driven snow.
16 to 25 .... Passionate but prudish.
26 to 35 .... Normal and decent.
36 to 45 .... Indecent.
46 to 55 .... Headed for serious trouble.
56 to 60 .... In terrible shape.
61 or over .... Condemned.

Star Dumb

1970 marks the beginning of the Aquarian Age. But what that really means is a small mystery to the astrologically unaware. So as another one of its public service features, the E-K Report would like to offer a layman's guide to the new age.

"This is the dawning of the Age of Aquarius." What this really means is that the water carrier (Aquarius) has come of age and will now be carrying something stronger than water. But seriously, according to the experts, the symbol of Aquarius, carrying not the tools of war or strife, carries into the '70's truth, justice and peace for all. That is the theory or should we say, the hope.

But let's see how it fares by taking a closer look at how it all began. You know the age has dawned, "When the moon is in the seventh house." That is horoscope talk. And translations cost money. But for free, the E-K Report puts it into 1970 English. First we must identify the moon by its proper astrological name (i.e. Apollo). And if you will recall, the mission of Apollo 11 was the first landing on the moon. And Aquarius is the 11th sign of the zodiac. Now the seventh sign of the zodiac is Libra, the balance. And so Apollo goes to the seventh house (Libra) and tips the balance in favor of truth, justice, and peace. Unless what happened last year, happens again. It seems that Apollo took a rather extended layover at the sixth house (Virgo, the former) and arrived at Libra's too late to affect the balance.

Another indication of the dawning is, "When Jupiter aligns with Mars." Now as everybody knows, Mars is a candy bar. And it is the favorite candy bar of Isaac Jupiter of south Minneapolis. And when Mr. Jupiter queued up to see "I Am Curious, Yellow", he got in line with a Mars bar in his pocket. Hence the prophecy fulfilled. That may seem a little far out, but it's straight from the stars (of "I Am Curious, Yellow").

Official Daily Bull

And as you stare at a grade slip full of flags or an insoluble physics problem or an icy Tri-Delt, just remember the anxious words of James Bond, "With the number I've got, the Draft is sure to get me." And if you think he's got it bad, just think what happens down in the Valley when the Jolly Green Giant goes up in the mountains to relieve himself!

And an interesting side-light to the case of the couple who unsuccessfully sued for child support from their druggist when he mistakenly dispensed aspirin instead of "the pill", is this sour grapes comment from the new father: "She labors for 2 hours and I labor for 20 years."

February 16-28

16—Nudists Unlimited, Minnesota Branch (NUMB) clothe up International Falls Chapter Day.
19—Long Distance Call Girl Day. It's cheaper after 7. (If you don't mind being 8th.)
22—250,000 march on Washington. George in fair condition at Walter Reed.
27—Tiny Tim's Fruit of the Loom withers on the vine Day.
29—Never on Sunday Sunday.

March 1-15

1—Paternity Suit Day. Ask for one with a vest.
4—Buy a Louis XIV commode. Have a royal flush Day.
10—Gen. Electric, U.S. Army Ret., urges the use of gas Day.
12—Become an engineer with Bell. Do as you're tolled Day.
15—Bare Back Day. Horse around.

Conclusion: It was recently announced that the Department of the Interior plans a drastic updating of several of this country's most famous monuments. Stung by recent criticism that included a Planned Parenthood picket line around the Washington Monument, Winsome Walter Hickel has proposed the following changes. The first step in modernization is a mini skirt for the Statue of Liberty. The Secretary stated however, this was dependent upon finding a pair of panty hose, size 182 long. Other plans call for adding Eldridge Cleaver to Mt. Rushmore and an "Afro" haircut for Uncle Ben (of converted rice fame). And a blond wig for soul mama Aunt Jemima too. And like the rough-hewn Alaskan (millionaire) he is, Sec. Hickel justified the above changes with this egregious remark, "It gives our boys in Viet Nam something to fight for."

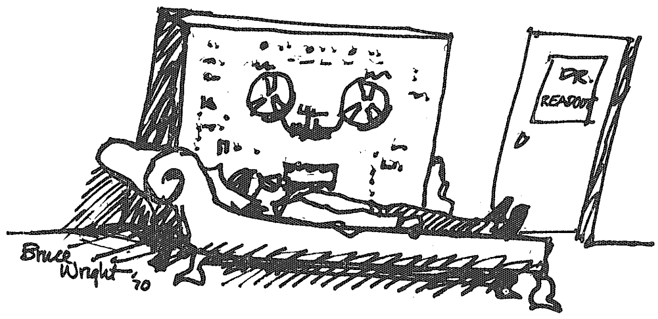
Log Line

Course Evaluation

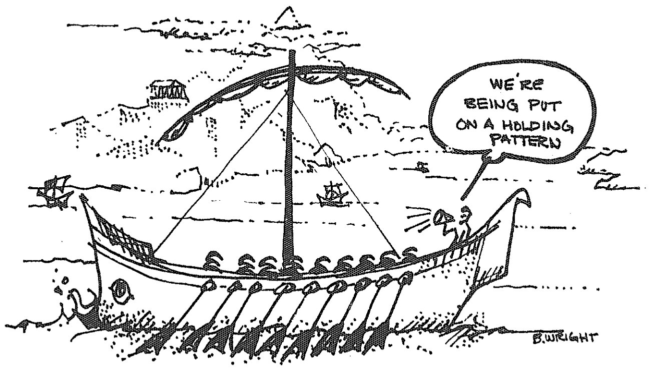
For the Tech Commission course evaluation this quarter we have a large questionnaire for you engineers to fill out. You poor overworked slobs will be sitting up all night filling it out (sorry, no slide rules or log tables allowed). We hope you will release all your pent up frustrations on this questionnaire since it goes directly to your instructor and counts for half of your grade. Now, if you are really interested in all this guff, read on.

The Tech Commission started a course evaluation program fall quarter in an attempt to improve the instruction in IT. The fall quarter evaluation was an attempt to determine what students had to say about their courses. Contrary to popular expectation, what they said was generally favorable. This quarter's questionnaire is designed to give the instructor information that will help him improve the course and give the students a chance to tell the instructor what they like or dislike about the course. If you have any courses that you want evaluated, tell us in 114 Main Engineering or drop a note in campus mail addressed to Tech. Commission, Main Engineering.

Warren White
Vice President
Tech Commission



What seems to be the matter?



The Racer's Prayer

Our Father in Heaven
As I sit here before this race
I find it necessary to talk to you.

And if I should spill
And lie helpless upon the track
Through guidance, I ask
That you keep the others
Off of my back.

Please bless my machine
And give us strength
That we may endure
Through the entire race.

And although it is
My ever-present dream
I ask not for victory, Lord.
I merely want to survive.

—overheard at Donnybrooke
Int'l Speedway

We're not willing to waste a day of your life.

Are you?

It's tempting for a company to stockpile good people. Keep them puttering away at something or other. Often for months.

But we think that's an awful waste of time. At the crucial point in your career. The beginning.

So, the day you start working for Celanese is the day you start a productive, meaningful career. No long training programs. No red tape. You'll learn the job as you advance in it. And you'll advance just as fast as you'll let us move you along. Frankly, our plans for the future won't let us waste talented people by keeping them stuck in a slot.

If you have a degree in chemistry, chemical or mechanical engineering, industrial engineering or accounting, we have a lot to offer you. Like interesting projects. Rewards based solely on performance. How far you go, of course, depends a lot on you. On your ability, imagination, and a little plain hard work.

If this sounds like a company you'd like to work for, please write to: John Kuhn, Manager of University Relations, 522 Fifth Avenue, New York, N. Y. 10036.

CELANESE

An equal opportunity employer

THE CITY IN CRISIS

As engineers and scientists, we must solve society's technical and social problems. These pages do not give unalterable answers but present some problems and some solutions.

by RODGER WHIPPLE

Our attitude toward nature implies a specific attitude not only toward man but also toward the city. The wilderness boys bristle with indignation when told that the city has been the seedbed of all human achievements. Most nature-worshippers see the man-made world of the city as artificial, stifling, and dehumanizing. They want to get close to nature, unite with it, and become "natural."

It is true that cities are built by nature-taming races. The city has been the general headquarters of the battle with nature. It even seems plausible that the domestication of animals and plants, and particularly the evolvement of the fabulous varieties of vegetables and fruits, originated in the city. The same is true of pottery, metallurgy, and the elaboration of other crafts.

Who ever heard of anything new conceived and invented in a village? Man's greatest achievements were conceived and realized, not in the bracing atmosphere of mountains, plains, and forests, but in the crowded, smelly cities of ancient Mesopotamia and Egypt, and in Jerusalem, Athens, Florence, Amsterdam, London, Paris, and New York.

Men who live close to nature have little occasion to experience continuous progress toward something new and better. What impresses them rather is the recurrence of the old, the endless repetition of similar events. In the village there is a concern with security rather than adventure.

To develop his unique potentialities, man had to cut himself off from nature, and it was in the city that he cut himself off, not only from the non-human cosmos, but also from clans, tribes, and the other primitive modes of organization. Moreover, the city is a place where people of different bents and pursuits rub shoulders, where minds are cross-fertilized, and where is found the concentration of circumstances which prompts people to ask new questions, tinker with new possibilities and combine familiar elements into new compounds.

Thus for millennia, man dotted the face of the earth with cities, his most fabulous invention, havens of welcome for strangers, nurseries of the human spirit, stages for pageantry and high drama, cradles of freedom, art, literature, science, and technology.

The tragic paradox of our time is that just when our mastery over nature has reached unprecedented proportions, our cities are falling into decay. In the past, cities decayed because they lost the battle with nature and could no longer support themselves. Our cities are decaying at a moment when our victory over nature around us is almost total, and affluence is widely diffused.

We suddenly find ourselves battling nature in the cores of our affluent cities. It is inside our cities just now that nature is striking back at us, pushing us back into the jungle, and turning us into primitive savages.

Eric Hoffer

The people-moving capability of our cities is gasping for air under the weight of the inefficient, money draining, public mass transit and the two-car-in-every-garage suburban sprawl.

As everyone these days knows, the transportation in our cities is a mess. This transportation crisis was brought on by the affluence our citizens have gained since World War II, an affluence that puts two cars in every suburban garage. But the technological revolution which made affluence possible has done nothing for our old fashioned cities. Consequently, the grid pattern of our streets that is helpful for real estate development gets clogged with traffic every work day, and because the people prefer the convenience of their automobile, the mass transit system lies practically idle at all times except during the rush hours. In general, we are making scientifically poor use of our technology and facilities.

What is happening to our public and private transportation systems? Why is the former losing money and will continue losing money? Why is the latter creating havoc in the city? We have failed to adapt to the automotive age and have failed to keep progressing with the realities of public transportation, especially in the less dense cities. This trend is not about to reverse itself as more people move out to the suburbs to get away from the city congestion. The suburbs themselves are automobile oriented; in many suburbs there is no inter-suburban public transportation, or even suburb-to-city public transportation.

Adding to the problem of city traffic congestion is the lack of facilities for handling the daily auto influx. Not only is there lack of limited access highways for fast travel but there is also a lack of parking facilities. Granted, there are expressways in the cities but these are largely built for ease of entering and exiting. Hardly any provision exists for ease of short distance inter-city automobile travel. Timed stop-and-go lights help alleviate this problem but they are only capable of handling a certain volume of traffic—a volume which is far below the rush hour peak loads. Cost of highway modernization is practically prohibitive, permitting only necessary improvements.

Yet with the ever-increasing use of city streets, the public mass transportation facilities are carrying only half as many passengers as they were in the pre-war period. This also arises from the flight of the people to the suburbs. Because the mass transit lines cannot match the convenience of the automobile, and cannot operate profitably in low density areas, they are in financial difficulty. The only area of mass transit that looks reasonably bright is buses. But bus lines, which cut costs by operating on public highways, add to the general traffic congestion and are affected by traffic tie-ups.

The traditional rapid transit carriers, whether commuter, subway, or elevated rail, are all affected by the high cost of maintaining service during off-rush hours. These carriers do

When we organize and run our cities better, new technical systems, better than the San Francisco Bay Area Rapid Transit (BART) system, will solve our transportation problems.

With all the difficulties that metropolitan transportation is facing, it does not mean that efforts are not being made to correct the problems. Urban expressways, off-street parking, and truck and bus terminals used for consolidating truck and bus unloading operations are part of the effort. Unfortunately there are problems for which no action is being taken. First, there is no concept of the relative roles private automobiles and public carriers play in the total transportation picture. Second, there is no satisfactory policy dealing with the methods of finance of transportation systems. Third, there is no organizational coordination: each sector of the system is operating in a vacuum.

The biggest problem facing the transportation system is money. For rail transit, there is the dilemma of whether to subsidize or to make transit lines self-supporting. If the city finds it necessary to support the rail transit to maintain service, it soon finds itself dumping vast amounts of money into the system, imperiling its own financial condition. On the other hand, self-support is not feasible if the transit lines are to retain and maintain a flat rate fare. If the lines are to support themselves, they must begin to charge more money and on a distance traveled basis. However, the former means loss of customers while the latter complicates fare collection. Other means of finance that appear feasible, but are perhaps unfair, are a general tax support, from not only users but also non-users who are affected only indirectly by mass transit systems.

If the transportation crisis is to be solved, then the transportation systems must be effectively organized and coordinated. In many cities, there is more than one agency that has control over the same facility. In New York City, the Port of New York Authority, the Transit Authority, the Triboro Bridge Authority, and the state agency that runs the Long Island Railroad are all connected with transit. Adding to the New York transit problem is the size of the metropolitan area, an area which covers parts of three states.

In some places, like the San Francisco Bay area, the city governments have decided to actively support a mass public transportation system. As as much as fifty percent of their business during the rush hour but they must pay personnel and maintain equipment 24 hours a day.

Transit lines face the additional problem of rising operation costs versus a fixed income. Any attempt to raise fares usually results in a reduction of passenger volume. To add to their woes, many transit companies are finding themselves the victims of practices dating from more financially successful days—practices such as reduced fares for school children and paying for snow clearance on public property. All of these problems create financial difficulties that preclude investment in new equipment and systems. Thus the antiquated conditions drive more people away, further reducing revenue. As transit companies get deeper in debt, they must either be subsidized or must be completely run by the city. The city is then obliged to pour money into the system, endangering its own tenuous financial condition.

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a result, the Bay Area Rapid Transit (BART) system is being built. This will be a fast, comfortable, rail transit system. The success or failure of this system will heavily influence the future of public mass transit. If we can provide convenient service to the people, service so convenient they will prefer leaving the car home, we will have taken a major step toward a solution. But technology will have to improve before this can happen for the suburban sprawl cities like Los Angeles or smaller cities like Atlanta.

The ultimate solution to the transportation crisis will not come until there is comprehensive metropolitan planning to control density, growth, industrialization, and other factors affecting transportation policies.

The Rise and Fall of Internal Combustion Engines
Or
How Henry Ford Put This Country on Wheels

You'll remember from last year's lesson
They taught: The Technical Ingenuity of Man
was Sanctimonious.

And surely assembly-line construction
would please Providence.
The Auto gestated from hot, sweaty, grease pits.
A four wheeled contribution to the USA.
(Quite a contribution to Henry Ford, too.)

Before:
(The Redwoods are going,
Passenger Pigeons are gone.
When was the last time you saw a Butterfly?)

We've saved some Redwoods
Few Buffalo have escaped
Passenger pigeons are extinct.
But a Memorial was built
to assuage a conservationists conscience.
We won't let that happen again.

Except those greedy gusher searchers
Who've got
to get the oil ("Santa Barbara's unique tourist
attraction is its unusual black beaches.")
to get the gas
to run the car
to a filled parking lot
to make more exhaust
until we're exhausted.

But we still love you
Henry "Maverick-Mustang" Ford.
A car in every garage makes you sooty-rich

So, get those monuments ready.

Water, air, thermal, aural, and visual pollution is the illegitimate child of competitive industry and free society which is adversely affecting our lives.

Of the deadly five pollutions, water pollution is one of the most obvious; a glance at your favorite fishing lake or at the local stream will probably show a layer of oil, detergent, or sewage covering the surface. Except in the wilderness, it is difficult to find pure water. Even in these sanctuaries, pollution is beginning to spread. The oceans are becoming polluted, as the coast lines have been for years. Cleveland's Cuyahoga River is the best known of the polluted streams, because of the fires it has had. Other rivers like the Passaic and Raritan in New Jersey are open sewers receiving wastes from industrial firms and cities. The Great Lakes are all polluted to some extent, Erie the most and Superior the least. In spite of the relatively unaffected and therefore salvageable state of Lake Superior, the government still allows mining companies to dump waste material into the water. Water pollution is upsetting the ecology of our waters, destroying game fish and permitting garbage and parasite fish to live. On a long term basis, an upset of water ecology will disturb all forms of life.

On a clear day what air traveler has not seen pollution shrouding our metropolitan areas? Air pollution directly affects the health of the city resident because that is where it is most prevalent. In New York City, when a temperature inversion layer holds airborne pollutants next to the ground, health officials have noticed a disastrous rise in the incidence of respiratory ailments, accompanied by a rise in the number of deaths.

Aural pollution or noise pollution, while often blatantly noticeable is also insidious. The roar of a low flying jet arouses storms of protest from the suburbanite who lives in an airport approach pattern; but when that same complaintant goes to work at his city office, not a whimper does he make about the continual din from the city streets and construction sites. It is this latter noise that sneaks up on a person. Studies have indicated that the decibel range that is normal for a city street during the working day will make the average person tired, tense, and irritable. This strenuous condition lowers the working efficiency and morale, and probably does not help domestic tranquillity. Prolonged exposure to the average street decibel level statistically leads to insanity at the worst, and deafness at the least.

The extent and effect of thermal pollution is relatively unknown, but its existence is not doubted. The heat that is generated and given off by a city is possibly large enough to have an effect on weather conditions—an effect that could turn a productive area into wasteland. In summer, however, we do know that thermal pollution, mainly air conditioner exhaust, besides increasing the discomfort of the urbanite, raises surrounding air temperatures which in turn cause the air conditioners to work harder thus turning out more heat. Thermal pol-

The best way to fight pollution is with legislation because industry will rarely eliminate it on their own.

The solution to stopping pollution is to fight it with legislation, but the problem is complex. After all, what can Missouri do about cleaning up the Mississippi when Minnesota, Wisconsin, Iowa, and Illinois all pollute the water before it reaches Missouri. However, because they cannot stop pollution from flowing into their state does not mean that they must add to it. In general though, where pollution is an interstate problem, the federal government must enact legislation to ensure the well-being of its citizenry. However, the city and state can lead the fight by enacting their own stringent legislation. One example of this is Minnesota's fight with the Atomic Energy Commission for stricter standards of pollutant emission controls for an atomic power plant.

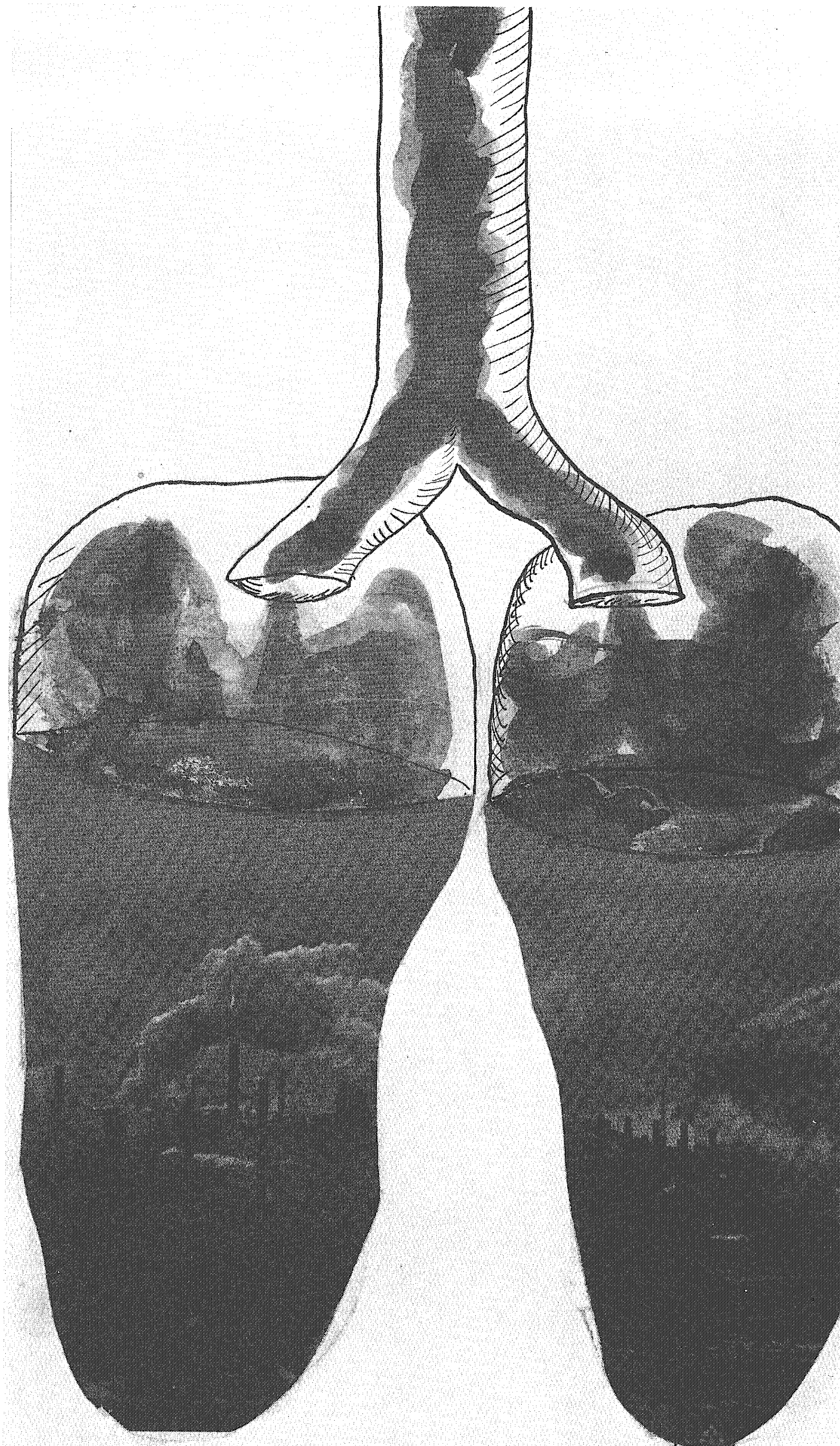
Before legislation can be written prohibiting industry from polluting water, city governments must stop dumping their own raw sewage into public waters. Many city governments cry out at the terrible condition of their waterways but they do not eliminate their own contribution to the problem. There are no reasons for not enacting restrictive legislations; the problem lies with our rural dominated legislatures who do not have a feeling for the concerns of the city. Until his water is unclean, the rural legislator will listen to, and agree with the industrial lobbyist.

As in water pollution, air pollution in an interstate problem. The refineries in New Jersey pollute New York's air one day and the next the airborne industrial pollutants choke the New Jerseyites. In this case, the two states must get together and work out a mutual plan for stopping the pollution. However, if they cannot, they can still eliminate much of the problem by getting rid of their own pollution.

In New York City, a citizen's league has been formed to investigate the cause of, and solutions to, noise pullution. They have come to the conclusion that the level of noise can be cut by modern technology but because of the increased costs, the operators of noisy equipment will not install muffled equipment unless forced to do so by law. Of course, if everyone was forced to muffle their equipment the added cost would become minimal.

The problem of thermal pollution will be difficult to solve until we know lution is also at work in the rivers, where, for example, power plants dump in clean but warm water which raises river temperatures and upsets the ecological balance of the river.

The fifth pollution, visual pollution, includes billboards, litter, auto junkyards, and all the unsightliness Mrs. Lyndon Johnson fought against while she was First Lady. Visual pollution works quietly on people. We may not see a direct cause-effect relationship between it and the health of our cities but visual pollution undermines the morale. Somewhat like the adage of clothes make the man, neighborhood cleanliness helps citizens by instilling pride. If a citizen lives in a rundown, junky neighborhood, he probably makes no effort to keep his yard and house clean. However, from a more practical, financial standpoint, auto junkyards, billboards, and litter lower property values. After all, how many auto junkyards do you see in an upper-class suburban neighborhood.



its extent. However, thermal pollution of water by industry can be regulated more closely, just as air conditioner exhaust can be.

Visual pollution, like the other five pollutions, can be controlled by legislation, but here the people can do and have done more on their own. In many cities, neighborhood beautification campaigns have resulted in clean vacant lots that had been used for dumping, clean yards, painted buildings, proper city sanitation service, and children educated in the pride that comes with a clean neighborhood. The beautification programs of Mrs. Lyndon Johnson, while not as far reaching as necessary, have helped the cause, but better, more efficient controls are needed, especially on the state level.

Police, sanitation, telephone, and power services can break a city because continual unsatisfactory performances from any of them will drive people away from the city.

The public services directly affecting all the people are crucial to a city's well-being. Total discontinuation of any service returns the people to a primative condition from which they must fend for themselves.

The urban police forces have come under increasing attack for their conduct, especially in regard to handling minority groups. In most cities, the police have not received higher education prior to joining the police force; they are returning war veterans and they are from the lower or lower-middle class. These factors combine to breed a lack of toleration for ethnic minorities and for political dissenters. The National Commission on Violence, in its investigation of conflicts in Chicago and Cleveland, determined that neither the police leaders nor rank and file members exercised the restraint that could have prevented violence. In other documented cases, police have not shown good judgment in handling racial violence or war protest demonstrations. The police, in their enthusiasm to uphold the letter of the law, and often the spirit as they see it, react rather than act. They are more concerned with the protection of property rather than the protection of lives. Police contact with political issues is not the only area where police behavior needs improving; police still take money from organized crime and wink at regulation violations by their fellow officers.

A major complaint of the blacks and other residents of low income city neighborhoods is the poor sanitation service they receive. Their complaint is usually justified because in low income neighborhoods, snow removal priorities are lowest, garbage pickup is sporadic and incomplete, and city repair service is almost non-existent. The city is delinquent in its efforts for two reasons: the tax support comes from the middle and upper class areas and the residents of the middle and upper class neighborhoods are organized with channels of communication for protesting inadequate services.

A New York ad agency recently placed a full page advertisement in the New York *Times* listing all their employees and their office phone numbers. The accompanying text explained the action was taken because the New York Bell Telephone Company left the agency out of their latest edition of the phone book. In the same area of New York, a half hour wait for a dial tone is not unusual. Other complaints include poor connections, terrible repair service, and general time delay in all services. The cause of these communication problems was a poor estimate by the telephone company of future phone needs. Consequently, the company did not budget for or train enough service personnel, or expand their facilities to handle the

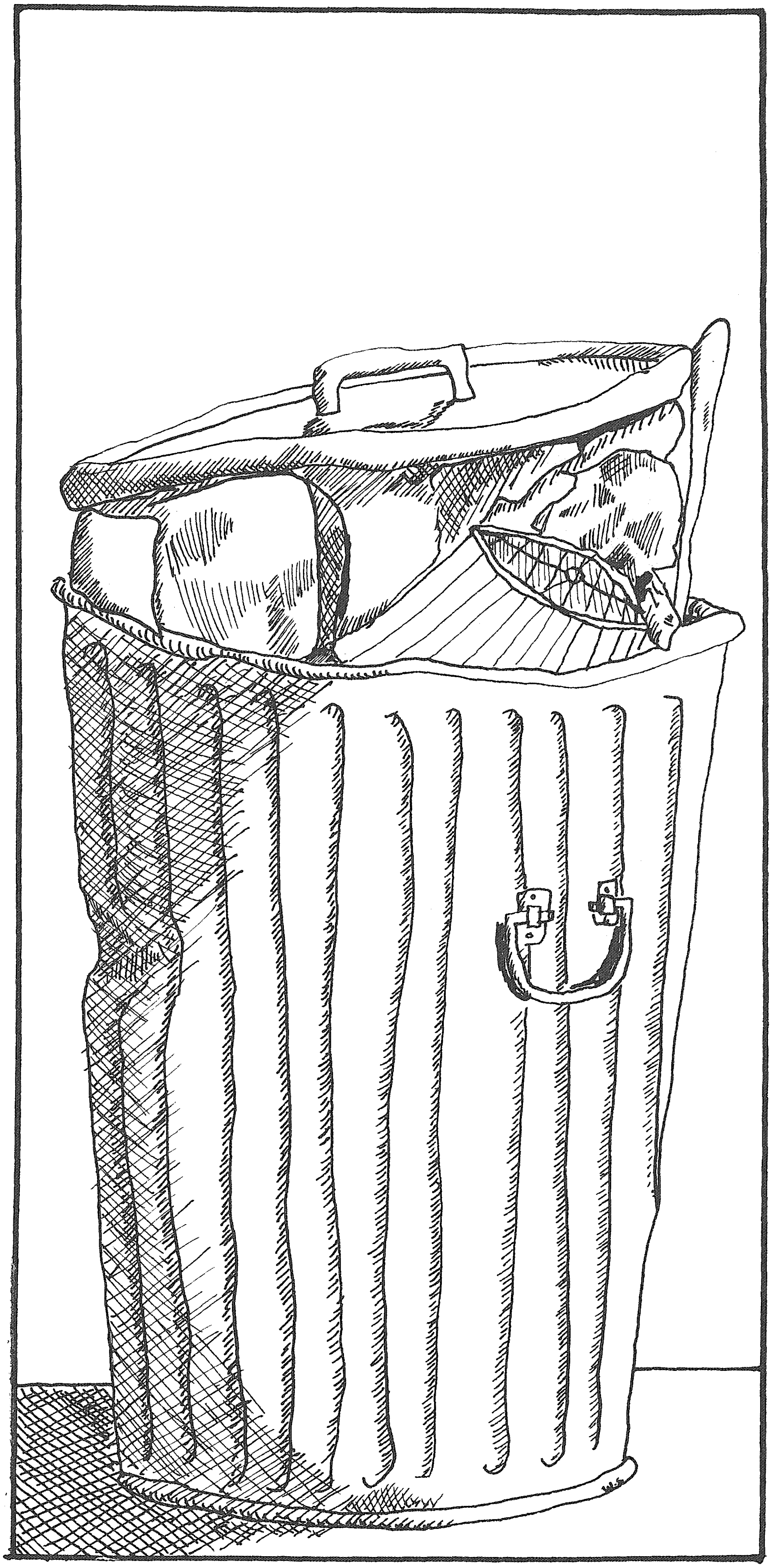
Good planning, unbiased service, and money will solve the crises in public service.

We must control our police departments and run them more effectively. The first step to a better police force is more pay for the police. This course of action was advocated by, among many others, Eldridge Cleaver when he pointed out that a cop was not going to take a bribe or mistreat someone when that action would jeopardize a substantial income. Starting a policeman on a pay scale that puts him near the official poverty level, will not attract competent, educated men. Higher education is essential for policemen if we expect them to deal with people in an intelligent, qualified way. While education is not guaranteed to eliminate prejudice, it might expose the future policeman to ideas other than those he grew up with, as most students find that after four years of college they have become more tolerant. But if we cannot eliminate an officer's prejudices, we must at least teach him to suppress his opinions while on duty so that he acts with fairness toward all groups. However, it is difficult to teach him to do this if his superiors encourage him by discriminatory practices against minority groups. Honesty and fairness at the top levels will prevent corruption from spreading downward through the ranks. The leaders must also exert themselves in the area of community relations. Some cities, like San Francisco, had excellent community relations programs but they were abandoned in favor of flying tactical squads or riot suppression forces when the citizenry and governmental leaders saw the race riots occurring in other cities. Such hard-nosed tactics inevitably led to confrontation and conflict.

City officials are to blame for poor sanitation service, but, if they will not act, the people must exert pressure on volume of calls.

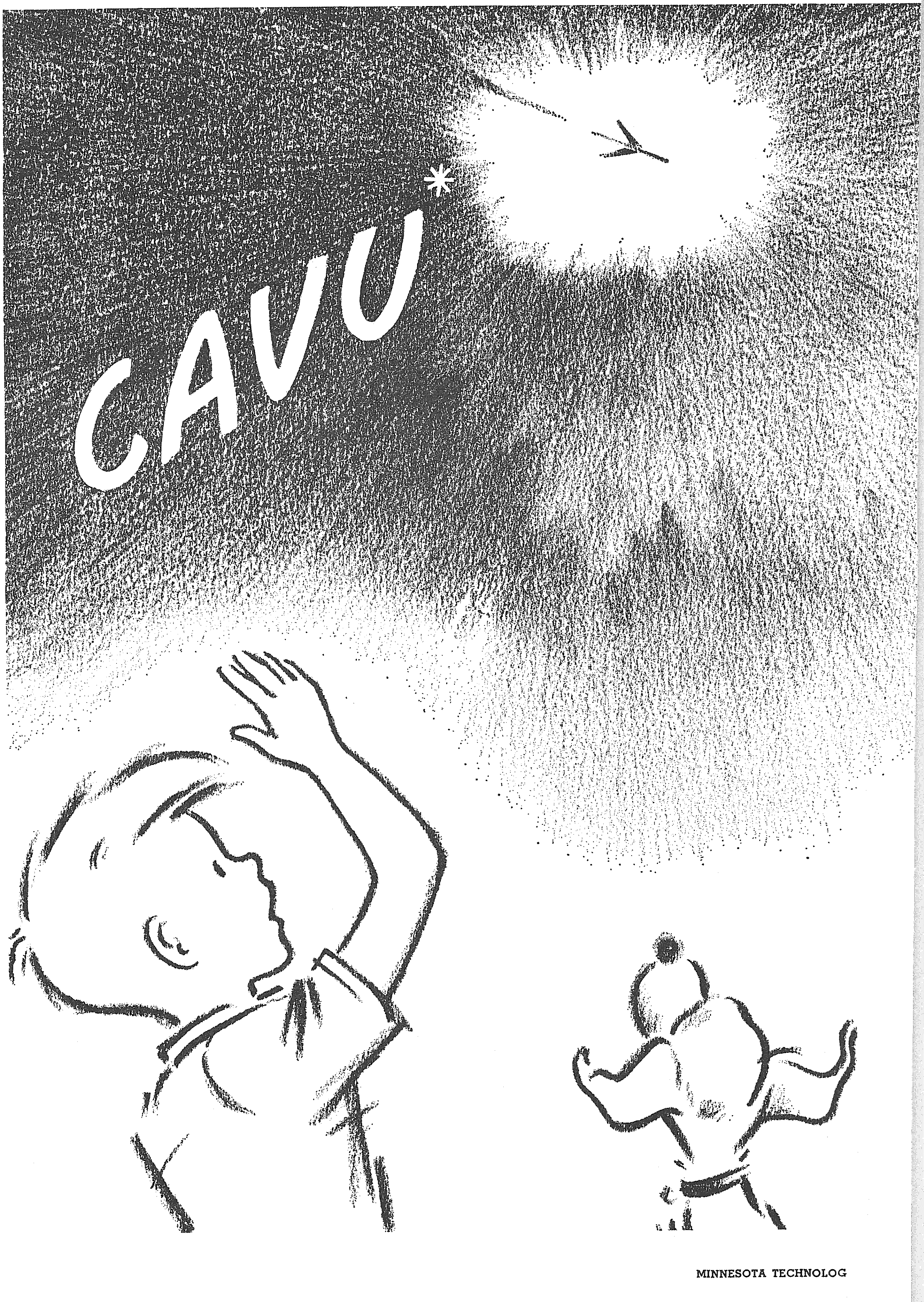
While everyone remembers the great Northeast power failure of 1965, not everyone knows that power shortages are common in New York City and other major cities. During summer heat waves, the power companies plead with consumers to turn down their air conditioners so that power demand does not exceed power supply. Another surprising feature of electric power service is the number of older buildings in our older cities that are wired for direct current rather than the presently used alternating current. This condition creates headaches for building tenants and occasionally ruins AC appliances when they are plugged into a DC circuit.

Occasional service inadequacies can be annoying; but if they are continual, they become frustrating. Too much frustration forces industries and residents to consider moving elsewhere, leaving behind those who must remain.



their elected officials. The power of the ballot box is real, and is known by the representatives. The formation of residents associations in many city ghettoes is beginning to bring better service. However, the sanitation departments are hampered by a lack of money. In St. Paul, the city budget covers only a certain number of snowstorms every year; if that number is exceeded, snow removal is limited or non-existent.

The public service monopolies, in their inadequate service, are guilty of poor planning. If they cannot provide contracted services, they should be forced to pay penalties.


CAVU*

Illegality is created by legislatures but crime is the result of Puritan influence, social conditions, and failure to accept authority.

Our crime laws were handed down to us from our Puritan forefathers; thus, the laws are puritanical in content. Behavior that is more or less condoned in other countries—criminal offenses such as drunkeness, prostitution, and gambling—is severely punished here. The largest category of arrests has been for drunkeness but women are most often picked up for prostitution. This offense is often compounded with disorderly conduct and vagrancy arrests. Known prostitutes are subjected to unwarranted arrests even if they go out at night for a bottle of milk. Gambling in most forms is regarded as a crime in most states, although we permit government lotteries, horse racing, and bingo, none of which is any more morally decadent than poker or blackjack. The policy racket is especially widespread in many states.

The unintegrated Negro contributes heavily to all forms of crime, except organized and corporate crime. The culture in which he is forced to live, plus an overwhelming percentage of the group living at a low economic and social level, are the main causes of the crime rate among blacks. Arrests are generally not made within the ghetto except on a sworn warrant or when someone is caught "in the act." The Negro can commit crimes within his own racial community with less fear of arrest than if he goes outside the ghetto to strike against society. In addition, prejudice probably contributes greatly to the crime rate because it relegates the black to a second class citizenship status which, in turn, leads to greater desperation and a higher crime rate. Moreover, as the black and the white police confront each other in riot situations, the mutual hate they hold will result in violence and still more black arrests.

Another cause of crime is the cultural conflict between the Nordic protestants and the southern and eastern European catholics. Generally, the former are more established and of the same cultural background as the American ideal; the latter are more poverty stricken and from an alien cultural background. The number of southern and eastern Europeans from wine drinking cultures, in trouble during prohibition was much higher than the number of Nordic protestants in trouble during that period.

The right to bear arms was guaranteed in the Constitution to provide a means of protection for a new nation that was expanding its frontiers at the expense of the American Indian. This is practically the only country in the world granting this right, a right that is largely responsible for most adult crimes of violence.

Our frontier heritage, which is in part our love of freedom, is another contributing factor to crime. The free land was for many years an outlet for the dissatisfied citizen. But with the end of the frontier, he could not turn to the soil. The law began to provide security and soon vast restraining laws were created for the protection of the people. The "white collar criminal", who does not believe in the propriety of the restraining laws and does not obey them, emerged as a response to such legislation.

The upper class law breaker, among them the white collar and organized

The high crime rate will be diminished when we reexamine our laws, social structures, and methods of rehabilitating convicted offenders.

Where the puritan influence was not great, as in continental Europe, drunkeness, prostitution, and gambling are treated much more sensibly. In Europe a drunk may be locked up, but only for his own protection. In many of the European countries where water is not safe for drinking, and where milk is left for babies, the people begin drinking wine as children. Consequently, alcoholic beverages do not have a stigma attached to them like they do here although the incidence of alcoholism is higher in Europe than in the U.S. The European prostitute is generally left alone, and is regarded as a necessary evil. In fact, houses of prostitution in the past have been supervised by the government ostensibly to prevent the spread of venereal diseases. Gambling of all types is permitted only in licensed clubs, so the government can watch over them and collect the maximum amount of money under the percentage system.

The solution to the high black crime rate will not come until the Negro gains his place in society through cultural assimilation. Just as the conflict between southern and northern Europeans will not be resolved except through cultural assimilation.

The question of gun control is currently receiving widespread attention in this country. However, the effective lobbying of the National Rifle Association and other pro-armament groups is defeating any attempts at effective gun control. These groups assume that gun control necessarily means elimination of private weapons for target practice, and hunting. Effective gun control legislation should not restrict sporting or self-defense use of weapons, it should restrict the uncontrolled sale of military inspired weapons, and weapons that can be used for terrorism and crime. Such legislation would also provide police authorities with means of tracking weapons and ownership.

The white collar criminal and the syndicate criminal must receive more attention from our national law enforcement agencies. We must also find means to ensure the non-cooperation of government officials with organized and corporate criminals.

The convicted criminal is punished by either probation, if prior conduct warrants it, or a jail sentence. If the offender is put on probation, he needs wise counsel and assistance for securing a job, stabilizing family life, participation in community activities, and enjoying leisure time. If the offender does not secure this help he might soon get into trouble again. Probation officers are often poorly trained and criminal does not offend the sensibilities of the group the way the lower class offender does. It is usually the petty offender who is caught, tried and convicted, while the more serious disruptive forces of organized and corporate crime remained unexposed, either through neglect or through influencing effects.

Crime has also increased because of the increased complexity and interaction which comes with urbanization. The fashionable districts of our cities are pressed up against the slum areas, thus creating a contrast that is not lost on the desperate people in the lower classes. The city also creates more opportunities for crime by producing more potential victims.

Many Europeans heard of America as the land of opportunity where a poor immigrant could become a millionaire. But the realities of the steel mills, coal mines, and tenement districts soon disillusioned them. It is not surprising then, that immigrants such as Italian immigrants would build a vast crime syndicate.

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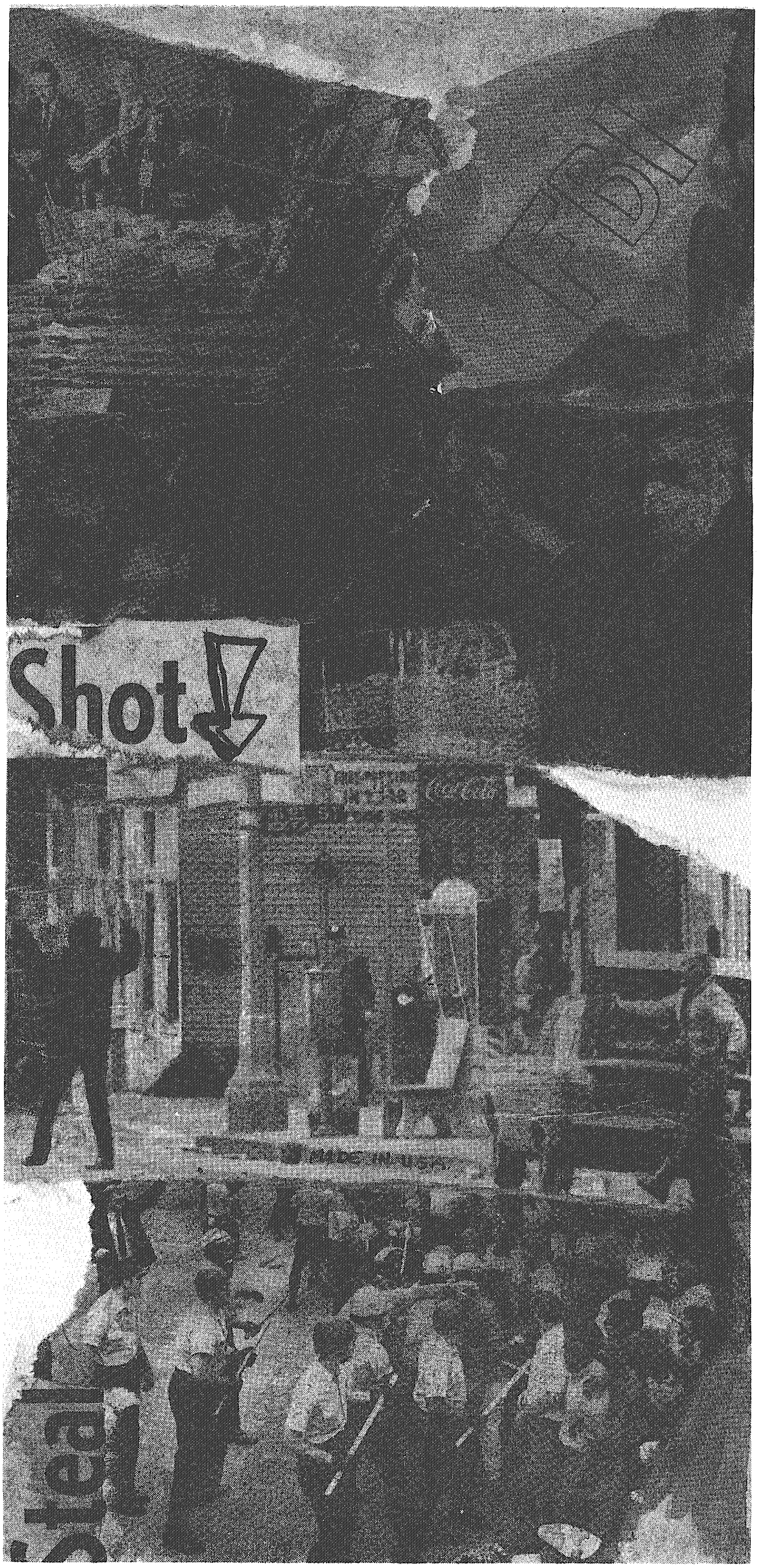
have too many cases to handle to do an adequate job of counseling. Even sentencing is often done on a hit or miss basis by an overworked judge. When a convict is sentenced to a term in jail, he must be provided with a secure place to live, eat, and sleep. In general, the state must assume responsibility for his total life, including training for a normal life which will keep him out of prison after his release. In many places the state does not provide a rehabilitation program as it should or else it "rehabilitates" on a mass production basis without considering the individual's case. The community, meanwhile, is torn between the desire to rehabilitate and the desire to punish. Parole is a device used to let the convict readjust to normal life before his term is up. Unfortunately, again, the guiding officer is often inadequately trained and has too many cases to handle.



The difficult and disruptive problem of race is not unique to black-white relationships but is greatest there and will intensify.

While the economy, crime, and political tension may vary in cycles, race is an always volatile issue. Race is a broad heading under which four groups fall — Caucasian, Negroid, Mongoloid, and Austroloid. "Ethnic groups" is perhaps a better term because it applies to a group of people with a common culture.

Differences in skin color lead to irrational fears and discrimination. Generally, much of this can be explained by a lack of familiarity with the culture of another ethnic group. Some of the fears may be based on experience with a few members of the ethnic group but most fears are based on hearsay.

The American Negro is, of course, not the only sufferer of discrimination; the American Indian, the Mexican Indian, the Mexican-American, and even the Chinese and Japanese also suffer. Discrimination and low economic status reinforce one another. The unemployed minority group member finds it more difficult to get a job because of his poor educational background and his ethnic group. Thus he cannot improve his condition which leads to more employment discrimination.

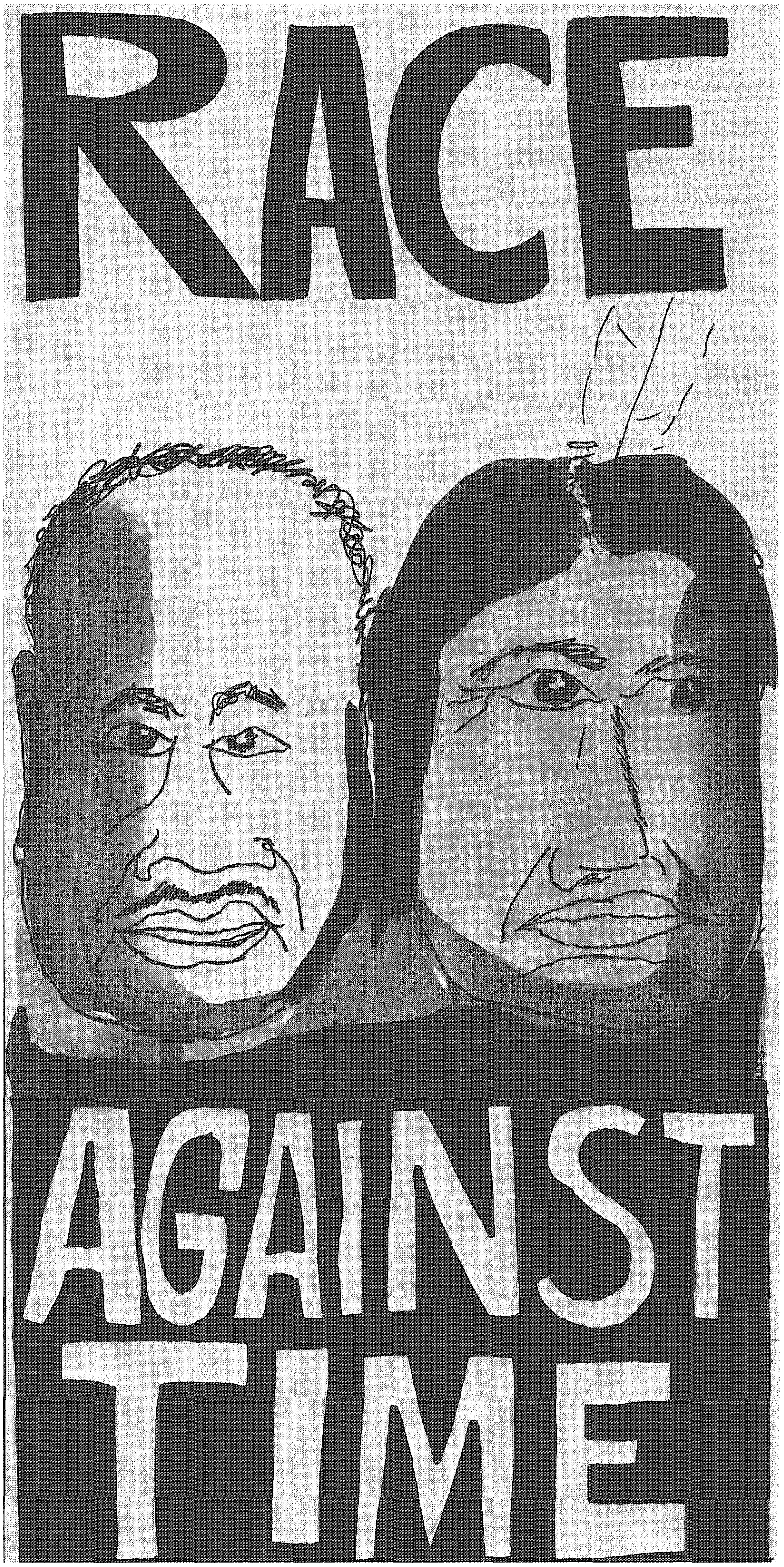
Actually, there is little that can be added to a statement of the problem of race discrimination. News of racial discrimination appears daily in the media. Many people form definite opinions on discrimination without considering how true or false their "evidence" may be. But in spite of the acknowledgement that the problem exists, little is being done to alleviate

In regarding the potential solutions to ethnic conflict and considering society's seeming inability to depart from historical behavior patterns, an attempt to predict the future based on past and similar conflicts is the best course.

Revolutionary uprisings are preceded by a long period of social unrest during which a number of subversive groups emerge to compete for popular support. Because of their illegal tactics, subversive groups are regarded as organizations of terrorists, but they often begin as discussion groups, clubs, or religious cults. The period of revolutionary unrest is marked by sporadic outbursts of violence when there are raids, street demonstrations, and insults hurled at officials. Even though these actions are initially scattered and relatively ineffective, the authorities take harsh action by jailing or eliminating agitators, a repression which often welds a previously disunited minority group into an effective resistance movement. Much of the work of subversive organizations consists of agitation and propaganda within the minority group, although many different organizations could be competing for support in the group. Some of the revolutionary leaders are educated men who command respect from the dominant group, while "grass roots" leaders are often ignored—a fatal error. Nationalism, which serves to instill pride in the people, is a basis for ethnic identification and has a unifying effect on the group. If there is no history, the intellectual leaders invent one; if there is a history, it is developed for self-serving purposes.

Sustained contact between ethnic groups will result in some members of the minority group acquiring the cultural aspects of the dominant group. At first, this acquisition is limited to a few and is only superficial but it eventually develops into widespread participation. Breaking away from the old traditions results in a period of social disorganization and clashes between traditionalists and moderns. As the more progressive members of the minority group become accepted by the dominant group, they sometimes become interested in perpetuating the color line to preserve their position. The more progressive minority members are sometimes condemned by the traditionalists for abandoning their group—a condemnation based on the assumption that ethnic loyalties should supersede other loyalties. However, most independence movements have been led by men educated in part by the dominant group.

The struggle within the minority group is between the nationalists and the integrationists, and, because both are intensely aware of what the other it. Letting the issue take its own course has done great damage, and could do greater damage, to the structure of our society. Conflict between ethnic groups will intensify before the problem is solved. The riots of the past several years were only an indication of the general frustration of the minority members. As they find that they cannot make social or political headway, they will turn to more illegal methods of securing their rights.



position means to their own, the struggle is fierce. People in the minority group do not have a choice of sides, rather their awareness is developed by their peers and their opinions are formed by their personal priorities—whether they want to live comfortably or to advance the "cause."

As people continue to occupy a given geographical area, they become more interdependent, more knowledgeable of each other, and more alike. The minority members become aculturated, acquire better jobs, form friendships across the color line, and they eventually inter-marry. Thus a new ethnic group is formed with a new moral code of conduct to support the new classification. However, this new ethnic group will meet another, and the conflict begins again.

Our urban areas suffer from a lack of money, organization, leadership, state help, and problem solutions; they suffer from a surplus of bureaucrats, vested interests, apathy, people, and city governments.

Money and organization remain the two largest problems in urban affairs, with all the others depending in some part on the solution of these two. Historically, when one never knew when a raiding party of barbarians might descend upon a community, walls were put around the city for protection. The walls marked the limit of city expansion, and the city fathers took no responsibility for people living outside the walls. Today, the likelihood of being attacked by barbarians has greatly diminished and people are not afraid to live outside the city boundaries. However, they still depend on the city for jobs, social life, and services. But unless there is a city income tax, these non-residents do not make positive contributions to the city. Certainly they contribute to their own suburban government, and to the state and federal governments but they do not help the people who help them most. The upper and middle class flight to the suburbs has drained the city of its support, its tax base. Even employers are moving to the suburbs to be where their employees are, where they do not have to pay high taxes, and where they have room for expansion. Metropolitan people are finding that they are paying more to the state than what is returned to them. While the state does provide services for the city, city residents get proportionally fewer services than their country cousins. Much of the money also is lost in the state capitals by the bureaucrats who redistribute the money. The city and the state are faced with the same problem in their relations with the federal government. Too much money is being passed around the country and the cost of redistributing the money is high.

Even when a metropolitan area has money to spend on programs, much of the effort is being duplicated by the various city governments, especially for similar programs in different cities. On the other hand, some city programs are too far away from the people—the people have no control over the kind of education their children receive, or they have no channels for complaints to government officials.

Poor organization may be the result of any one or combination of a number of things. City charters were written in response to fears of one kind or another; consequently the city council may dominate governmental

Decentralization, federalization, and physical factor controls are the key to city problem solutions.

De Tocqueville in *Democracy in America* points out that if the government were centralized, while the government was good, life would be good, but if the government was bad, life would be bad all over. He was writing about national government but his comments apply to urban government. The people in a decentralized system are closer to the power and can effect changes that will directly affect their lives—presumably for the better. They can tailor their government to fit their own needs. A centralized government must exist for uniform and efficient services and control, but a centralized administration can only lead to a disinterested citizenry and, perhaps, to tyranny.

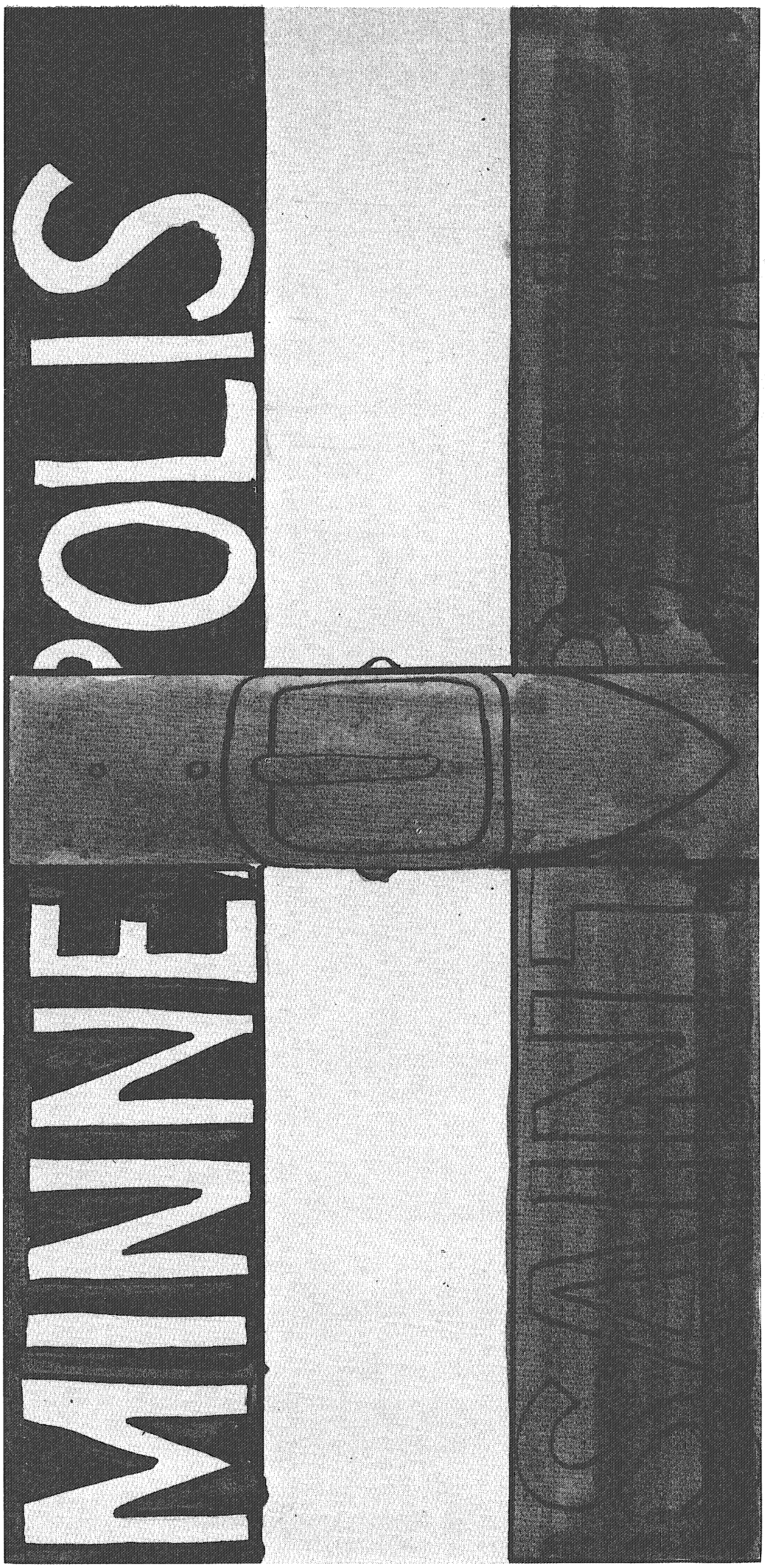
But looking at another side of the question, we find that the best approach to the metropolitan dilemma is the federated approach, although it certainly is not simple to achieve or maintain. The state, or states if the metropolitan area crosses state lines, should support the federation of city governments because there already is a super-metropolitan government role on matters like flood control, highways, education, conservation, etc. However, the metropolitan government would work only if the body were constitutionally constrained, not precluding the setting of minimum standards which would better life throughout the metropolitan area, and which the local governments could improve upon. It would preclude total centralization that would result in the local units becoming caretaker governments. The official body should be composed of elected local officials and elected officials of the state. Some of the powers of the state would be shifted downward while some local power shifted upward until the plan became realized.

The advantages of a decentralized, federated metropolitan government are overwhelming. A primary effect would be to return the entire urban center to a walled city scheme where all the residents are under the jurisdiction and control of a central government. A beneficial way to complete this analogy would be to determine the limits beyond which people would not commute to work, shop, or participate in social activities. Then using the limit as an outer circumference boundary, construct a natural park, or preserve for five to ten miles inward toward the city center. Any expansion that was done outside the "wall" could be directed toward the creation of a new metropolitan area.

Other advantages of metropolitan government would be a uniform tax structure that would bring more money into the central cities where it should be and where it would do the most good. The unified metropolitan community also would be able to tackle problems that have been too large for an individual city—problems such as regulation of density, size, and industrialization.

However great the advantages of federalism may be, the size of the metropolitan area would be a major factor in determining its ultimate success. An optimal city size demands that cities be small enough to enable ready access to the countryside and a reasonably moderate journey to work. The average city of 10,000 will have a radius of one mile; 100,000, 2.3 miles; one-half million, 4.1 miles. Another criteria concerns environmental activities, or the mayor may have too much power, or both branches of government may have equal power and compete for its use. Political patronage may dominate the city services, thus giving a suspicion, even if not justifiably, of corruption and inefficiency in the services. The vested interests in a city may be too concerned with maintaining the status quo or may not lead the people toward reforms.

To run a city properly, the government must control the size, density, and land use in the urban area. Unrestricted expansion of the population leads to disorderly conditions such as homes being sandwiched between industrial companies, poor use of recreational areas, and deterioration of the city center core.



and institutional aspects of the residents' health. The ratio of physicians to population increases with increasing city size. Life expectations are higher in smaller cities where there are fewer incidents of cancer, heart disease, T.B., diabetes, stomach ulcers, suicide, and respiratory disease. Generally, crime rates increase with city size, but per capita expenditures for law enforcement also increases with size. Police expenditures make the largest jump when city size increases from 250,000 to 500,000. Municipal efficiency is difficult to measure, although it should improve as size increases until it reaches a limiting point, but that point is statistically unknown. There is also an optimum size for social contentment—where there are enough activities to satisfy the cultural and recreational needs of an overwhelming majority of the people.

City planners must take the above considerations and play one against the other until they find the optimal size for a metropolitan area. Urban centers like New York, Los Angeles, and Chicago are obviously too large and might best be run if they were broken down. Optimal size is probably exhibited by Milwaukee, Atlanta, or Denver.

What's New in

Science and Engineering

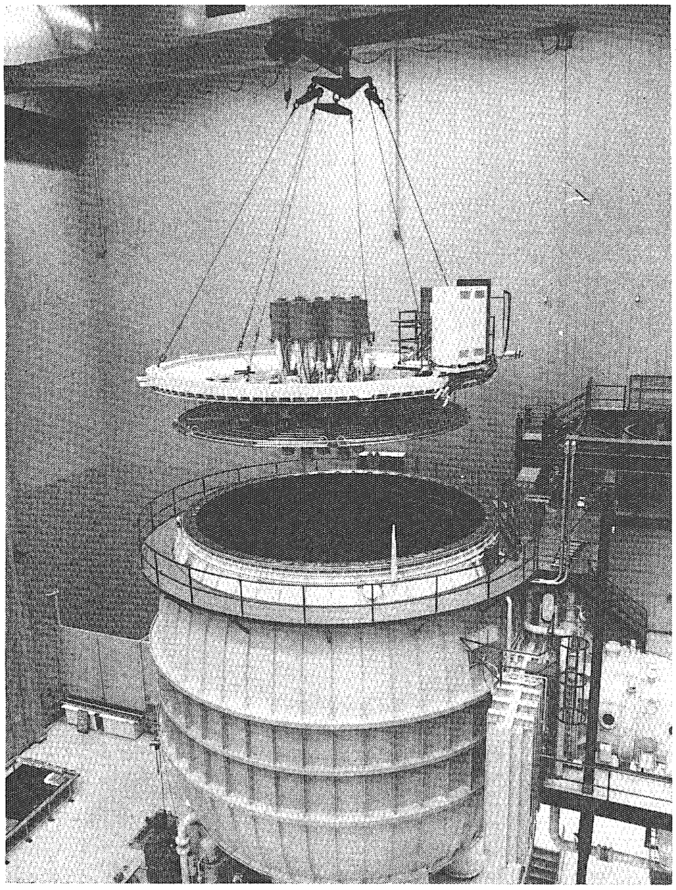
by JOANN HAWKINSON

Solar Simulator

Because of its incalculable effect on Earth, the sun is a priceless commodity. But a sun simulator represents a $1.5 million investment by the Boeing Company.

The 30-ton solar simulation lid was just completed for the company's 39 × 50-foot space chamber. The portable lid carries its own power supply for a battery of powerful xenon lamps which cast a beam of light accurately simulating sunlight above the Earth's atmosphere.

The new solar simulator, one of the largest in private industry, achieves the most accurate laboratory match



for sunshine above the Earth's atmosphere of any of the large simulators operating today.

The seven powerful xenon lamp modules which are the heart of the simulator produce a seven-foot-diameter beam of collimated (parallel-ray) light. The solar lid is designed for expansion to 37 xenon modules which would produce a light beam 19 feet in diameter, larger than the width of the entire Viking spacecraft. Viking is the National Aeronautics and Space Administration's project to make an unmanned landing on the planet Mars in 1973.

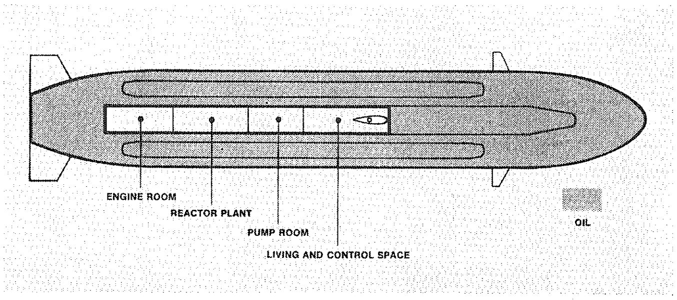
The solar simulator adds to the capability of Boeing's large environmental chamber to test materials, components, or entire systems under space conditions. Besides the ability to simulate blistering sunshine above the Earth's atmosphere, the space chamber provides a vacuum equal to that of about 400 miles above Earth and subzero temperature of minus 320 degrees F.

Arctic Submarine

General Dynamics announced today that it had made proposals to five oil companies to build 170,000-ton nuclear-powered submarine tankers to move Alaskan oil under the ice to an ice-free North Atlantic port, where the oil would be transferred to conventional tankers for delivery to U.S. East Coast destinations.

The submarines could traverse the Northwest Passage or move under the ice of the Artic Ocean to the open sea. They would be loaded either on the surface or while submerged off Alaska's Prudhoe Bay.

Beyond the inherent reliability of nuclear power, the arctic submarine, operating submerged, enjoys a steady 28-degree temperature and protection from ice, wind,



waves, and storms. In this constant and protected environment, the submarine is exposed to a minimum of environmental hazards. Navigation and schedule adherence can be precise.

Capable of carrying 170,000 tons of oil in its rectangular shaped hull, the submarine would be 900 feet long with a beam of 140 feet and a hull depth of 85 feet.

The submarine tanker will achieve substantially lower cost for moving oil to the U.S. East Coast than those attributed to projected pipeline systems. Comparison with possible icebreaking surface tanker costs is difficult because the oil moving costs of a surface ship system are dependent upon the ability of ships to operate through the ice on schedule at reasonable cost on a year-round basis at economic speeds.

Several aspects of the submarine's inherent flexibility are of special interest. Capable of being loaded either on the surface or while submerged, it can adjust its route as required to service possible new arctic oil discoveries and may be especially advantageous for moving oil from the Arctic Islands, if oil is found there.

Reduced transportation costs are possible with bigger submarine tankers and the design provides that the main pressure hull and power plant of the 170,000-ton ship could be employed for ships up to 300,000 tons as larger shipbuilding facilities become available.

Boeing Structural Tests

Structural strength of the Boeing 747 superjet has surpassed the original engineering predictions, as airframe stresses of more than 107 percent of ultimate design loading have been applied to the giant jetliner.

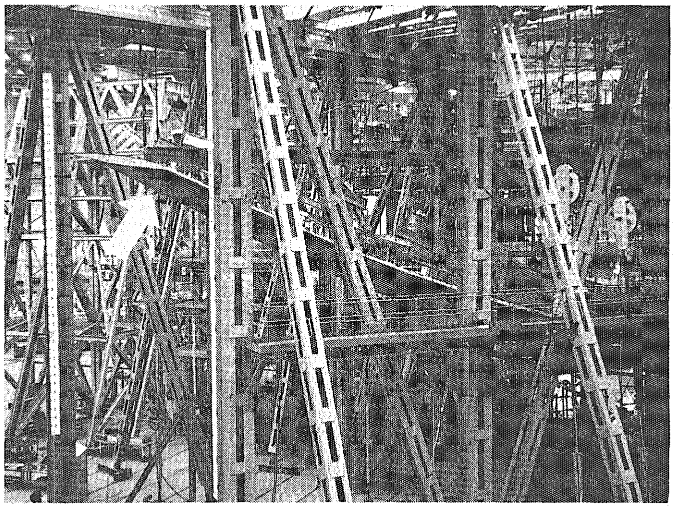
During "torture tests" in Everett, Washington, Boeing test conductors flexed both 747 wings upward 23 feet before a structural failure in the plane's aft body section terminated the testing. The wing was undamaged.

The demonstrated extra strength of the airplane gives the 747 a greater gross weight, or load carrying, capability in service. The test confirmed and then surpassed the design expectations.

A composite test plan was followed for what at first was considered a test to destruction. Load pressures applied by a hydraulic system simulated severe gusts on the forward section of the 747 combined with a dive maneuver on the aft body section and a high angle of attack on the wings.

In addition to the torture-test, a second 747 is undergoing fatigue testing in a program which will simulate 20 years of airline service.

Preparing for the test program, Boeing poured more than an acre of concrete three feet deep to provide a firm support. When in place, the 747 was surrounded by

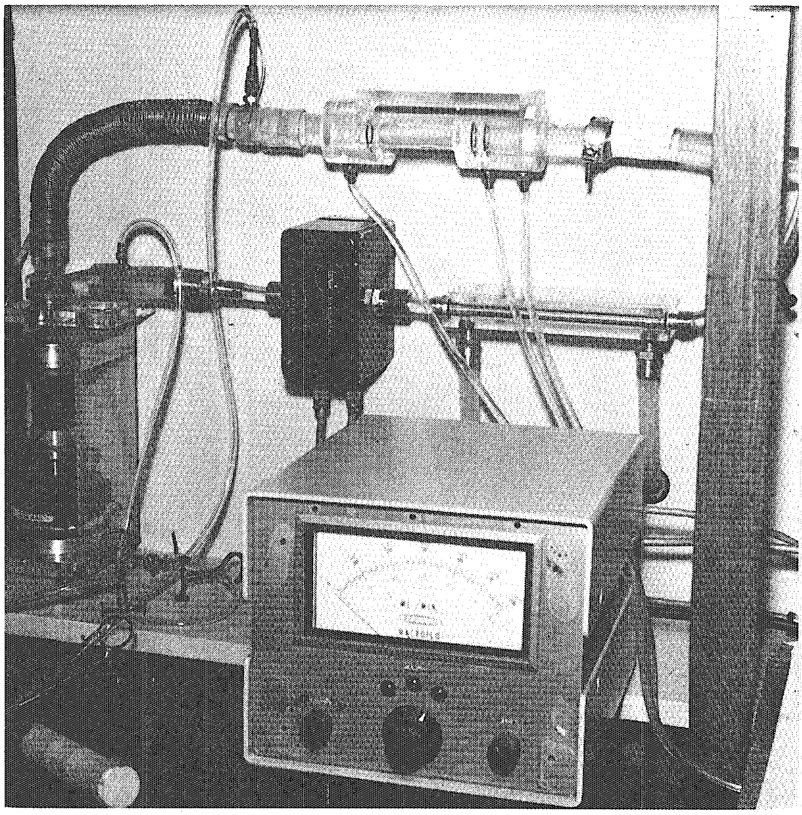


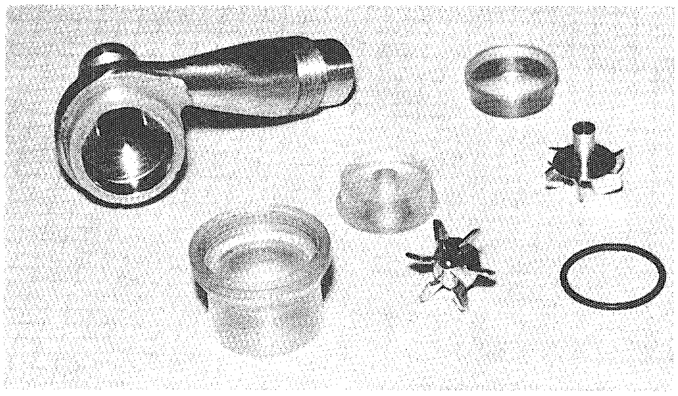
39 million pounds of structural steel—used to "tie down" the airplane and support the hydraulic test equipment (Arrow). More than 250 miles of instrumentation wiring, a multitude of gauges to gather data, and 24 miles of hydraulic tubing were required.

Introducing . . .

Heart Pump Development

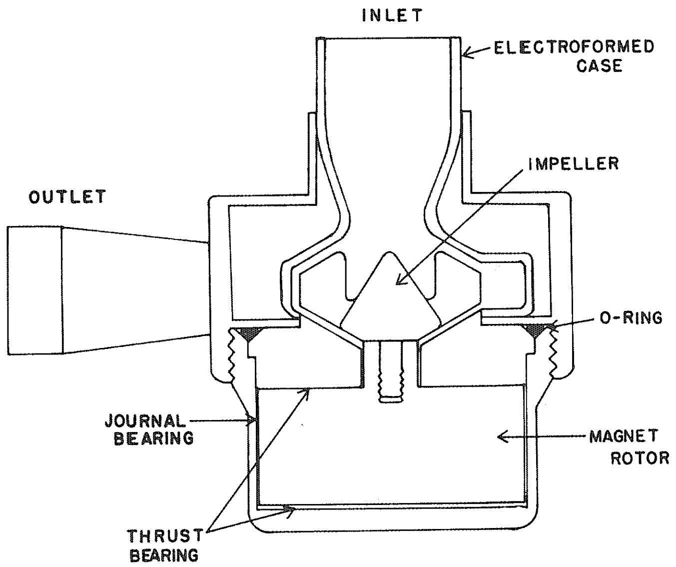
By KATHY FROMMER





Above: The component parts that make up the basic design and construction of the pump.

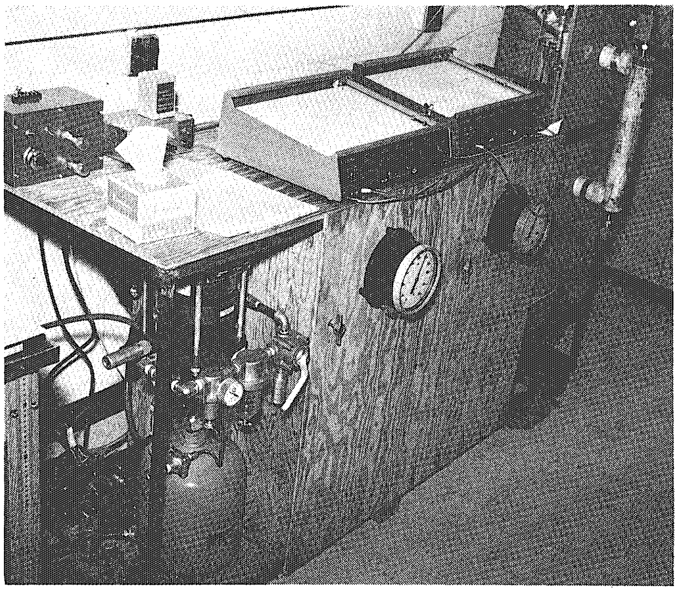
Below: The pump is assembled by placing the front thrust bearing unit on the rotor shaft and screwing in the impeller. This assembly is placed into the rotor housing; the O-ring seals the fluid from the impellor chamber.



In today's complicated world, one often finds many scientific fields combining forces in research that benefits mankind. Engineering sciences have now merged with the field of medicine in the research of artificial heart development.

Both surgeons and graduate engineering students, trained in bio-engineering, are allowed to do graduate research under Professor Perry Blackshear, Jr., and Frank Dorman, Mechanical Engineering Department co-investigators in heart pump development. Together, these two fields cooperate in examining the contributions and tools needed to advance this research.

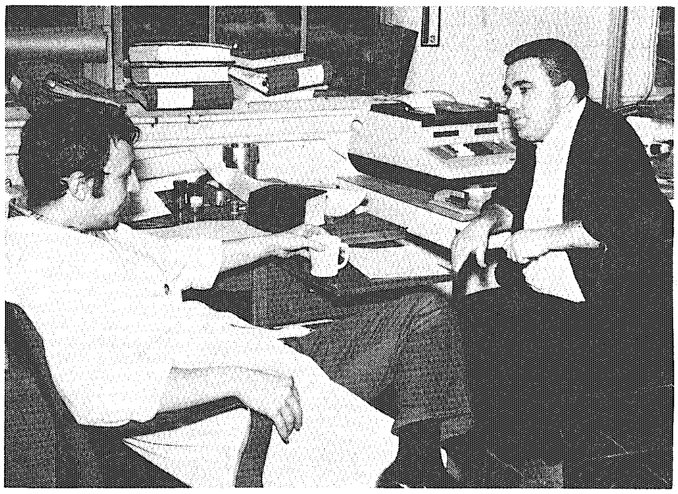
One aspect of the heart pump research is the construction of the heart pump itself. The pump casing is fabricated from electro-formed nickel, with



Above: *This apparatus is capable of measuring the effects of pressure in a wide variety of materials under different regimes of freezing.*

Opposite Left: The test loop used to test the pump's performance and measure the pressure difference across outlet to inlet.

Below: Richard Forstrom, a co-worker in heart pump research, talks with Frank Dorman, inventor of the pump, about stress on red blood cells.



photos by BRIAN JOHNSON

the internal passages plated with copper. The form is first electroplated with a thin gold layer and then covered with a thick nickel plate. The copper core is removed in a nitric acid etching bath. The inside of the nickel plate retains the gold layer, resulting in a smooth internal surface that minimizes destruction of red blood cells.

The dependence of the pump's performance rests on the internal impeller that controls the blood flow and pressure. The pump's impeller is screwed into a magnet that is imbedded within the shell. The impeller and magnet fit into an outlet sealed by a plastic cup. The blood, which acts as a lubricant, then flows into the cup space, in between the magnet bearing and the impeller.

Professor Blackshear said that to install the pump into the body, a flap of skin is pulled back and the pump is inserted through the ribs with the cup just under the skin. With the magnetic bearing near the surface, the power energy is transferred to the pump from an outside magnetic field, thus preventing the skin from being broken.

The short-tubed inlet is attached to the apex of the left ventricle, with the longer-tubed outlet attached to the descending thoracic aorta. With the pump intact, the heart can still perform its normal functions but the pump can relieve the function of the left ventricle as necessary.

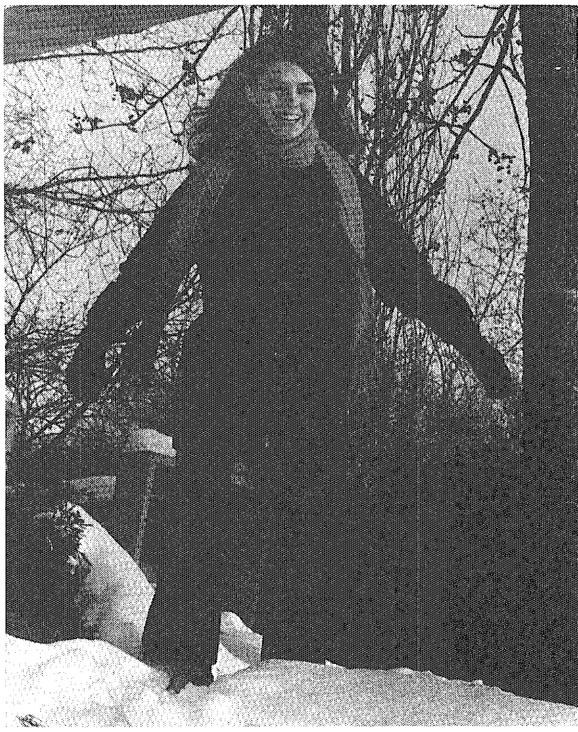
Another aspect of the research includes a test loop, a plastic version that tests the performance of the pump. With the test loop, problems are studied, performances evaluated, and any modifications made.

The influence of pressure on the survival of blood in freezing and thawing is a very important aspect of heart research. Freezing disrupts many of the red-blood-cell proteins. Under present freezing procedures, the blood requires the protection of 20 to 40% glycerol. The glycerol allows a lower freezing point, separating the saltier water from regular water in the blood, preventing a concentration of salt from damaging the red blood cell membranes. Under thawing conditions, the glycerol must be removed by washing. When high pressure is applied, however, it acts as a protective agent and less glycerol is needed, making thawing of blood and removal of glycerol easier.

Research is also being done in other areas involving pressure. Such research has vast possibilities, aiding other aspects of medicine such as in the freezing of kidneys and other organs.

MISS FEBRUARY

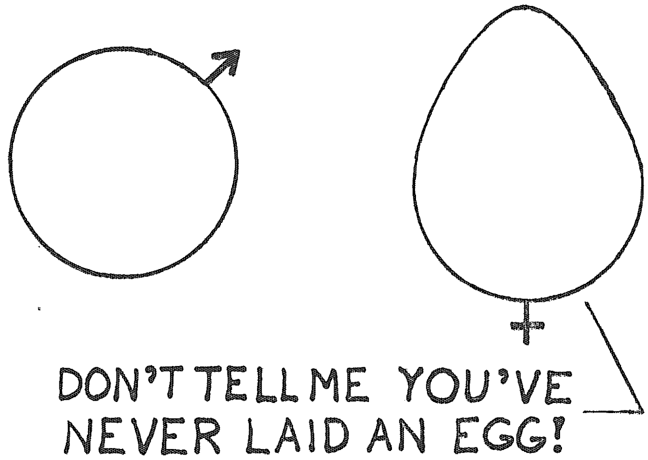
SHARYN ANDERSON

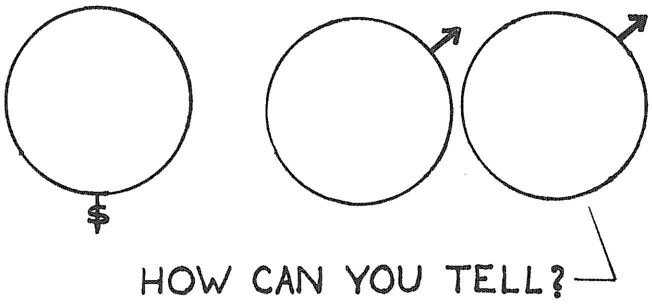


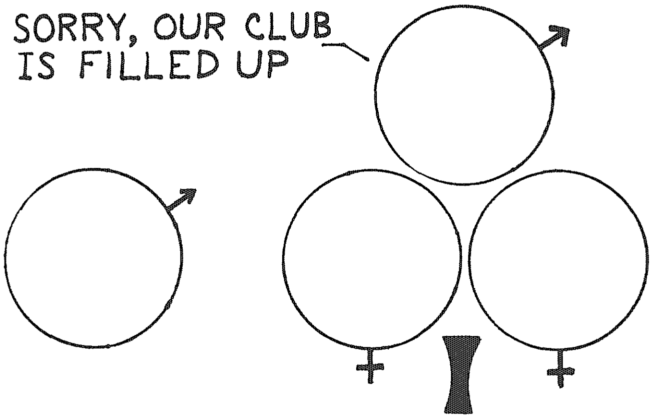
During a month historical for famous statesmen, we hope to make our own history with our Valentine babe, Sharyn Andersen. A 19-year-old St. Paul campus coed, Sharyn is a related arts major specializing in fashion merchandising. To clarify that for technically oriented IT students, Sharyn hopes to become skilled in fashion coordinating so that she can plan fashion shows and work interdepartmentally for a department store.

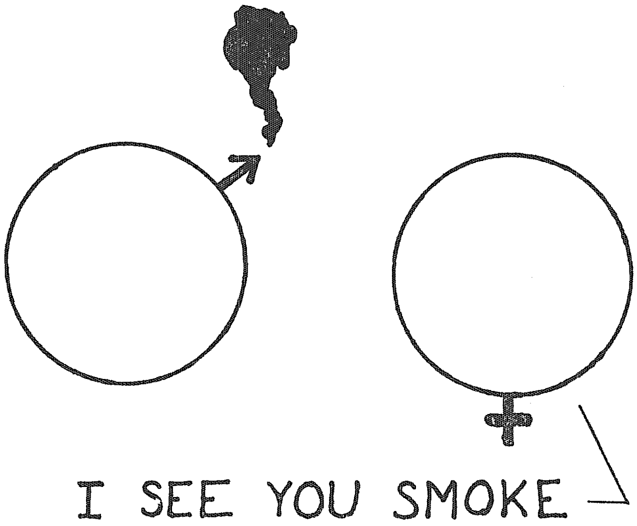
But before she settles into a career, she plans to satisfy another desire—travel. The calls of international airlines have left "stewardess" ringing in Sharyn's ears. But until next fall, at least, she will grace our campus.

photos by BARRY BRIDGES



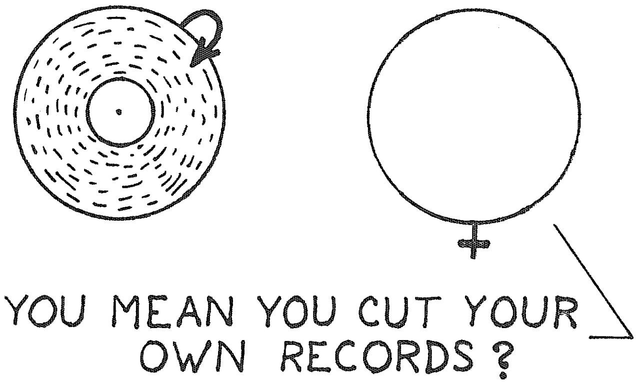


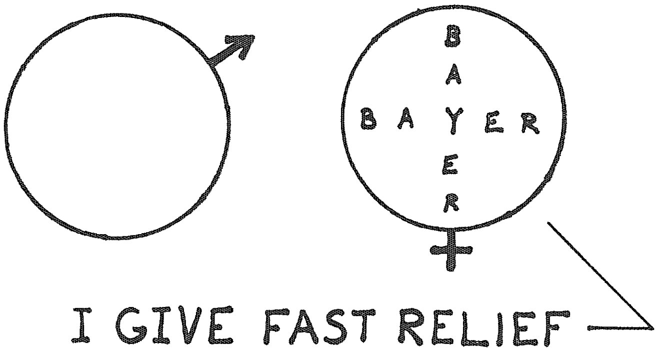


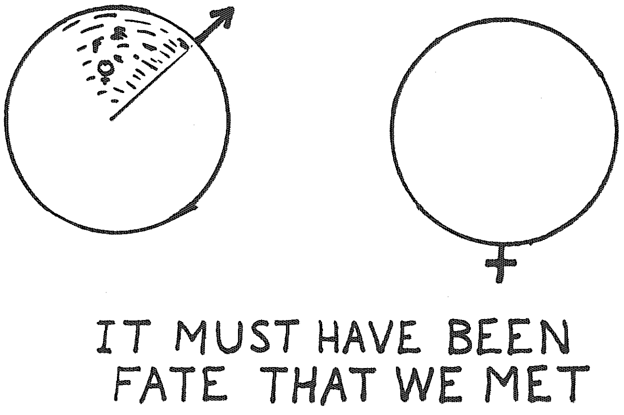


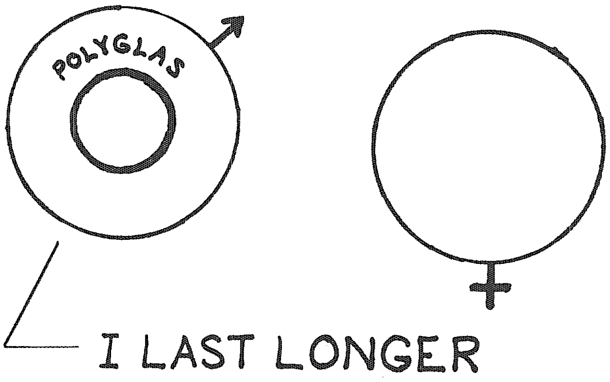
THE SYMBOL THINGS IN LIFE

by CLIF OLLILA









SPLINTERS From the Log

by CLIF OLLILA

—vilitas et crudus semper eternam

There's the story of the couple who furnished a 12-room house with premiums redeemed from cigarette coupons. They showed a friend around proudly commenting on how many coupons each chair, table or carpet "cost." At the end of the tour the visitor said, "But you've shown me only five of the 12 rooms—what about the other seven?"

"Oh, those," shrugged the householder. "That's where we keep the cigarettes".

• • •

Give a woman an inch, and she'll want five more.

• • •

Virgin: an ugly sixth-grader.

• • •

Some people have all the luck. One fellow I know left his address book in his shirt pocket when he took it to the laundry. It not only came back in good condition, but it had 12 new girls' names, addresses, and phone numbers.

• • •

During the occupation of Japan, several Red Cross nurses had rented a private house in Yokohama with a Japanese butler named 'George'. Having served as a steward on passenger liners before the war, he insisted on calling all visitors 'passengers.' The doorbell would ring, George would answer it, climb the stairs and announce: "Miss So-and-So, you have three passengers."

Finally, one girl spent a half-hour coaching him over and over: "Not passengers, George. Callers, or visitors, or company."

That evening the doorbell rang, and George trotted upstairs to announce two male guests. Proud of his newly acquired knowledge, and anxious to show off before company, he poised at the top of the stairs, and bellowed, "Miss Smith, you have two customers."

• • •

A pink elephant is a beast of bourbon.

An Australian, returning to his London club after many years, found only an elderly and grim-looking man in the lounge. Said the Australian, "Excuse me, sir, I know I'm a stranger but I'm feeling lonely and I wonder would you have a drink with me."

"Don't drink; tried it once, didn't like it," said the old boy.

The Australian mooned around a bit, and thought he'd try again. "Sorry to barge in, sir, but I wonder if you'd smoke a cigar with me."

"No, thanks, don't smoke; tried it once, didn't like it."

The Australian, wandering off once more, noticed the billiard room, and decided to make a final approach. "Pardon me, sir, but perhaps you'll have a game of billiards with me."

"Sorry, don't play. Tried it once, didn't like it. . . . But look here—my son will be along soon. He will enjoy a game with you, I know."

"Your *only* child, I'm sure, sir!"

• • •

A young fellow named Fred, accompanied by a beautiful blonde, entered a big fur store on Friday. "We want to look at a mink coat," he said.

The $3000 model pleased her, but not him. Finally the saleswoman brought out the $25,000 model. "We'll take it," he said. "Here's my check. Put her initials in the lining, and we'll call for it next Tuesday. That will give you time to make sure my check's okay."

On Tuesday the couple came in for the coat. The saleswoman apologetically told Fred the credit manager wanted to see him. He left the blonde and went up to the office. Before the credit manager could say anything, Fred asked, "Did you call up my bank? Did they say my family had millions but that I was the black sheep and my limit was $500 a month?"

"Why—yeessss, but . . ."

"Good!" said Fred. "And thanks for a very pleasant weekend."

A Minneapolis bakery has for years insisted on placing the following sticker on all the bread they sell to restaurants and cafeterias: It's fun to eat out!

• • •

Three old men were passing the time of day discussing the ideal way to leave this world. The first, aged 75, remarked he'd like to go quickly, and suggested a crash in a speeding car. The second, aged 85, agreed on a speedy end, but thought he'd prefer a jet-propelled plane.

"I've got a better idea," mused the third, aged 95. "I'd rather be shot by a jealous husband."

• • •

The haughty dowager called at the hospital to see her injured chauffeur. "He's a very sick man," said the nurse. "Are you his wife?"

"Certainly not—I'm his mistress!"

• • •

In a small New England city the Community Chest campaign had just gone over the top. The secretary of the campaign, a prim, gray-haired little lady, was called upon to say a few words about the chairman, a Mr. Smith, at a victory dinner.

"Ladies and gentlemen," she said, "in China there is an ancient custom that parents must kiss their offspring on that part of their anatomy through which they hope the children will become famous. If they want their child to be a philosopher, they kiss him on the forehead. If they want him to be an orator, they kiss him on the mouth. If they hope he'll be a singer, they kiss him on the throat. Now I don't know on what part of his anatomy Mr. Smith's parents kissed him—" she paused an instant for effect— "but he certainly makes a wonderful chairman."

• • •

A discharged WAC telephoned the veterans' center in Cambridge, Mass., to inquire whether the GI Bill of Rights covered hospitalization for maternity. "That depends," replied the clerk absent-mindedly. "Is this a service-incurred disability?"

A wolf lounging in a New York hotel lobby perked up when an attractive young lady passed by. When his standard come-on, "how-de-do," brought nothing more than a frigid glance, he remarked, "Pardon me, I thought you were my mother."

"I couldn't be," she iced. "I'm married."

• • •

Two black youths were walking down a sleepy Mississippi town's main street, Looking ahead, the older of the two spotted a hunter returning home with a raccoon slung over his shoulder.

Turning to his younger side-kick, he said, "Man, do you see that animal he's got slung over his shoulder? How come all the time we get called the same name as one of them?"

Retorted the other, "You mean, for sure, that's a mutha- . . .!"

• • •

Strange, but true: Dogs in Slobbovia show a pronounced flattening of the nose. Scientists theorize that this phenomenon is due to their chasing of parked cars.

• • •

What most women want is a great big, strong man who can be wrapped around her little finger.

• • •

An ermine-bedecked show girl entered a New York night club. When someone commented upon her wrap, she replied, "Oh, this, I got it for a song."

To which came the retort: "It looks more like an overture to me."

• • •

About a woman's age: "She was born in the year of our Lord only knows."

• • •

Football season takes all the fun out of walking down the street with a blonde on one arm and a blanket on the other.

• • •

A young married couple who had just settled down in their new home got a pleasant surprise in their mail one morning—a couple of tickets to one of the best shows in town. But the donor had omitted to send his name and for the rest of the day the question was: "Wonder who it was?"

They enjoyed the show; but when they reached home, they found that all their wedding presents had been taken. A note from the burglar said: "Now you know."

Sometime during the Russian-Finnish War—in a Karelian Bar: two Finnish Karelians are sitting at a corner table. A group of Russian soldiers enter in a drunken state and begin running off at the mouth about the size of their army.

"Those Finns don't have a chance. We've got hundreds of tanks, many planes, and hundreds of thousands of troops. . . ."

Arvo leans over and whispers to Toivo, "Where are we going to bury them all?"

• • •

The phone at the White House rings and Richard Nixon answers it. The voice on the other end whispers, "Your wife and Spiro Agnew are having an affair!"

"What," exclaims Nixon, "Spiro cheat on me!?"

• • •

"I got to take you home to meet my father," said the sweet young thing. "He hasn't had a good laugh in years."

• • •

A kindergarten teacher smiled pleasantly at the gentleman opposite her in the bus. He did not respond, Realizing her error, she said aloud, "Oh, please excuse me. I mistook you for the father of two of my children."

Xerox: For engineers who think of more than engineering.

There's one in every crowd. A Doug King, who'd rather do something than talk about it. By vocation, Doug's a Manager (Test Engineering) for Xerox. By avocation, a teacher of functional illiterates. By instinct, an unabashed do-gooder. "I just feel that if one person can be effective—*really* effective—it's better than 100 people sitting in a meeting."

The wish being father to the deed, Doug involved himself in inner-city programs and Rochester's Business Opportunities Operation. Doug teaches adults with less than a sixth grade education to read—on a 1-to-1 basis, just teacher and pupil. He went about this in the same professional way he tackles his daily work. He first took a course in how to become a teacher. Now, he's training fledgling instructors.

On the business side, one of the persons under his wing had never been anything more than a janitor. Doug helped him secure a franchise from a national rug-cleaning company. It's successful, too. As Doug puts it: "For the first time in his life, this fellow finally has a stake in something. And he knows if he needs help or advice, it's there for the asking."

Doug also benefits from his avocation. For one thing, he's more patient. More understanding of society's so-called problem children. He knows why they are what they are—and what they can be.

At Xerox, we like people like Doug King. Engineers who can see beyond engineering. Engineers who can feel for humanity. Engineers who seek additional outlets for their talents.

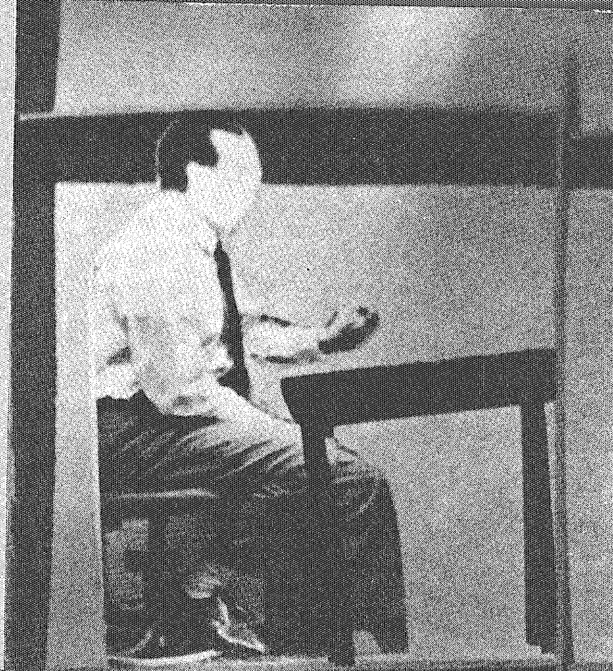
If you're this kind of engineer, we'd like to talk to you. Your degree in Engineering or Science may qualify you for some intriguing openings in a broad spectrum of developmental and manufacturing areas.

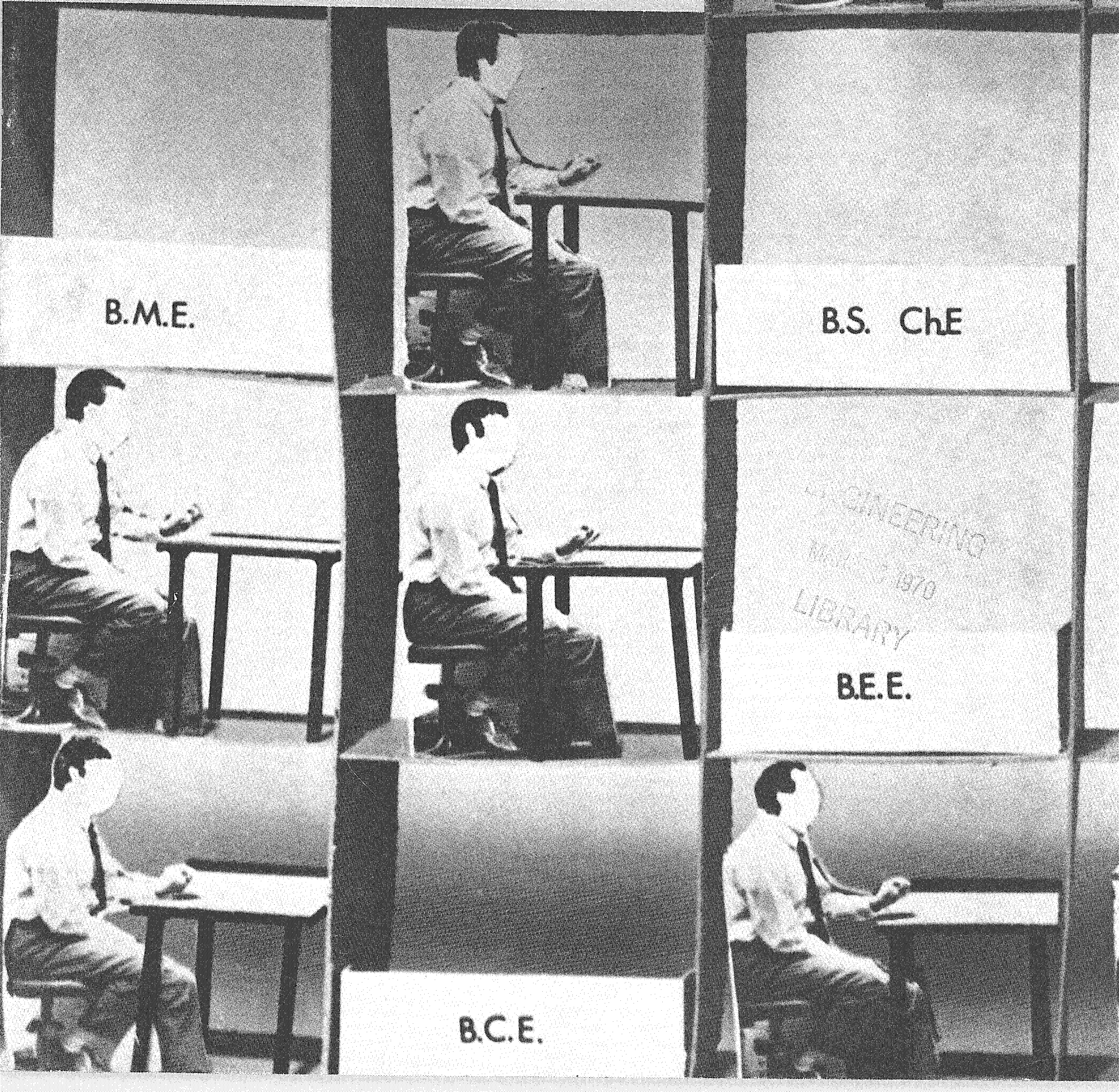
We're located in suburban Rochester, New York. See your Placement Director or write directly to Mr. Roger VanderPloeg, Xerox Corporation, P.O. Box 251, Webster, New York 14580. An Equal Opportunity Employer (m/f).

XEROX

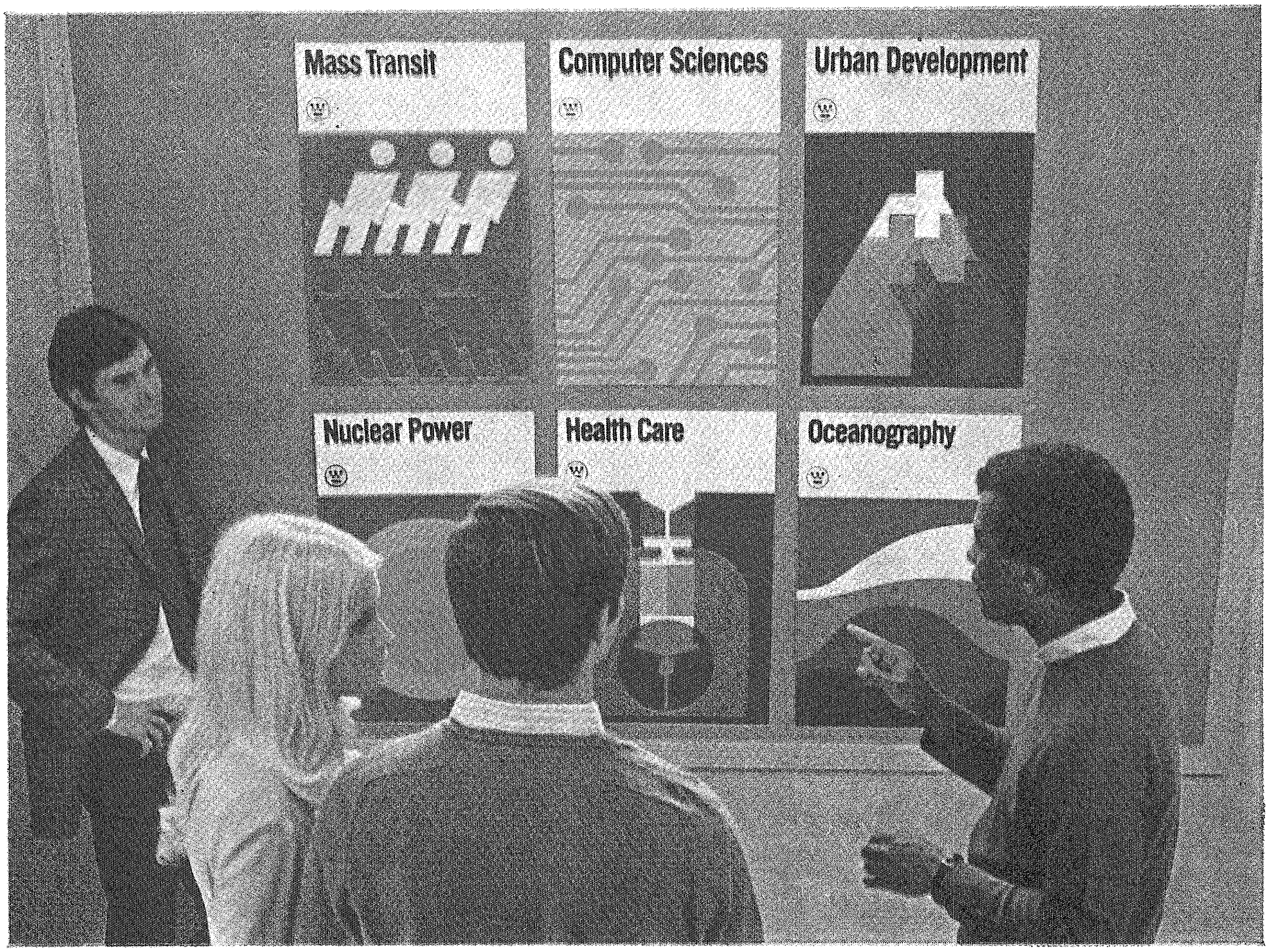
TECHNOLOG

MARCH, 1970





If you want to engineer a better world...



a great place to start is with one of the most diversified companies in the world.

Westinghouse thinks its responsibilities are as big as its capabilities—and that's big.

And when you're in everything from computers to urban development, to medical science, to mass transit, to oceanography—there's action. For example...

Transportation: Our computerized transit systems can operate on a 90-second schedule, and meet the transportation needs of many cities.

Urban Development: Our new construction concepts will provide better communities across the country. Projects are planned or underway in 30 major cities.

Health Care: We are using a systems approach to provide better medical care for more people. Example: electronic equipment that lets nurses monitor the hearts of eight patients simultaneously.

Nuclear Power: Westinghouse leads the way in nuclear power generation. Seven nuclear plants in operation, 34 in various stages of design. We're working on a breeder reactor to keep us ahead.

That's a sampling. We're just getting started. If you'd like to help us engineer a better world, talk with our campus recruiter. Or write Luke Noggle, Westinghouse Education Center, Pittsburgh, Pa. 15221. An equal opportunity employer.

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

TECHNOLOG

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

COVER: All to often engineers find themselves stuffed into a pigeon hole next to countless other faceless engineers; continuing education may help engineers find their identity. Design by Bruce Wright, photo by Marvin Vikla.

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Speaking with the Dean about . . .

EDUCATION

As our civilization has become more complex and the time constant associated with change ever shorter, the goals of a college education have undergone rapid evolution especially among those faculty and students associated with professional curricula. It is relatively straightforward to predict the evolutionary trends of the 1970's in science and engineering education; the trends have already acquired significant momentum. Our responsibility is to interpret these inevitable changes within the context of our particular situation.

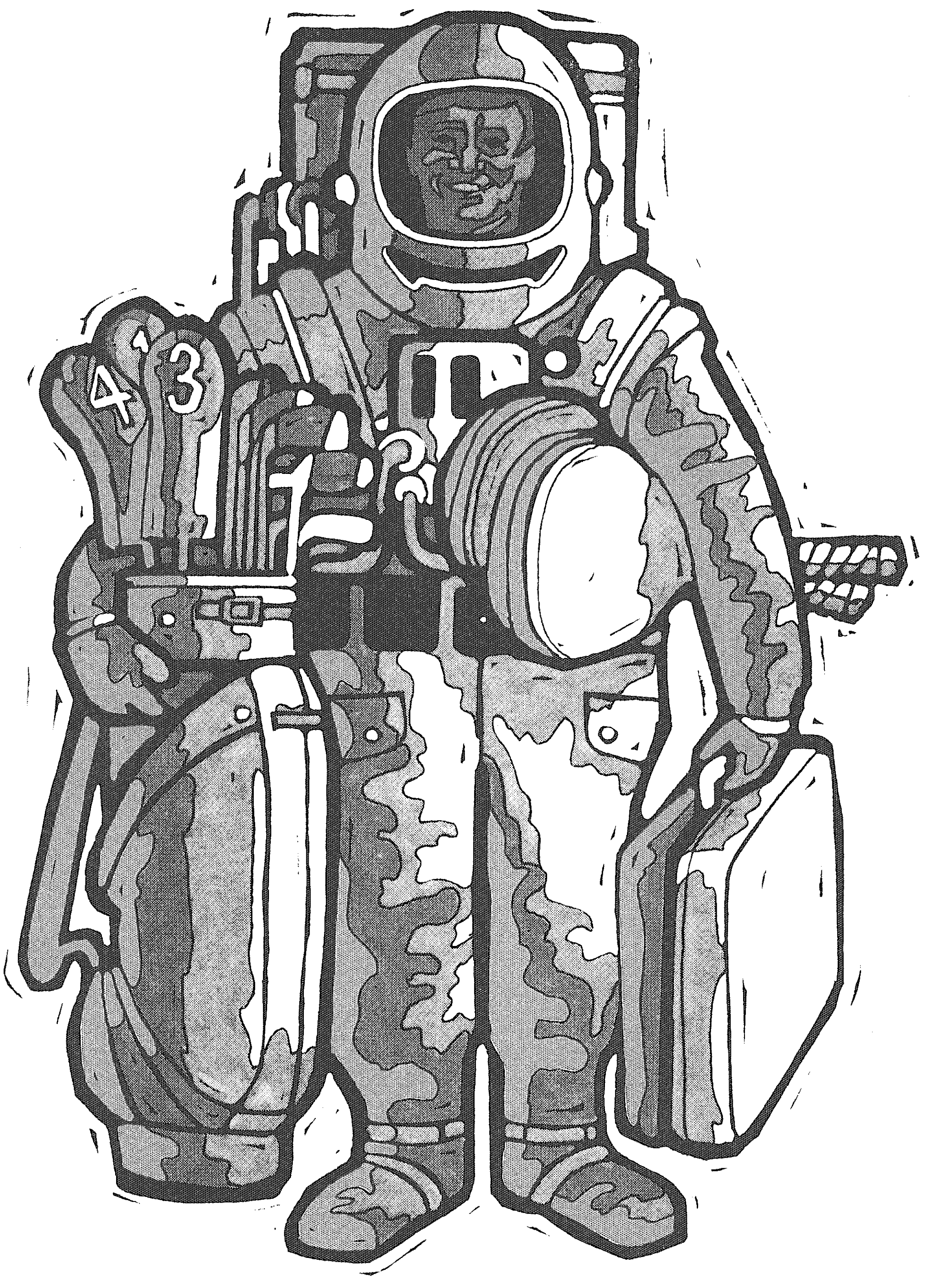
Whereas a decade or so ago it was commonplace for those who employed the graduates of colleges of engineering and institutes of technology to look for a finished product in their prospective employees, it is now more common for industry to search for a graduate with a general background adaptable to the changing demands of the industry. Universities are expected to place more emphasis upon education and less upon training. Industry itself has taken unto itself a major role in the post-baccalaureate education of its employees through in-house instruction and through continuing education programs in cooperation with colleges and universities. The largest computer manufacturer in the United States has an education budget in excess of that of the University of Minnesota! It is becoming possible to look on formal education as a process whose extension in time rivals that of life itself. Technological innovations, including television and videotape, make all this possible. However, the significant link in this educational change is the university. Its primary job is to inculcate a receptivity to education in students with whom it interacts but briefly in a very small segment of the educational lifetime of an individual.

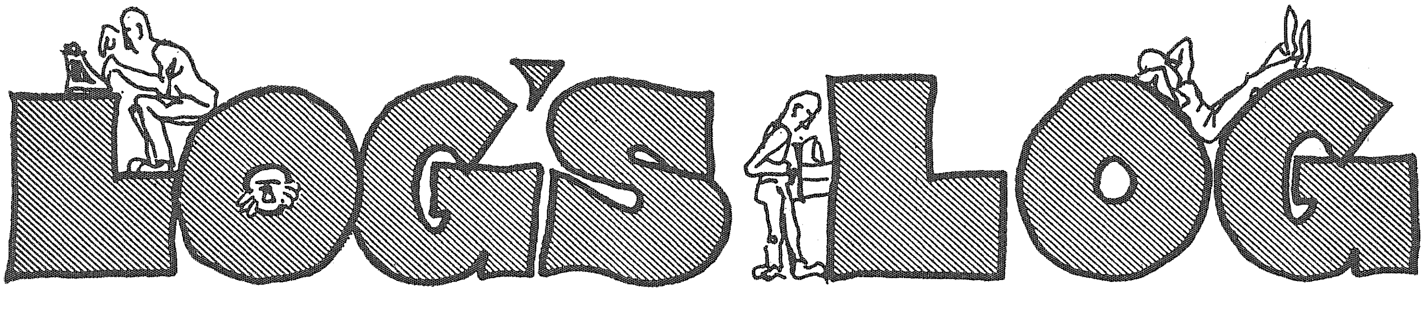
It is possible, of course, to provide a college student with a very specialized training, but it is becoming increasingly evident that such a highly trained specialist soon becomes obsolete (in fact, may be obsolete before he graduates) like a finely honed knife which has nothing to cut. There is nothing immoral about wishing to possess very specialized capabilities and it is understandable that faculty may wish to see as the goal of their educational efforts the molding of graduates with these capabilties. However, faculty are rapidly acknowledging that the goals of education are adaptability rather than speciality. Early in the nineteenth century, the poet Wordsworth commenting on a related matter wrote:

> ". . . A bondage lurking under shape of good—
> Arts, in themselves beneficient and kind,
> But all too fondly followed and too far"

which might be taken as an admonition to those who look towards universities as centers of training rather than of education.

Warren B. Cheston





The Engen-Kehrberg Report

Introduction: Here's a riddle for you. What has four legs, four arms, two heads that are better than one, twenty nimble fingers on the typewriter every month and three wheels? Why it's the E-K Report, of course (we were just kidding about the wheels). Moving right along, here's a knock-knock. Knock-Knock. Who's there? Dave Engen and Dan Kehrberg. Dave Engen and Dan Kehrberg who? Dave Engen and Dan Kehrberg who have just been voted, "Life's Pimple" by the American Acne Association. And in honor of this honor, the *Technolog* is holding an open house on March 20. Why don't you come over and give us a squeeze!

Normal

We suppose that at least once in every undergrad's sojourn at the Factory, he thinks about transferring to a small school. Lines everywhere, crowded classrooms, and an impersonal administration and faculty encourage the student to dream of "elsewhere." But for most of us, that is as far as it goes.

One friend of ours, however, decided to go a little bit further (and we shall be forever grateful to her). She decided to enroll in one of those quaint, little New England colleges. Her choice was Rhode Island Normal. And that's about as quaint and New England as you can get! And we have persuaded her to lay a couple of paragraphs on us. Go baby!

"Well the first thing you learn about a quaint, little New England college is that their tuition is two years ahead of its time. Another thing you learn is what Miss Peabody, the spinster librarian, does in the back stacks. And the third thing you learn is not to go back there with her.

"There is, however, an open door policy at the dorms. It seems the hinges are bad. But then, so is the plumbing, roof, floor, plaster and faculty. Which is the last thing you learn about a quaint, little New England college: you don't."

Thank you, mama. Our friend is now back here at the Factory with a grateful heart and a strong aversion to the Wilson Library. ". . . twice shy," we guess.

You Can't Win

A good friend of the E-K Report recently told us his marriage has been a continuing education. Well, since neither of us are in the above position (at the moment) and since it is also true that "a little knowledge is a dangerous thing," we have decided to print (in his own words) three vignettes from our friend's post-nuptial life.

One: Her time of the month. "A period of 28 days every month when my wife makes unreasonable demands upon my time, paycheck and sanity. As for the other few days, she doesn't feel good and makes sure I feel the same way."

Two: Shopping for furniture. "Betty, why do they call this an occasional table?"

"Because its only used occasionally, dear."

"And why do they call this one, a commode table?"

"Because its only used occasionally, dear."

"What's the matter, your record stuck? (aside: That remark cost me a new stereo.)"

Three: Introducing her at the office party. "Boss, I'd like you to meet my first wife, Betty."

"I didn't know you had been married more than once."

"I haven't been. (aside: Actually, I was trying to impress my wife with the fact that I was keeping my options open but it turned out to be another lesson for me. That night I learned the couch is lumpy.)"

Rears Viewed

The January issue of the *Technolog* was dedicated to a study of the automobile. Its impact is total. It affects every American. It has even given new names to people who don't drive (i.e. walkers became pedestrians). We even communicate with the automobile, or rather, we paste our philosophies on its bumpers. And conducting a recent survey of rear end axioms, the E-K Report discovered the following:

Help High School Drop-Outs
Vote Maddox in '72

Draft LBJ in '72
He did it once to you

Santa Claus in '72
He has the Pole-ish vote in the bag

John Dough in '72
The country kneads him

When there's nobody else—
There's Hubert

Vote Raquel-Twiggy
40 + 32 = '72

Agnew in '72
He won't try as hard when he's #1

Kennedy in '69
Remember for '72

E-Day '70
The End.

Results

Just as promised last January, the E-K Report is printing the winner's awards for the super whoopee Log's Log Limerick Contest. The awards are money. We are also printing the winner's entries. Congratulations to the winners and our cash-less thank you to the losers.

Second place, $5, was won by Bob McPartlin with this original:

Derivatives are sometimes fun;
Especially when the answer is one
But the problems are breezy
And the calculations easy
When the answer comes out to none.

The most unusual entry (because it speaks for a large portion of our readers and that is unusual for the Log's Log) is worth, $5, a reading. It was submitted by Richard Barotz who foresaw the future with this thought:

Without our *Technolog*, where would we be?
Without its startling exposés on the bird and bee?
For I, myself, would be out a fin
If our good ol' *Technolog* hadn't a 'bin
Gullible enough to believe that there's a poet in me.

Finally, first place, $10, was awarded to Charles Halfen for his opinion, of course:

A beauty up from Indianapolis
Entered a strange room on Campus
(It contained MM 35)
She barely came out alive
And never came back to Minneapolis.

Underground Re-Pressed

Following on the heels of the book reviews we presented in October, the E-K Report has been busy scanning the great and not so great and will below present our latter reviews of the former. Or in other words, the literary talent of the E-K Report once more strikes out on its own.

The first book we are reviewing, *I Always Felt Mommy Never Changed My Diapers Often Enough, So Now I'm Overcompensating* by Calvin Griffith, is probably the sports bombshell of the year. In this counterattack on his critics, the president of the Minnesota Twins delves into a deep self-psychoanalysis and comes up with a mediocre apology of his efforts at the helm of the almost American League champions. And to justify his constant replacement of managers, Mr. Griffith delivers an introspective grand slam with this comment, "What the Twins suffer from is a lack of sound leadership." ($10.95, Abraham, Billy Martin & John)

Out of the Frying Pan by Joan d'Arc is a poltical autobiography of France's most renowned governmental leader. In this book Mlle. d'Arc fiercely defends her committment of troops to Indo-China and reminisces fondly on the birth of her son, Noah d'Arc. Joan will be remembered by most, however, for her sultry vocal rendition of "Light My Fire." ($7.95, Kindling Press)

Life With Father by Pope Paul VI is a tender and memorable account of one man's life of dedication and service. It is a remarkable collection of the many personal and moving experiences of the spiritual leader of millions. It is an excellent book but who really knows what was left unpublished, unless we accept the expertise of Bishop Shannon who recently said, "I do"? ($22.50, True Confessional Publications)

Finally, Pat Nixon adds a fresh dimension to our political culture with her first book, *The Making of a President*. From her unique vantage point, Mrs. Nixon is able to let the reader in on all the intimate details. And nothing can compare with the surprise Pat feels when she awakes the morning after election night and still finds her husband on top. She goes on to endear herself to her readers with such admonitions as, "politics make strange bedfellows" and "Julie, stay away from that Eisenhower kid!" Pat's place in history is definitely assured by this exclamation, recorded during her first night in the Lincoln bedroom, "Before I do, are you sure Hubert isn't going to win the recount?" ($6.90, Un-Im Press)

Official Daily Bull

Having fallen prey to Hank Stram and his 40 Chiefs, general manager Jim Finks spoke for the entire Viking squad when he said, "Granted we didn't Marshall our forces to Kapp a sustained drive in the first half but it should be remembered that the last Page has not been written about that Grimm Sunde in New Orleans. And we promise all of our many loyal fans that the 1970 season, without any ifs, ands or Butkuses, will find the Vikings once again Velone in the cold."

And think about the nation's #1 football fan, hereafter known as the President of the United States, now that the pigskin parade is over. Faced with nothing to do, President Nixon has bought a seal and is training it to balance a ball on its nose. Spiro Agnew has seen a performance and said it was great. In fact, Spiro is so enthusiastic he wants to get into the act. Which leads to the Urgent Plea of the Month: "Don't let him, Mr. President!"

Mar 16–31

16—Dr. Christian Barnard opens restaurant. Eat your heart *out* Day.

17—St. Patrick's Day. And since St. Pat was decanonized by Pope Paul, there's no longer any excuse for E-Day.

19—Marry the Pillsbury heiress. Have a flour child Day.

24—Ice^3 Day. Raise to the fifth power.

27—Little Miss Muffet finds out what she's been sitting on Day.

31—March - ing ends forever Day. April fool.

Apr. 1–15

1—Lie Day. Get past tensed.

3—April showers with a friend Day.

9—Navy Day. Make WAVES.

13—Have your girl's "no's" fixed Day.

15—Box spring training begins.

Conclusion: Faced with the dramatic and dynamic transformation on campus and indeed throughout the entire world, the E-K Report is again reminded of the haunting strains of our favorite Bob Dylan song: "For the times they are a' changin'." And never was this old saying more true: "America is a' meltin' pot."

And just think how well the world would work if all the people in it went on a coffee break. Or if the entire Defense Department budget was used to make love. And there would be no mystery to, "where have all the soldiers gone?" And lest we forget the motto of sales clerks everywhere:

Put in a nickel
Take out a dime
G. B. Dayton's
Soon will be mine.

What you need to fly 20,000 dragging a bomb on a 500-foot exploring for nickel.

Sound involved? It is.

Exploring for nickel is complicated and expensive.

To start it fast and efficiently, you start in the air.

You dip into your pocket and come up with over $300,000 for a plane you'd feel safe in flying 20,000 miles a year—at an altitude of 500 feet—going 120 mph.

Then into your pocket again for another $200,000. That's what it will cost you to modify your plane and install equipment you'll need to locate nickel if it's around.

The bomb is like a microphone. You let it dangle from a 500-foot cable. The sensing devices inside detect mineral deposits on the ground and relay the information up to the electronic equipment in the plane.

To be effective, it's got to be close to the grouhd. So be careful. If it gets snagged in an unusually tall tree, you're in trouble.

Of course, once you've acquired all this expensive equipment, you'll want to go to where the nickel is.

One of your best bets would be northern Canada. So dress warmly and bring lots of supplies.

Up there it gets down to 40° below, and you won't find many towns around.

You've got the equipment and you know where to go. Now you'll need men. Well-trained, experienced men.

If you can get five like the ones pictured below, that would be ideal.

From left to right they are: Trevor Blachford, data processor. Randy Dutchburn, navigator. Heikki Limion, group head. Bob Veale, pilot. Paul Wessler, equipment operator.

Bob, Paul and Randy work the plane hunting for the nickel.

When they land, they turn their electronic readings over to Trevor for interpretation.

Heikki, who is a geophysicist, studies the information looking for indications of possible nickel deposits.

Eliminate even one of these men and you've hurt your chances of finding nickel.

Well, that's it. Except for one thing.

Once you've found an indication of nickel, your work is just beginning.

You'll have to have experienced men to go in on the ground and examine the area. Then you'll have to send in more men to drill hundreds of holes for your evaluations.

So be patient. This takes a lot of time.

If the findings turn out negative, don't be discouraged. That's how it goes—99 out of 100 times.

But if, with a combination of effort and knowhow (and a nod from Lady Luck), you happen to find a worthwhile deposit of nickel, there are a few things you'll need to know: like how to mine it, process it and get it to market.

Before we give you that information, there's a couple of things you'd better check on.

Like putting your hands on a few dozen million dollars and a few thousand workers.

Once you've got these two things worked out, you're ready to tackle the big problems.

Nickel helps other metals resist heat, cold, impact, pressure, abrasion, corrosion . . . to advance engineering in vital fields—power, desalination,


miles at 500 feet in 40° below,
cable at 120 miles per hour
electronics, transportation, aerospace.
We're doing everything we can to produce more nickel. Searching around the world—Indonesia, Australia, Guatemala, Canada. We've found ways to extract nickel from ores thought too poor to mine a few years ago.
We count our blessings and respect our surroundings. From nickel ores, we recover platinum, palladium, twelve other commercially useful elements. Make iron pellets for steel. Convert smoke in our stacks to chemicals for other industries. On sand left from processing ore, we grow meadows of hay.
We are explorers. We're in 18 countries. Miners, researchers, market builders. We bring opportunity to underdeveloped lands, new technologies, new payrolls, new tax income. Nickel in the ground is useless. We put it to work.
INTERNATIONAL NICKEL
The International Nickel Company, Inc., New York, N.Y.
The International Nickel Company of Canada, Ltd., Toronto
International Nickel Limited, London, England

Log Line

Thanks Dean

Dean Cartwright must be applauded for his concentrated efforts to reduce the IT morality rate. By the end of the 1962-63 academic year, more than 60 percent of the freshman class in IT had dropped out, victims of traditionally rigorous requirements. During the 1968-69 year, however, only 37 percent were unable to continue doing C work or better. This dramatic change must be attributed, in large part, to the program of retention and recruitment which Dean Cartwright heads. Three years ago Cartwright began the first steps in the three-part program. His first concern was to recruit, through increased contacts with Minnesota high schools and junior colleges, a larger number of potential IT students. The contacts were made by three-man teams, consisting of a working engineer, a professor from IT, and an IT senior, who visited various high schools and two-year colleges, talking with interested students.

The second stage of the program involved cleaning up the IT image. As Cartwright explained, "Potential students used to shy away from a college program in IT because they had heard it was extremely difficult and once they got in, they would be lost in their studies, without anyone to go to for outside help." In order to change this image, Dean Cartwright began writing explanatory, informal letters to prospective students, encouraging their enrollment in IT.

The third stage, and perhaps the most important in the program, includes the establishment of IT houses in the men's dorms and both on- and off-campus tutoring. Each IT house is supervised by a live-in IT senior who tutors the students; this part of the program is headed by Dr. Ronald G. Taylor, a fulltime psychiatrist with the University's Student Counseling Bureau.

Other policies, established largely through the work of Dean Cartwright, include allowing a student who gets an F or a D to repeat the course and having only the second grade count in his GPA and allowing a student to remain undecided about his major during his first year in IT.

In any event, the continuing, concentrated efforts of Dean Cartwright have been of major importance in the drastic reduction in the IT mortality rate . . . and we thank you, Dean.

Dianne Rekow

Engineers, Builders or Destroyers

I suppose that by the time this *Technolog* comes out, we'll all be over our heads with finals and E-Day will be the last thing on your mind. Actually, it will soon be too late, so get your ass in gear if you want to participate because deadlines are approaching fast. The organizations already have taken most of the steps necessary to enter a queen candidate, a race car, a button design, or one of the tournaments, but we want much more independent participation. Did you know that any group of three engineers can enter a queen candidate? that anyone can submit a button design or enter a tournament? You may win a trophy!

We also want to have a "senior" picnic this year and we are open to suggestions concerning location and/or any other picnic details.

So, while you are feeding your migraine on math, physics, or EE30, think for a minute about May 8, E-Day 1970. This is your day to screw the books and show the rest of this raunchy institution that engineering students are really with it. If you are starting to think about some of the things you will do and the fun you are going to have this E-Day, there still might be hope for your decaying techni-brain.

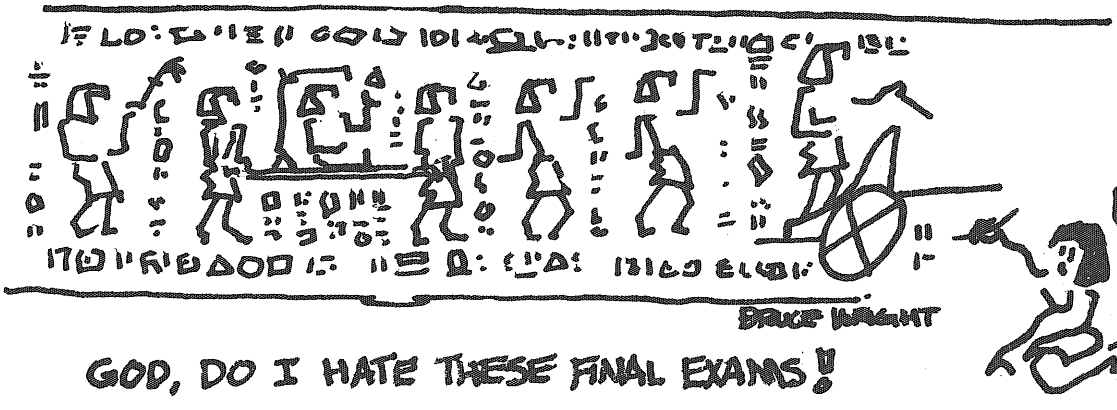
Check in ME 114 and ask about E-Day or call me or Bill Lange at 331-7931 for information.

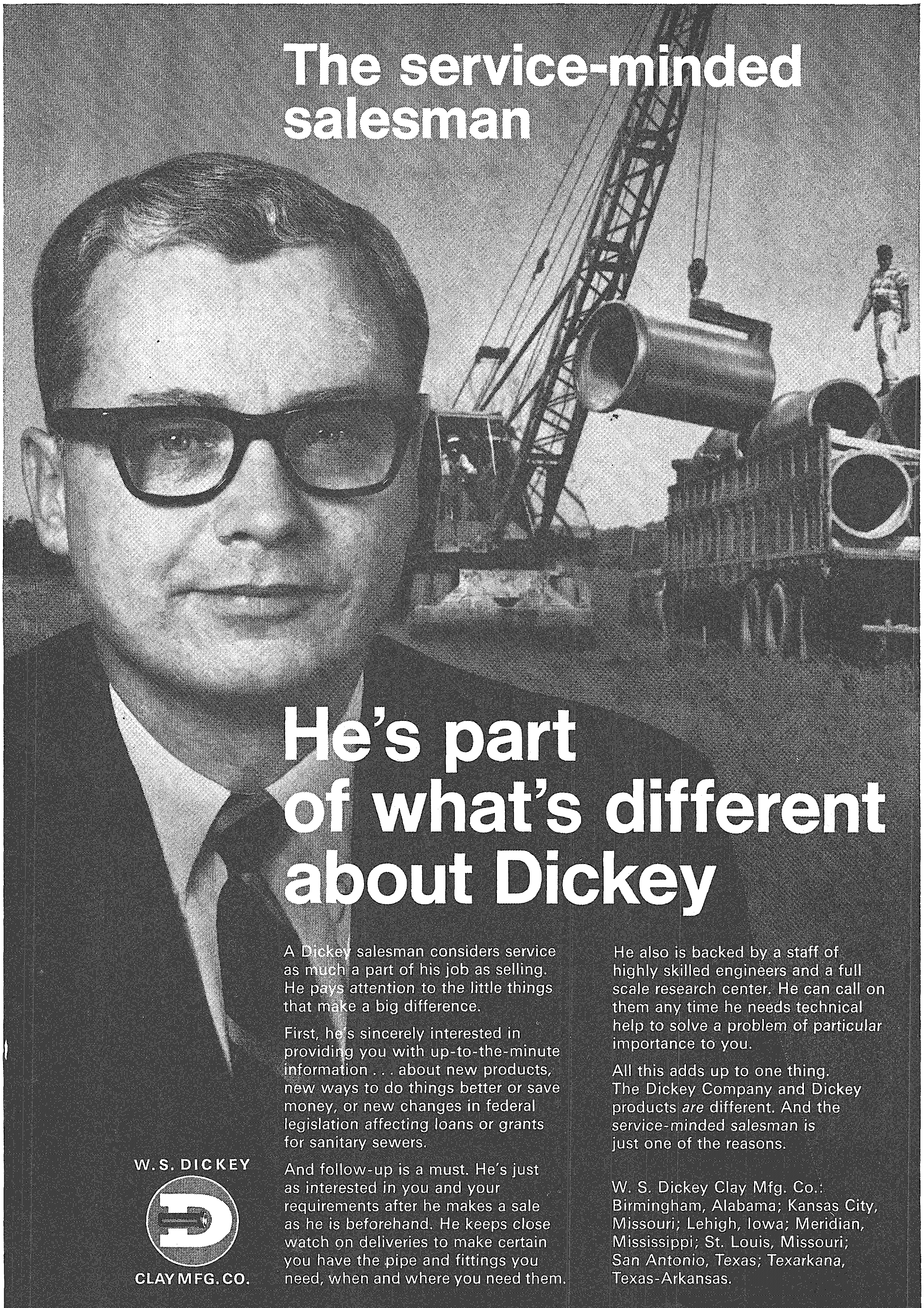
Jim DeBenedet
Publicity Chairman

Button, Button

All groups going all-par in IT Week activities must have at least one design submitted by 4 p.m. Friday, March 13. Designs should be full-scale, neat drawings in up to three colors, on a two inch diameter circle. They must include the dates "May 1-8, 1970" and they may be based either on the official theme "Engineers, Builders or Destroyers?" or on the unofficial theme, "a week of fun for engineering students." Further rules and information on all events is available in 114 Main Engineering.

Bill Lang
E-Day Chairman




The service-minded salesman
He's part of what's different about Dickey
A Dickey salesman considers service as much a part of his job as selling. He pays attention to the little things that make a big difference.
First, he's sincerely interested in providing you with up-to-the-minute information . . . about new products, new ways to do things better or save money, or new changes in federal legislation affecting loans or grants for sanitary sewers.
And follow-up is a must. He's just as interested in you and your requirements after he makes a sale as he is beforehand. He keeps close watch on deliveries to make certain you have the pipe and fittings you need, when and where you need them.
He also is backed by a staff of highly skilled engineers and a full scale research center. He can call on them any time he needs technical help to solve a problem of particular importance to you.
All this adds up to one thing. The Dickey Company and Dickey products *are* different. And the *service-minded salesman* is just one of the reasons.
W. S. Dickey Clay Mfg. Co.: Birmingham, Alabama; Kansas City, Missouri; Lehigh, Iowa; Meridian, Mississippi; St. Louis, Missouri; *San Antonio, Texas; Texarkana,* Texas-Arkansas.
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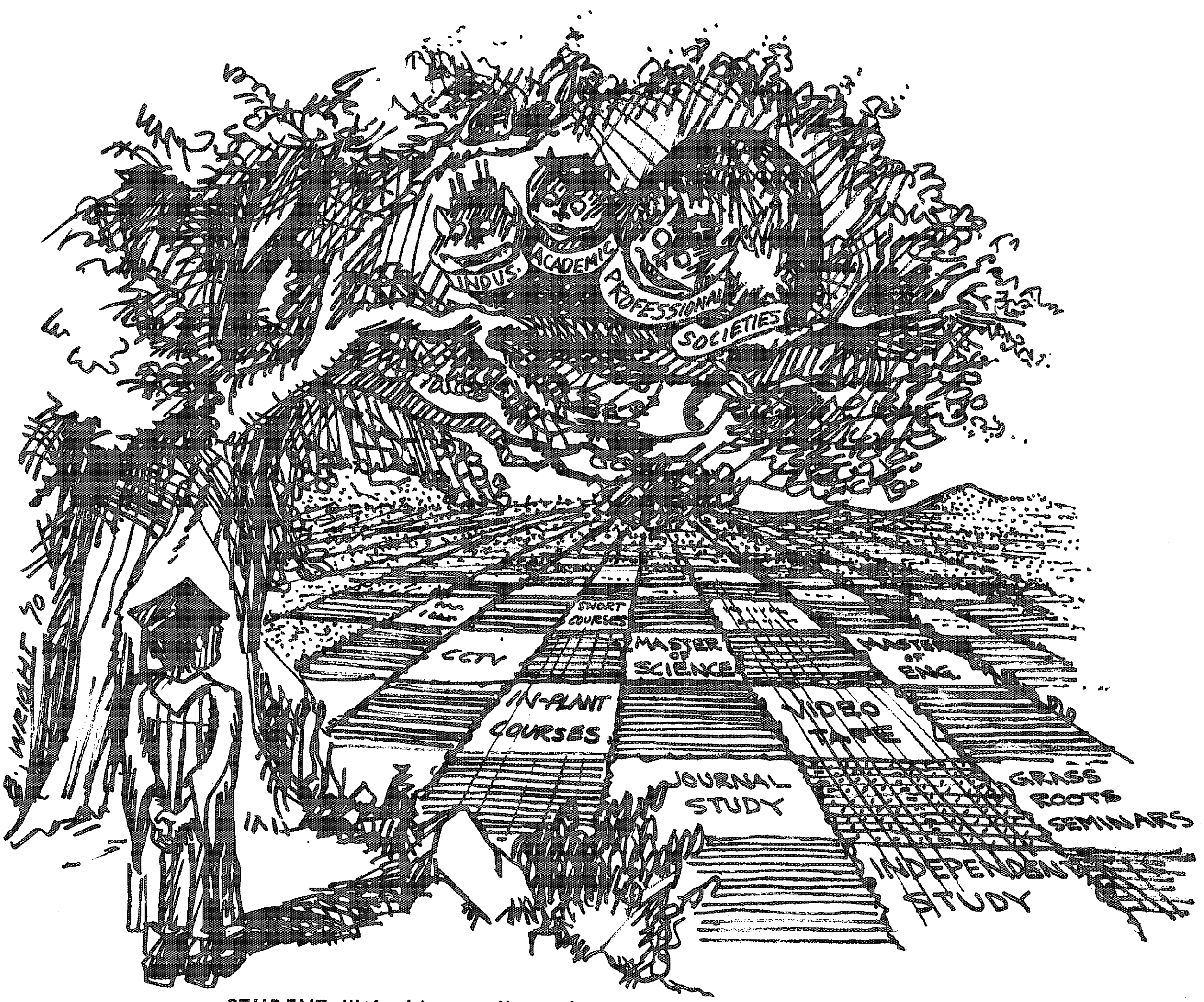

STUDENT: "Would you tell me please which way I should go from here?"
THE CATS: "That depends a good deal on where you want to get to."

CURIOUSER and CURIOUSER The Continuing Education Revolution

by JAMES E. HOLTE
Director of Continuing Education in Engineering and Science, General Extension Division

Continuing Education and the Establishment

Speaking in late 1968, President Fred Harvey Harrington of the University of Wisconsin observed, ". . . it is curious to note how little has been said about continuing education as a revolutionary force in larger universities."[1] He goes on to say that although interviews with administrators and faculty would indicate that the view of a continuing education revolution is nonsensical and on a par with that of enrollment and research, we are indeed at the beginning of such an adult education revolution. We share the perplexed musing of Lewis Carrol's Alice as we examine the "curiouser and curiouser" expanding spectrum of continuing education activities based in universities apparently fulfilling a portion of the institutional mission and yet having no clear-cut relation to the traditional activities of undergraduate and graduate teaching and research.

That this student publication, the *Technolog*, should devote an issue to the subject of continuing education may indicate a sensitivity at the student level to the immediacy of the revolution suggested by President Harrington that is being missed by some senior members of the academic community. In the paragraphs that follow, I will examine some ways in which student attention to current views in continuing education can enrich not only later professional development but the undergraduate experience as well. To help restrict the topic to manageable size, traditional graduate degree programs for either full or part time students will not be considered.

Added Dimensions for Undergraduate Learning

It is the theme of this section that the specific features of an effective continuing education program in an industry or discipline may be the very qualities missing in the related undergraduate degree curriculum. By studying techniques, objectives, and evaluations of continuing education offerings, we will see ways to achieve some of the recommendations of the recent University of Minnesota report, "Education of the Engineer".[2] For example, the report proposed identification of additional opportunities for independent study by undergraduates. Conversations with industry suggest that it might be possible for the interested undergraduate to participate in selected courses and seminars taught by industrial technical specialists for their own personnel. With proper prior approval by the student's department, it should be possible to award independent study credit for this activity. The potential value of such an arrangement is enormous. The student would experience the give and take of engineering discussion in the industrial setting and see first hand the multi-disciplinary constraints he will face throughout his career.

A second inspiration for undergraduate activity may be borrowed from the enthusiasm industry is showing for the retreat-type program. Carefully chosen groups are removed from the job setting to attack a problem of mutual interest at some secluded site. Imagine the exchange of ideas and growth of understanding if a group representing students, industry, and education was isolated and given the charge of formulating an approach to some topic of mutual concern. At a time when the professional societies and their student branches are actively seeking new forms of service, such a project should not have difficulty finding sponsorship.

Continuing education programs throughout the country are recognizing the need for educational media that allow student study at times convenient to him and paced to his background and learning rate. It is increasingly clear that in many cases the advantage of a live instructor or leader is secondary to the need to have the material available at a specific time or place. In addition, large clearing houses for dissemination of this material are coming into existence. Students through their participation in departmental committees and their own organizations can do much to bring these new resources to bear on their curriculum. Such organizations as the University of Minnesota Language Lab and Audio-visual Resources as well as Audio-Visual Extension are in a position to help a department identify these outside resources and employ them in specific curricular programs. School and industry based continuing education programs throughout the country can provide current and relevant materials in a variety of formats.

The Bending Twig

The complexity of technology today demands a much more efficient and widespread approach to true *continuing* education during the entire life of the individual than has been previously recognized. The possibilities of curriculum improvement cited in the previous section are exciting in themselves but more important is the creation of a basic attitude in the undergraduate that he must continue his conscious learning activity even after school is no longer his full time concern. The graduating senior is well advised to investigate the kinds of learning opportunity available from a prospective employer. He should realize that much more is involved than the proximity of a University and a tuition reimbursement plan. An outstanding example of what can be done by firms who recognize their responsibility in providing self-development opportunity for their professionals is the Self-Development Bank Account Plan of the Research and Development Division of Kimberly-Clark.[3] Up to three weeks of paid time away from work and $750 are available to professionals and managers to pursue self-development objectives by a variety of means. Active participation of technical supervisors in planning and approving individual programs ensures that there is company awareness of an individual's progress, thus improving the likelihood that new skills or information may be utilized in the job situation or that new and more challenging job assignments can be made. The point to be stressed here is that by this particular approach, the firm is encouraging the viewpoint that continuing education is a way of life and takes many forms to serve the highly personalized needs of the individual. It is most interesting to note that in 1967-1968 credit course (graduate and undergraduate) activity accounted for only about 12 percent of participant activities at Kimberly-Clark. I hasten to add that the graduating senior should not expect such a liberal and flexible program from most prospective employers but he should try to determine what attitude he will encounter and what encouragement and support he will receive as he attempts to expand his competence through various continuing education activities. The illustration accompanying this article of the queen rushing the graduate along the path of progress is misleading in the sense that all too often such a headlong rush is expected but neither resources nor encouragement and direction to make it possible are provided. Much effort in the immediate future must be devoted to correcting this situation.

How Will You Measure Up?

Some of the most intangible of qualities relate to the real benefits of educational activity, whether continuing or part of regular professional preparation. Job performance does provide a limited but relatively objective means of evaluating personal improvement. Even this area, however, is found to include strong emotional and personal biases on the parts of evaluators and individuals themselves. Northeastern University in Boston has developed a list of 56 objective, quantitative criteria which they have used in measuring the effectiveness of one of their programs, Project GAP.[4] This program utilizes continuing education techniques to enhance the regional economic climate by helping recent engineering and science graduates to close the gap between undergraduate training and the know-how required to be productive on a given job in a particular industry. Most definitely, this is not the only goal of an individual but it is a very important one. The 56 criteria are reproduced here with the suggestion that the reader clip them out and save them for future reference. Several comments are in order. First, a number of employees report that review of these criteria is valuable when they meet with their supervisors to consider promotion and pay raises. Second, these points can partially define for the undergraduate *some* of the important dimensions of his professional life. Are you doing things now and establishing viewpoints that will later allow you to measure up to standards related to these criteria? Third, various jobs will draw on or demand performance on some points more strongly than others and, indeed, many other quantitative criteria can be established. This list should be considered a basis upon which you can build a means of realistically measuring your own stature and growth. Finally, a list which is personally meaningful to you can provide one means of deciding whether a projected educational activity or program is likely to yield returns that justify the needed effort and expense. It should be repeated that other more subjective but equally or more important criteria are likely to be involved in any actual decision situation.

QUEEN (Industry): "Now here, you see it takes all the running you can do to keep in the same place. If you want to get somewhere else you must run at least twice as fast as that!"

Continuing Engineering Studies Effectiveness Evaluation Criteria

1. Ideas submitted in written form for support on independent development funds or discretionary monies.

2. Number of such ideas actually funded.

3. Dollar value of funded ideas.

4. Dollar value of new business resulting from independent work on these ideas.

5. Number of proposals worked on for submittal to customers.

6. Number of such proposals resulting in contracts.

7. Dollar value of such contracts.

8. Number of contract projects participated in. (Each project should be weighted by the ratio of total salaries of personnel assigned to the project divided by the number of people on the project.)

9. Contract projects satisfactorily completed.

10. Participation on reports to customers (number worked on and submitted).

11. Number of papers published, written, and started.

12. Number of patent dockets opened.

13. Number of patents obtained.

14. Number of ideas contributed to work of colleagues and so reported.

15. Participation in successful terminations of contracts (number of contracts so closed).

16. Number of people supervised.

17. Participation in negotiations for new or extended contracts (number of negotiations).

18. Number of discernible independent items entered, dated, and signed in the patent notebook.

19. Number of distinct contacts with customers.

20. Numbers of pre-established work schedules met and not met.

21. Number of reported failures to meet work objectives.

22. Number of customer complaints registered.

23. Number of customer complaints rectified.

24. Value in dollars of suggested and implemented cost improvements (savings on contracted work or investments).

25. Rate of salary increase expressed both as dollar value and percentage of salary.

26. Number and kinds of job-related teaching or coaching activities.

27. Number and kinds of instructional documents prepared.

28. Number of documented consultations by other employees.

29. Number of documented consultations with inhouse experts.

30. Number of documented consultations with outside experts.

31. Number of trip reports submitted.

32. Man-hours of drafting time initiated.

33. Man-hours of laboratory technician time initiated.

34. Volume of correspondence; in-house letters or memoranda initiated, outgoing letters or memoranda initiated, specifically directed in-house correspondence received, specifically directed outside correspondence received.

35. Number of books, documents, and reference material ordered through library.

36. Number and cost of toll calls initiated.

37. Number of toll calls received.

38. Number of wires received.

39. Charges for computer services.

40. Number of projects worked on simultaneously.

41. Number of disciplines worked in.

42. Number of presentations participated in.

43. Expense voucher charges for year and by month.

44. Number of outside visitors received.

45. Number of prospective employees recommended.

46. Number of prospective employees interviewed.

47. Days absent from work.

48. Days away from office on business trips.

49. Unapplied to applied time ratio by months.

50. Proposal time charges by month.

51. Total of different numbers charged to during year.

52. Mobility—number of changes in organizational group assignments (number of different managers).

53. Number of approved material purchase orders initiated.

54. Number of approved capital investments, such as new instruments, machinery, and tools ordered, and value of these purchases.

55. Number of written favorable citations received from customers.

56. Number of written adverse citations received from customers.

New Degrees for Continuing Education

It was stated in the opening paragraphs that traditional graduate degree programs would not be discussed here. However, a most significant project is underway at our neighbor, the University of Wisconsin, long noted for educational innovation. The first students are enrolled this year in a plan of study leading to a newly approved degree, the Professional Development Degree in Engineering. This degree is awarded after completion of 1200 hours of educational activity ranging over graduate course work (counted as 5 hours of effort for each hour in class), seminars and short courses, correspondence study, supervised individual investigations in industry, and other formats agreed upon by the academic adviser and the student. A strong feature of this approach is the tremendous flexibility possible in tailoring the program to individual needs. The role of the adviser is crucial here. It is also important that such a degree can serve a wide range of levels of sophistication and, indeed, would be as appropriate as a follow-up to a Master of Science or Master of Engineering Degree as it would when received as the sole post-Bachelor's degree. Unfortunately, space does not allow a more detailed consideration here but the reader is urged to watch for results of the Wisconsin experience and to be aware that traditional degrees do not exhaust the possibilities for recognition of educational effort.

In Summary

To all readers who share my belief in the existence and importance of a continuing education revolution in modern technology, I strongly recommend the recent NSF report "Continuing Education for R & D Careers NSF 69-20" (obtainable from Superintendent of Documents, U.S. Gov't Printing Office, $1.75). The problems considered and approaches suggested have broader interpretations than the title indicates although the data analyzed was taken from a strongly basic science oriented sample. The following quote from this report summarizes the relative roles of several participants in continuing education effort:

"The individual carries the basic responsibility for his own development and for keeping up to date. His employer has the responsibilities of providing both opportunities for continuing education and a work environment-job structure climate that encourages him to keep up to date. The professional societies and universities are obligated to help him by providing educational opportunities and subject matters from which he can select those best fitting his needs. Employers and professional societies, more than universities, share some responsibility for making the man aware of his needs and helping him plan to meet them."

Your own central and key role comes through clearly in the quote[5] of an engineer: "Lots of engineers around here expect management or someone else to squeeze a glass of fresh knowledge for them every day and then see that they drink it! But I guess you can only decide for yourself what to study when you know what kind of a person you want to be ten years from now and what you will want to be doing."

In closing we note that Alice's ungrammatical but descriptive exclamation, "curiouser and curiouser", may provide a desirable goal for continuing education on the basis of a dictionary definition of curious as ". . . exciting attention or inquiry, awakening surprise, inviting and rewarding inquisitiveness . . ."

References

[1] Fred H. Harrington, *Continuing Education Revolution*, Monograph #3 Continuing Engineering Studies Series, American Society for Engineering Education, pp. 8-12.

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[3] Ralph M. Buchen, *Continuing Education for Research & Engineering*, Monograph #3, CES Series, ASEE, pp. 42-46.

[4] Israel Katz, *Use of Quantitative Measures for Evaluating Project GAP*, Op. Cit., pp. 68-73.

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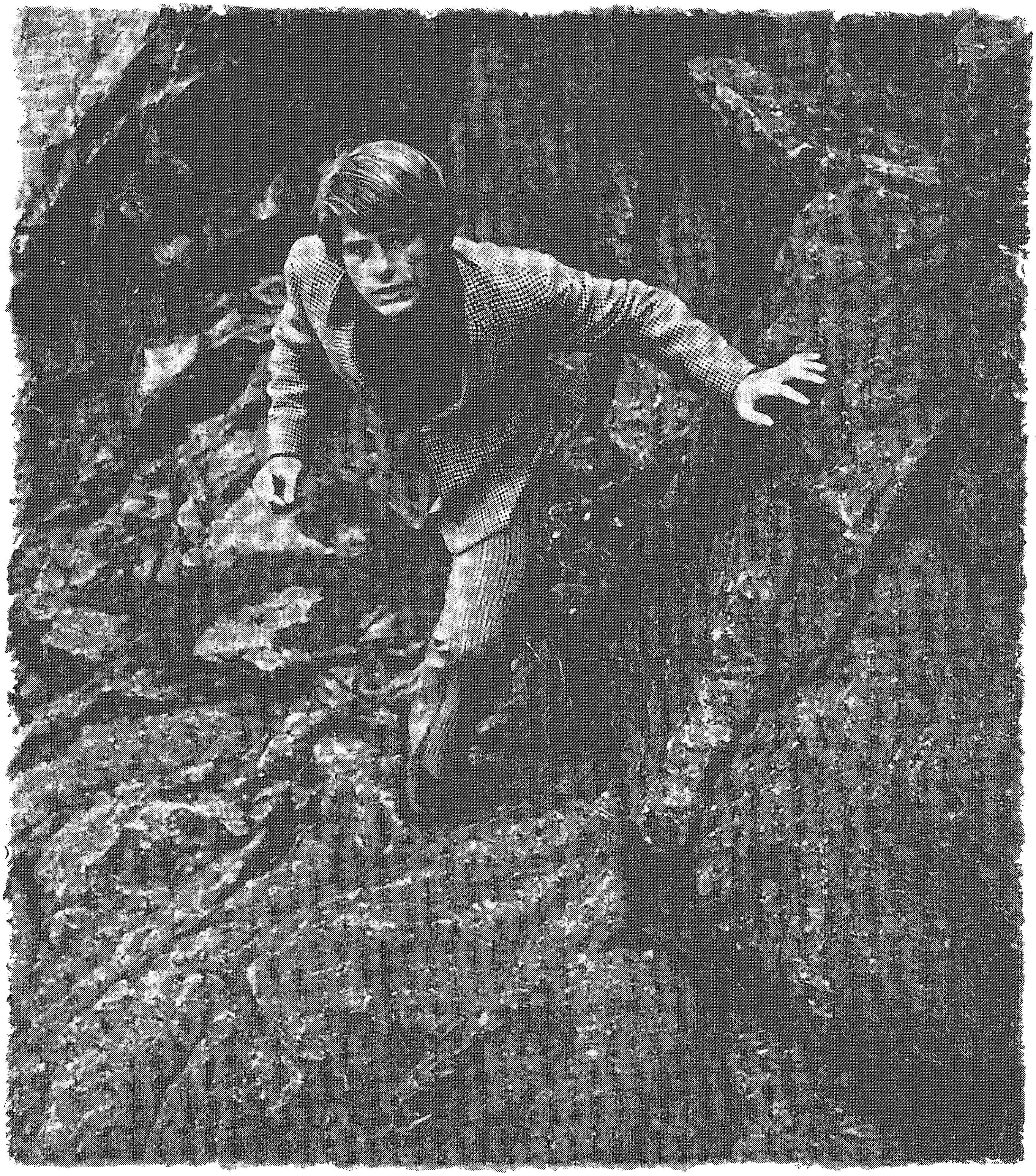


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Education of the Engineer

Summary of the Report of the Engineering Programs Study Committee

by RICHARD C. JORDAN
Engineering Program Study Committee Chairman

Man's consciousness of his history is peculiar to the species, so also his effort to peer forward in time to mold events he may never witness in the flesh. Education is the instrument by which a civilization seeks to understand itself and through which it reaches to shape the future. The form of engineering education is determined by the function of engineering practice. Engineering exists to meet human needs. While no sharp line divides science and engineering, there is substantial truth and utility to the view that science consists of matters of the mind, constrained to paper or restricted to the laboratory. In these forms, scientific matters in and of themselves pose no threat to society nor do they guarantee benefit. Engineering is the means, the process, by which new principles or concepts are translated into operating systems or devices. It is the reality of these engineering creations which threatens or enriches us. The engineer is interpreter and mediator. He stands between a mounting treasury of scientific riches and humankind. He perceives among these riches, those which are feasible and participates in the process by which certain elements of this smaller group are selected for engineering practice. The engineer participates with others in this crucial selection process in two roles. His education requires that he play the major part in determining the technical feasibility of proposed devices and systems. He is first and primarily a human being, however, and certain vital claims and responsibilities shared with his fellow men arise from this role, not the least of which is the preservation of the species.

The certain purpose of engineering has always been the professional pursuit of solutions to technological problems and a bridging of the gap between science and application for society. To the high credit of engineering education, it moved quickly from the engineering era of empiricism, sufficient for the technological goals of the first thirty years of this century, into recognition of the tremendous effectiveness of the techniques of

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[1]*In July 1968 Dean Warren B. Cheston, Institute of Technology, appointed an Engineering Programs Study Committee charged with undertaking a searching examination of the undergraduate engineering programs with a view toward changes which might constitute the foundation for major developments in engineering education at Minnesota for the next several decades. This committee spent some two to two and a half man-years of time both in committee meetings and conferences with representatives of the engineering profession. This article is a condensation of this report, "Education of the Engineer," both in wording and in content. The committee membership included the following personnel: Rutherford Aris, Professor and Associate Head, Chemical Engineering; George Ceman, President, Tau Beta Pi, 1968-69; Lorne M. Chanin, Professor, Electrical Engineering; John T. Hanley, Professor, Civil Engineering and Director of Undergraduate Studies; Arthur Hansen, Vice President, Plumb Bob, 1968-69; David Holger, President, Tech. Commission, 1968-69; Warren E. Ibele, Professor, Mechanical Engineering and Associate Dean, Graduate School; Dennis Johnson, Treasurer, Tech Commission, 1968-69; Robert F. Lambert, Professor, Electrical Engineering; Margaret Marsden, President, Tau Beta Pi, 1969-70; Bruce Nelson, President, Tech Commission, 1969-70; Robert Plunkett, Professor, Aerospace Engineering and Mechanics; William E. Ranz, Professor, Chemical Engineering; Louis E. Toth, Associate Professor, Metallurgy and Materials Science.*

mathematics, physics, and other sciences in the solution of more sophisticated technological problems. Throughout the 1940's and 50's increasing emphasis was placed by engineering education on heavy incorporation of the basic sciences into engineering training and a reorientation of many engineering subjects toward engineering science. In the process, many engineering schools virtually lost their engineering identity and, in most, the first two years of a four-year education was totally dominated by training in the basic sciences. One of the most powerful tools provided the engineer in his training will remain his competence to use the basic sciences. However, he cannot hope to compete with the mathematician, the physicist, the chemist, the biologist, or the geologist on his own grounds. The challenge to engineering education today is to train engineers who are strongly grounded in the sciences basic to engineering, while at the same time providing them with an understanding of and an ability to undertake the central goal of solving technological problems. The leadership in modifying engineering education to this end must be taken by those schools already strong in basic science education.

Engineering students emerging from universities at this time are faced with a background of unrestrained population growth, rapid urbanization, a deteriorating environment, diminishing natural resources, and a continuing threat of nuclear or bacteriological war. The solutions to problems such as these, with interfaces between engineering and society, require the participation of engineers trained with a greater sensitivity to the issues involved and the trade-offs possible than in the past. Although the lead time for the training of engineers is four to nine years and the maturation into responsible positions in industry is in the order of ten to fifteen years, fortunately an increasing segment of the engineers who are already in industry are becoming aware of the problems and are attempting to contribute to their solution.

The Engineering Programs Study Committee believes that engineers and the participation of engineers in society must be undertaken from an educational platform which provides many types of educational programs and from a background which assures that the engineers' training will integrate an understanding of the unparalleled impact of each new engineering development upon society. This is not to suggest that all engineers must devote a dominant part of their training to social and ecological activities. However, it does suggest that engineering programs should be able to accommodate those who do wish to direct their efforts and at the same time make certain that all engineering students are exposed to the issues.

The programs developed by the committee attempt to provide an educational pattern with variability under the control of intelligent choices, recognizing that some students are motivated toward careers in engineering sciences, others toward professional engineering activities, and still others toward engineering careers which maximize social interaction. Academic barriers, chronological or otherwise, can be reduced and the minimum essentials of basic science normally covered in the first two years would then permit the student to pursue either a science-oriented, professionally-oriented, or socially-oriented upper division program. The committee also believes that there must be recognition that four years of engineering education does not produce a finished professional engineer and that the four-year graduate must expect to pursue either further science or professional engineering education during a fifth year or beyond or he must expect to enter industry or government with further training provided through the variety of continuing education programs now available or being developed. To accomplish these goals with course programs which have relatively few specific requirements, substantial faculty effort must be directed into advising. Since a strong advising system must be introduced into the educational process individual professors, groups of professors and departments must all accept undergraduate advising as one of their primary teaching responsibilities.

Students

Students presenting themselves to colleges and universities are increasingly concerned with self-knowledge and development. Engineering students have additionally the expectation that their university experience will adequately prepare them to begin a career of professional practice. Continued understanding and intellectual growth, personal and professional, presume continued study and reflection. Education is an intensely personal process; its success is measured by the extent it affects personal attitudes and behavior and stimulates the individual to achieve his inherent potential. Self-discipline, self-motivation, and creative thought are central to life's educational process. The undergraduate engineering program should therefore stimulate the process of self-knowledge and personal development, fostering at the same time communication and fruitful interaction with others.

Students entering the Institute of Technology are academically among the best qualified in the state. The factor most strongly influencing their entrance into engineering study is a personal interest developed over a period of years. Experience has shown this interest to range from highly theoretical to design, development, and production of systems and devices to enhance life. In meeting this goal, the student should be able to retain the freedom, to the greatest degree consistent with other objectives, to delay his choice of departmental major. Emphasis throughout the program should be on developing the analytical and critical abilities essential for maintaining intellectual integrity during the pursuit and application of knowledge. Fundamental to this is a mastery of the minimum body of important scientific and engineering principles and procedures which undergird continuing study and professional practice. The process by which an individual's contribution is presented to society involves communication: oral, written, graphical, and mathematical. The student should be provided the opportunity to acquire competence in all modes of communication. To develop a creative and innovative approach to problems, a variety of situations should be utilized for problem formulation, solution, and criticism. During his program of study, the student should acquire an understanding of the special responsibility of the engineer as he transforms selected elements of the physical sciences to the service of men. Fundamental to this role is the ability to anticipate and identify the human needs to be met, a sensitivity to the social implications of technical decisions, and an understanding of the processes by which social needs and technology are harmonized.

Faculty

The engineering faculty at the University of Minnesota is well qualified, many are eminent, and their efforts in graduate education in some areas are nationally recognized for high quality. While the composition of the faculty and their interests have tended to follow the national trend toward emphasizing graduate study and research, the disparity in quality between graduate and undergraduate programs fortunately has never reached that found in some institutions of comparable size and stature. In all engineering departments there continue faculty whose sustained interest and dedication to undergraduate instruction provides a strong base from which curriculum innovations may begin and rapidly develop. Moreover, the engineering faculty in general has a creative approach to their work and a professional outlook. Many are concerned with the social impact and implications of engineering and technology and express their concern by direct participation in the process by which the community deals with such issues. The approach, outlook, and involvement of the faculty suggests, therefore, the existence of good models for aspiring young engineers if there were a mechanism by which these models could become known.

With a redirection of faculty interest and administrative encouragement, the committee believes the present engineering faculty can substantially improve the quality of undergraduate engineering education. This could occur by their active participation in effecting the recommended curricula changes and by a commitment to the advising plan believed necessary for the student to achieve his goals. We believe more emphasis on undergraduate education can occur without diminishing the high quality of graduate study and research. The setting of the University in a growing urban complex offers research and professional opportunities to the faculty no less attractive than the educational opportunities offered the students. New faculty additions, especially those expert in modern design coupled with social awareness, can contribute further toward an excellent undergraduate engineering program.

Curriculum

Present engineering study programs were generally conceived as offering students opportunities to meet these diverse needs. In practice, contemporary students view them as rigid, deficient in engineering content, and lacking opportunities for synthesizing the various program elements in the vital engineering method of problem formulation, study, and evaluation. Individual courses are well conceived and many are extremely well taught; nevertheless, the unity and focus of the program are less than optimum. Heavy total course and credit requirements circumscribe the opportunity for personal knowledge and development. Advising practices by faculty are uneven at best, often uninformed, and, on occasions, disinterested. This not only costs the student time and prevents him from realizing the maximum benefit from the program but it also inhibits the development of a relationship between engineering students and faculty which can be mutually rewarding.

The rapidly increasing store of knowledge, scientific, social, and technical, precludes the possibility of a four-year program of study embracing all aspects of learning. It is possible, nevertheless, to design a program which will be a significant educational experience and preparation for a full, productive life. Science requirements should be held to the minimum necessary for (1) supporting the subsequent work in engineering science, analysis, synthesis, and design, and (2) providing the foundations for continuing study and professional development. Similarly, social science requirements should stimulate awareness and provide the essential framework in which the engineer perceives the social needs to be met by a technology sensitive to all the implications of technical decisions. Here, too, emphasis is on a minimum essential requirement to support subsequent continuous study (undergraduate, graduate, and beyond) and a measure of freedom for the student to pursue his interest in some depth. Students interested primarily in the theoretical or applied science areas of engineering will be able to study extensively in these areas by the proper choice of electives.

Paralleling the growth of knowledge is the increasing variety of occupational specialties. It is unrealistic to expect every student in a given curriculum to study all the specialties in that field. Rather, he should be given the freedom to select one (or some combination) to explore in some depth. The adequacy of a particular program is measured by its overall coherence. Every program should provide the student with the opportunity to develop his powers of analysis, synthesizing the knowledge he has acquired—technical, social, and humanistic—to formulate the problem, develop solutions, and evaluate their merit. The specific specialty or subfield is of secondary importance, the student will probably not encounter the problem again and, indeed, may not practice in the sub-field.

The primary importance of his program and he should be constantly aware of this is that he is involved in a process, a strategy. The strategy begins when he anticipates human needs, perceives their order of importance, applies the principles of physical science, social science, and engineering to arrive at solutions, selects the appropriate system, and evaluates its technical and social characteristics for compatibility and satisfaction of the original need.

Summary of Recommendations

The total report "Education of the Engineer" provides the rationale for a series of recommendations which meet the objectives outlined briefly in the preceding paragraphs and which, in the view of the committee, will permit implementation of the program recommended. These recommendations are subdivided into advising and counseling, general degree requirements, lower division program, and upper division program. The committee has recognized that acceptance of the philosophy of this report cannot be accomplished solely through adoption of a series of pre-determined recommendations. Many minor and perhaps major unforeseen problems will be encountered. However, the committee feels strongly that the goals are worth the effort and hopes that

SUPPORT I. T. WEEK

both faculty and students will accept the challenge. The following paragraphs repeat the report's recommendations. In many cases, an explanation of the rationale for the recommendations requires reference to and review of the total report.

Advising and Counseling

1. Each degree granting faculty shall prepare and distribute, by May 1 of each year, several four-year course programs showing a detailed listing of suggested courses. Courses specifically required for the degree should be identified. These detailed programs are to be directed to representative students interested in various aspects of a specific field. An accompanying text should include timely advice and counsel of interest to all students associated with that department and any non-major who may elect to take courses offered by the department. This one specific action is intended to carry the major burden of program advising.
2. A central advising service shall have primary responsibility for advice and counsel to students in the lower division and shall provide specialized services, such as a consulting psychologist, for students in both divisions. The central advising service shall also have the responsibility for and be provided with the means for developing any special counseling programs such as senior advisors for freshmen, industrial advisors, professional advisors, dormitory advisors, etc.
3. Each student in the lower division, who designates the degree he seeks, shall be assigned, by the department through a central advising service at the college level, an academic advisor in the department offering the degree. Students without preference for a degree shall be assigned an academic advisor or provided his equivalent in a group effort by the central advising service. A lower-division student shall be able to change his advisor by appeal to the central advising service.
4. The degree granting department shall have primary responsibility for advice and counsel to students in the upper division. Advising shall be considered, by all quantitative measures presently devised and to be devised, as a teaching function of the whole faculty, with a minimum of 5% of total teaching effort devoted to advising and counseling activities on the basis of a departmental average. For example, in a department of ten members, one member might provide all counseling or many members might engage in counseling activities.

General Degree Requirements

1. The Bachelor of Science degree in a specific branch of Engineering will be awarded after a student has satisfactorily completed a lower division program as specified below and an upper division program as specified by the degree granting faculty.
2. As part of his over-all program for the B.S. degree, a student shall offer a minimum of 36 quarter credits selected from the fields described in the Council on Liberal Education statement as: English and foreign language communication skills; linguistics, rhetoric and logic; philosophical analysis; man and society; and artistic expression. Ideally about half of these credits should be taken as a part of his lower-division work. Nine quarter credits must be in courses appropriate for the fulfillment of the requirement for English Composition or their equivalent. Some significant part of the upper division portion should be of upper division quality. Upon petition to the Dean of IT or his designated representative and with approval of his academic advisor, a student may make a reasonable modification of this requirement; for example, include non-required courses in biological science.
3. Also as part of his over-all program for the B.S. degree, a student shall offer the equivalent of at least 13 quarter credits of observational and manipulatory laboratory work. A portion of these credits, ideally one-half, should be taken as part of the lower division program. Those credits taken as part of the upper division program shall be considered to be in partial fulfillment of required course credits for the degree so that the degree will require laboratory credits of upper division quality.

Lower Division Program

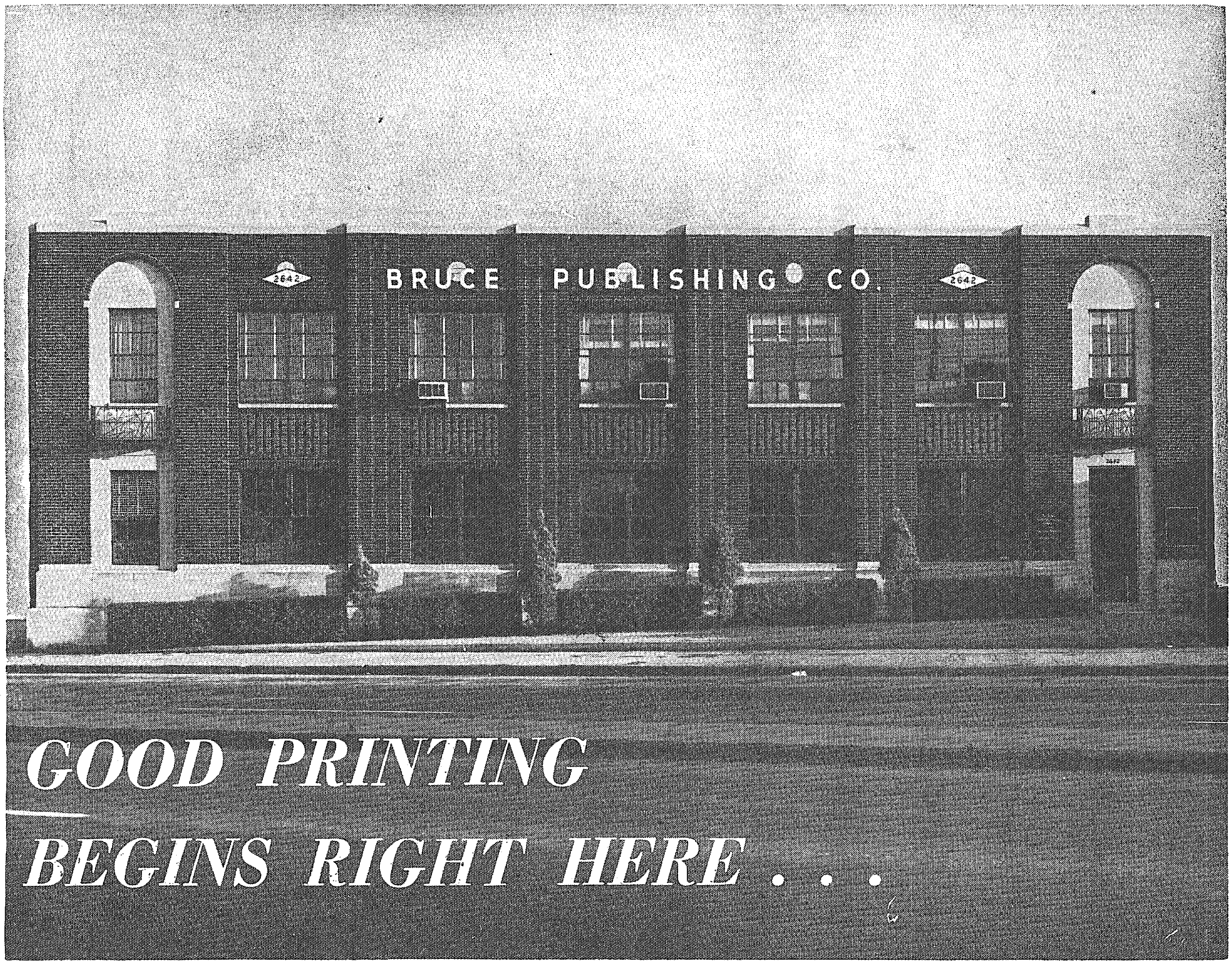
1. A Lower Division Committee shall be appointed by the Dean of IT to supervise the academic progress of all engineering students in the lower division.
2. The Lower Division Committee shall be responsible for monitoring the operation of the lower division program and for making timely recommendations to the faculty for any changes which are necessary in the rules governing it. The lower division curriculum shall have a minimum of 90 equivalent quarter credits and will consist of specific lists of courses for each of the first two years with alternatives and electives as appropriate. These lists shall include programs submitted by degree granting departments and approved by the Lower Division Committee.
3. Each department and faculty group offering an undergraduate engineering degree will have at least one representative on the Lower Division Committee. The designated representative certifies a student's completion of the lower division curriculum, subject to concurrence of the full committee.
4. The Committee will develop and maintain a list of equivalent courses for appropriate colleges and universities, satisfactory completion of which will be equivalent to completion of a course or group of alternative courses in the lower division curriculum. As an alternative to examining course credits in detail, a student might be considered to have satisfied all or any part of the requirements of the lower division at another college upon their statement that he has satisfactorily completed a program mutually agreed upon between that college and the Lower Division Committee. As another possibility, a student may submit a petition to the Committee for its determination of satisfactory completion of the equivalent of any courses in the program. The Committee will act on the recommendation of the department representative, based on whatever supporting evidence he deems necessary. This need not necessarily depend on earning formal course credits or having taken a proficiency exam.
5. Subject to the procedures outlined above, satisfactory completion of

the specified number and kind of course credits is a sufficient but not necessary condition for completion of the lower division program. The Lower Division Committee is responsible for developing at least one common concrete program which will adequately prepare a student for the upper division curriculum in any of the branches of engineering offered at IT. This is not intended to prevent a student from making his preparation more specific for a given field if he so desires.

6. At least once a year, in consultation with his academic advisor, each student in the lower division will prepare an academic program for submission to and approval by the Lower Division Committee or its designated representative. A student need not have his advisor's permission to register for any courses for which he is otherwise eligible but he is not assured of fulfilling the lower division requirements unless he follows his own approved program. Each entering freshman will prepare such a program during his first quarter and may not register for the second quarter until he has done so. Each transfer or advanced standing student must prepare such a program prior to registering for his first quarter.

Upper Division Program

1. The upper division program shall have a minimum of 90 quarter credits of which not more than 54 nor less than 45 shall be in technical courses as required by the degree granting faculty and approved by the Curriculum Committee. No student shall be prohibited from taking upper division course work for which he is prepared because he has not completed all the requirements of the lower division.
2. The remainder of the upper division program shall consist of freely elected course work subject only to the general degree requirements mentioned above and to the approval of the student's advisor and the Department Head, or his designated representative (i.e., the Departmental Director of Undergraduate Studies). The principal criterion by which a student's program should be judged is coherence.
3. There shall be no required course prerequisites for upper division courses. The bulletin listing of a course should show suggested preparatory courses which shall not be mandatory.
4. At least once a year, in consultation with his academic advisor, each upper division engineering student will prepare an academic program for the submission to and approval by the Department Head or his designate. A student need not have his advisor's permission to register for any courses for which he is otherwise eligible but he is not assured of receiving the Bachelor's Degree unless he follows his own approved program. Each transfer or advanced standing student must prepare such a program prior to registering for his first quarter. The Dean's office must approve the final program for compliance with the requirements for non-technical electives and laboratory credits. The degree will be awarded after the student has been certified as having completed the specific program approved for him by his Department Head and the Dean's office.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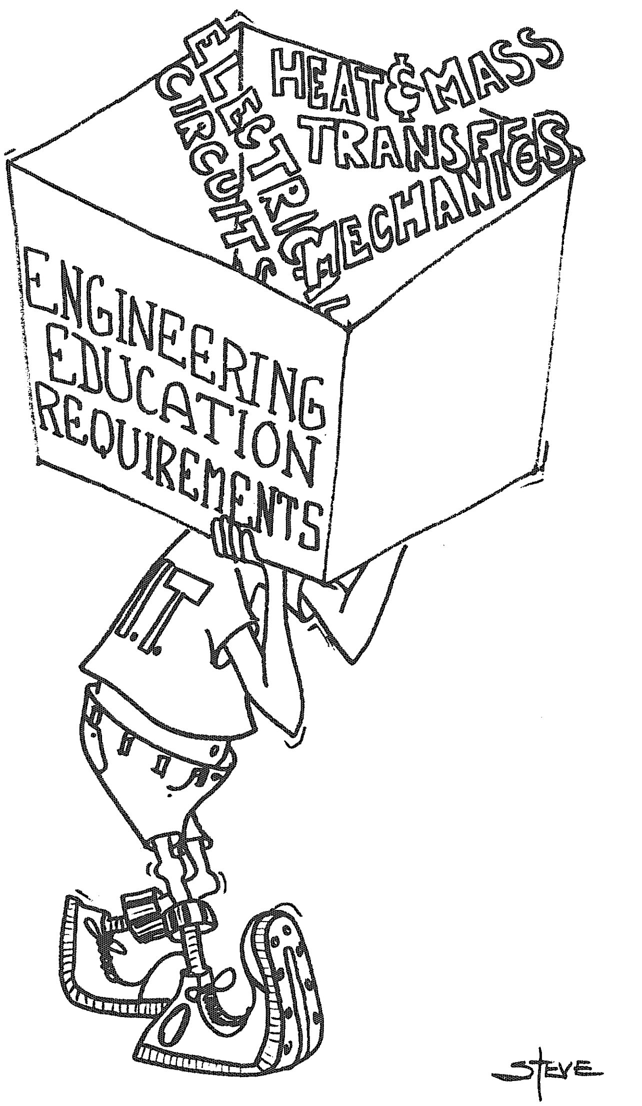
The Professional Master's Degree

by ROBERT PLUNKETT
Professor of Aerospace Engineering and Mechanics

Fifty years ago, undergraduate engineering education prepared a student to do real engineering work the first day after he graduated. Much of his time was spent learning specific skills that would be immediately useful. This approach was perhaps a reasonable one in the days when technological developments came slowly, when a technique that was learned today could be found in use twenty years hence. It is hard to justify at a time when developments are so rapid that techniques learned as a freshman can be obsolete by graduation. We were seriously faced with this problem for the first time in World War II. Engineers did a magnificent job of producing the standard equipment that was used in such large quantities; they were responsible for designing and planning the production of tanks, trucks, cargo ships, radios, aircrafts, guns and ammunition, roads, railroads, and airfields. In spite of these great achievements, the really new developments of that period were beyond their capabilities. Physicists, mathematicians, and chemists not only did the theoretical work on atom bombs, sonar, and radar, they were also responsible for detailed design and much of the production. The problem was that engineers were very skilled but not very versatile and lacked the necessary basic understanding of natural science.

Engineering education was drastically revised in the late forties and early fifties to include much heavier doses of what used to be called classical physics and what is now called engineering science: solid and fluid mechanics, thermodynamics, heat and mass transfer, and electrical circuits and fields. The older and more traditional courses in design, material behavior, construction and production methods, electrical machinery, electronic devices, and unit chemical processing techniques no longer found much room in a standard four year curriculum. A few schools, the University of Minnesota among them, felt that these courses were still important enough for all engineers and therefore they should be taken by all students; the only reasonable solution was to add a fifth year to the standard program for the bachelors degree.

The pressure for this solution was increased by the growing realization that the engineer needed some exposure to non-technical courses if he were to communicate with his fellow man and understand the emotions and desires that move him. Even twenty years ago, long before it became popular politically, some engineers and engineering educators realized that we could not continue to loot our natural resources with impunity nor could we continue to base technical decisions on purely mechanistic grounds without regard to the sociological consequences. While the results have not been overwhelmingly successful, a real effort was made to increase the amount of social and humanistic courses taken by the engineering student up to about twenty percent of



the total. The five year program was recognized as a useful and important one by industry; our graduates started at salaries about fifty dollars a month higher than those commanded by four year graduates of other schools. As time went on, the inexorable erosion of Gresham's law set in; the margin between the starting salaries gradually decreased until it was only about ten dollars per month. At that point the faculty of the College of Engineering did not feel that they could ask undergraduates to put in an extra year if it were not going to be recognized by industry and in 1964 we reverted to the four year curriculum.

Most of the faculty still felt that a large number of the students would benefit from another year in which they could cover professionally oriented subjects as contrasted with more analytically oriented ones. A committee was appointed to explore the possibility of finding a substitute for the fifth year of the old program. This committee operated in the rather ponderous fashion of all academic committees and after some changes in personnel and several years deliberation and consultation with students and the rest of the faculty, it developed a program leading to a professional master's degree with a field designation. As a result of the recommendation of the IT faculty, this program was approved by the Board of Regents in the spring of 1969. Following this authorization, a number of engineering departments of IT now offer a 1-year program, with emphasis on design methods, leading to a degree of master of engineering in a specific field (M.C.E., M.M.E., M.A.E.M., etc.). The program is designed primarily for students who have already received a Bachelor's degree in a related engineering field and have appropriate professional experience. A student spends about 40 percent of the year in a major field of study, about 20 percent in a minor or supporting area, and about 40 percent on a design study of significant professional content. A full time student should be able to complete this program in one calendar year by taking 27 quarter credits of appropriate course work and spending about twenty weeks on a design project. Each program is administered by a departmental professional engineering program committee monitored and advised by a Professional Master's Committee appointed by and jointly responsible to the dean of the Institute of Technology and the dean of the Graduate School.

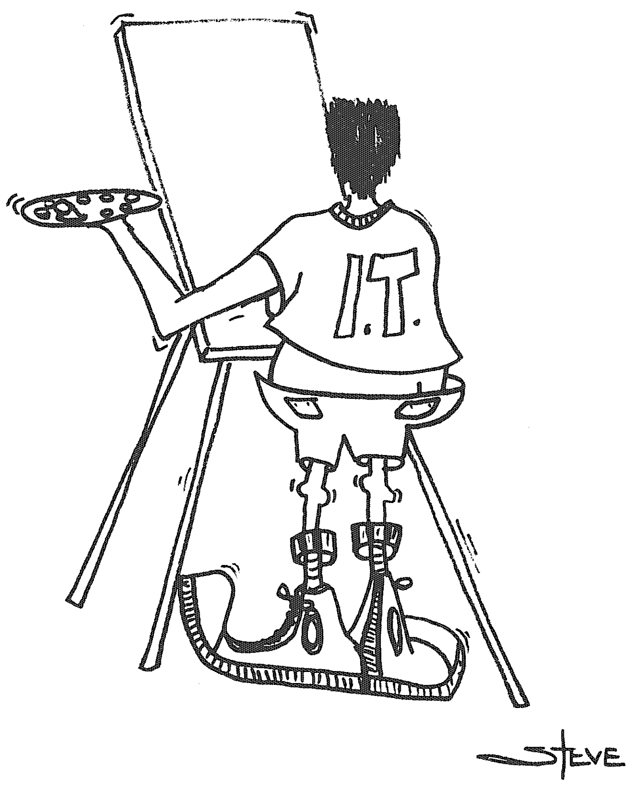
The distinction between the objectives of this program and that of the master of science depends on intent. Design concerns itself with the application of the knowledge and methods of engineering and of the physical and social sciences to adapt materials and sources of power to the use of mankind. Thus, any study which focuses on the engineering application rather than on the method or material behavior may properly be called a design study. For example, applied mathematicians have developed methods for optimal structural design; engineers might well use these methods for a design study of different types of structures to determine construction possibility, cost, sensitivity to construction deviations, or other parametric studies. Studies of the economic tradeoffs involved in aesthetic and sociological compromises would be highly appropriate. In some cases a combination of analysis, synthesis, and experimentation would be a suitable design project if the primary objective is the operation of the end product and not the development of the method.

These programs are currently being offered by the Departments of Aerospace Engineering and Mechanics, Agricultural Engineering, Civil Engineering, Mechanical Engineering (in both Mechanical and Industrial Enginering), and Mineral and Metallurgical Engineering. Since the criteria for admission are highly subjective, a prospective student must have an interview with the chairman of the appropriate departmental committee. He will advise the applicant as to appropriate forms and other information necessary. The requirement for this interview can be waived only under unusual circumstances. The criteria to be considered for admission are:

a. Interest in and aptitude for design-oriented and creative programs as evidenced by performance in undergraduate laboratory, professional, and design courses.
b. Technical reports or other evidence of performance in industrial design. Reports on undergraduate projects.
c. Recommendations from faculty or practicing engineers who have supervised the applicant or have other specific knowledge of his aptitude for design.

This program is designed primarily for students who feel they need more study (in-depth or in-breadth) or a formal introduction to the design process to prepare themselves for specific work. For this reason, most of the students admitted have received a B.S. in Engineering within the past few years from an ECPD accredited curriculum. Students must have a 2.80 GPA in their graduate course work and satisfactorily pass a project examination to receive the degree. The three quarter minimum residence requirement applies.

The necessity for programs of this type is being recognized in other Colleges of Engineering as well. The recent Goals of Engineering Education Report says that over 50% of the engineers holding Master's degrees in 1964 practiced in a design and development capacity. The Goals report concludes from this that there is a need for Master's programs to support the needs of the applications-oriented engineer as well as those of the teacher and scientist. Our Professional Master's Program is founded on the conviction that each of these professional functions is equally challenging and, therefore, each deserves supporting programs of equivalent value but of different character. It also recognizes that the ability of a student



to pursue a quality program in the disciplines of synthesis and design may not be clearly established by his undergraduate grade point average and that other performance criteria should also be considered to open the portals to further study in design-affiliated disciplines. The Goals report suggests that there is room for a post-baccalaureate program closely linked to the student's undergraduate study which is structured to accent the application of that body of knowledge rather than to pursue new and advanced levels of inquiry. Concurring with that recommendation, the program at the University of Minnesota is identified as an extension of his undergraduate education. This program should in no way be compared with the current M.S. program of graduate work. Some students may be equally eligible for both programs and should base their choice upon their ultimate objectives—professional design on the one hand and teaching and research on the other. Some students may be eligible for one or the other program but not both; in this case there can be no conflict.

The cornerstone of the program is the Design Project. It must be substantial, educational, and of a high professional level. It must be carried out by the student as an individual effort with no professional assistance other than the guidance provided by his committee and in particular by his project supervisor. Subprofessional assistance, properly acknowledged, may be permitted. While there is no essential objection to a design project associated with the student's employment, it must be clearly understood that exceptions to the requirements of individual responsibility, faculty supervision, and advance faculty approval cannot be permitted; no classified or "company confidential" material may be used.

While close liaison is maintained with the Graduate School, the responsibility for the success of the program lies with the Institute of Technology. Because of the specialized nature of the program, its supervision rests with those most intimately related to its objectives. In this way, any confusion between this program and graduate study leading to an M.S. with emphasis on research should be reduced.

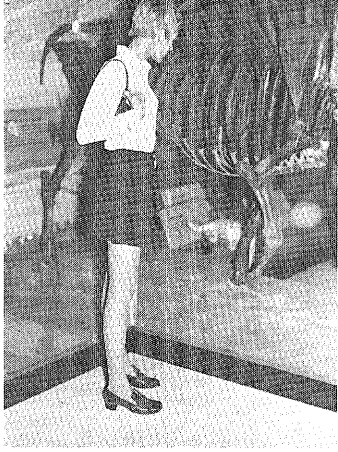
Because of the difference in objectives, financial assistance in the form of traditional traineeships and fellowships are not available for the Master of Engineering program. In some special cases these students might be particularly qualified to assist with undergraduate design and laboratory courses as teaching assistants or associates. It is hoped that, in addition, new financial support programs—principally from industry—will develop to assist these students.

Faculty support for this program will not be had at the expense of current graduate study offerings. While some departments can now offer this program on a modest and experimental basis with no increase in faculty burden, it is clear that any substantial program must eventually be reflected in the available budget.

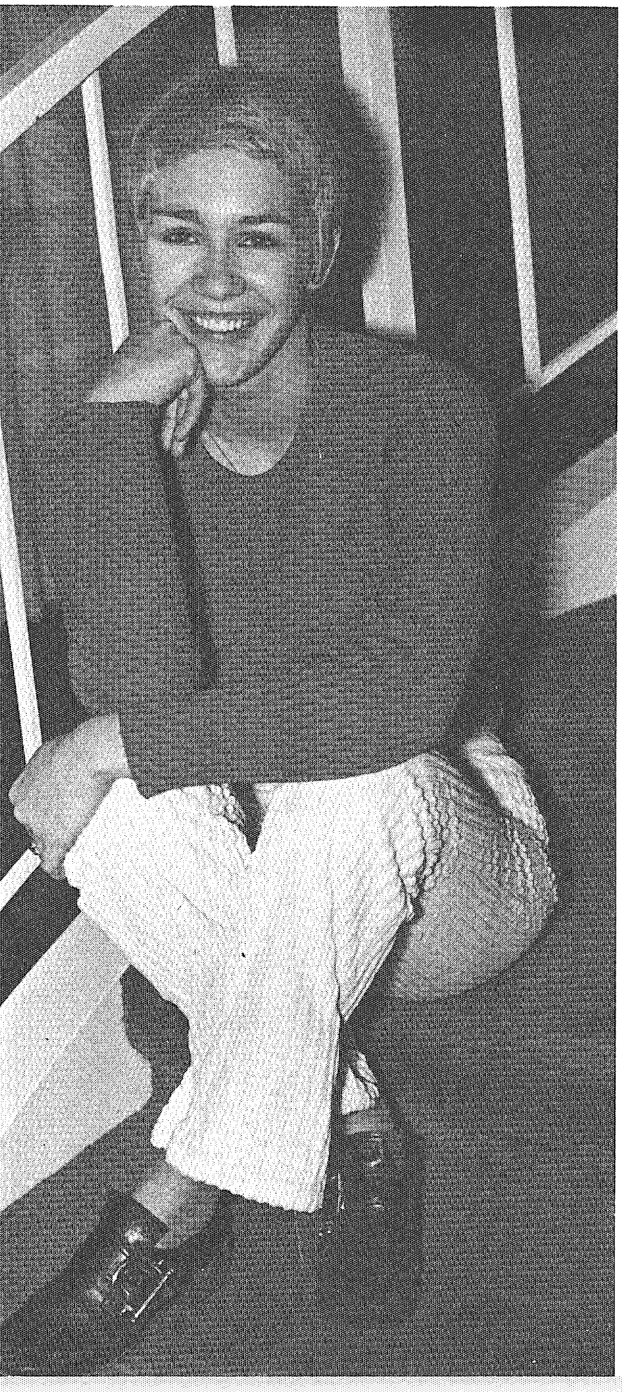
In order to make sure that the program would be properly reviewed, it was adopted for a period of five years. At the end of the five-year period, a review should be initiated with a decision to be made concerning continuance of the program. If it appears desirable to make changes in the program before the expiration of the five-year period, individuals or departments proposing such changes will make recommendation to the Joint IT-Graduate School Professional Master's Committee. Any changes thus thought desirable by this committee will be brought before the IT faculty for action.

The program was started on a modest scale in the fall of 1969 when several graduate students transferred from the M.S. program and several more were admitted directly. There are now about a dozen enrolled and more applications are being considered. We will not know for several years if this experiment is a success or not; that will depend on the joint efforts of the students and the faculty. The only thing we can be sure of is that there is a demand, that some form of education for engineering design is necessary, and that we are willing to experiment until we find the right combination which will be useful to the students and the profession.

MISS MARCH



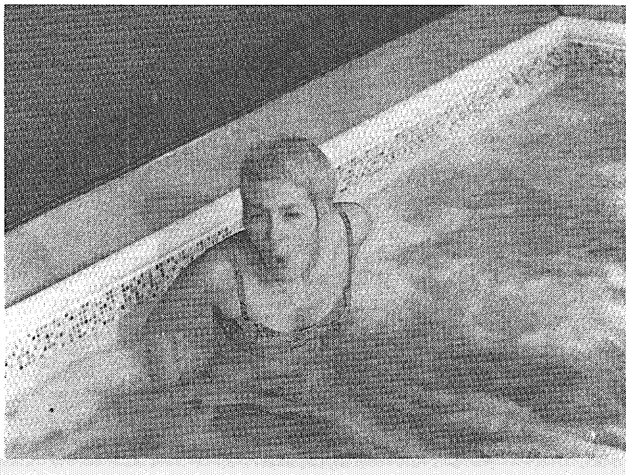
Joy Klimmek

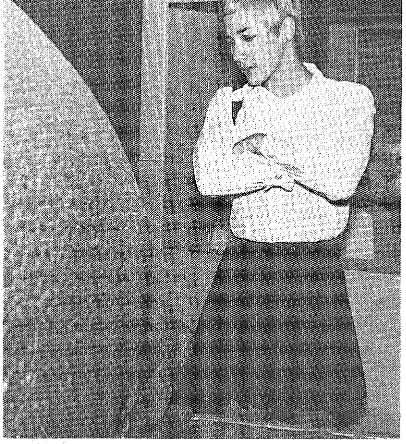


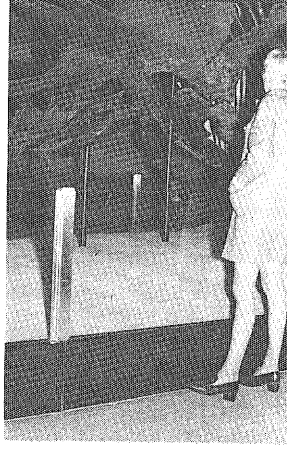
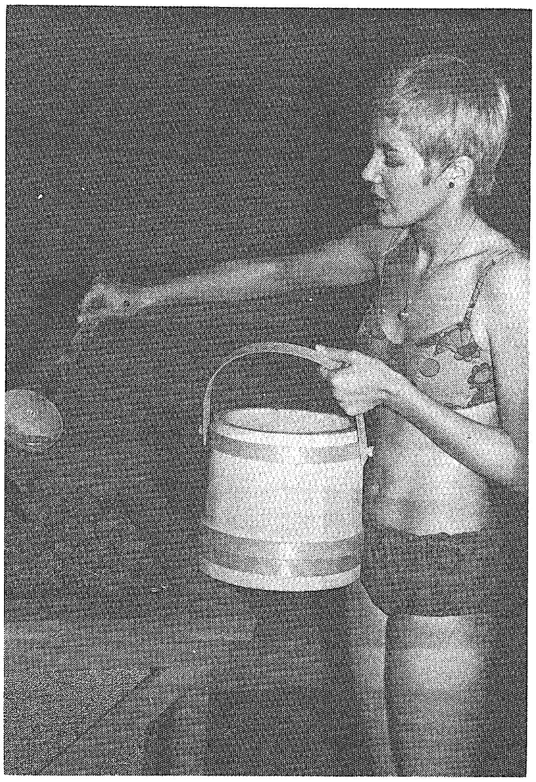
A few weeks ago a couple *Technolog* staff members spent an enjoyable day touring St. Paul. Our guide was nineteen year-old Joy who really thrives on St. Paul life. The pool, sauna, and whirlpool at the Highland Inn were most inviting—especially in the mid-winter season. In downtown St. Paul we visited the Arts and Science Center which thoroughly impressed us.

A year ago Joy was attending the University of Minnesota in Duluth. Hoping to return to the U (Minneapolis campus) as a history major spring quarter, Joy is currently working for Waterous, a company that makes fire hydrants. Winter seems to cramp her outdoor activities since her favorite sports are sailing and swimming. But our green-eyed blond St. Paulite has great fun gallivanting about in her new yellow Volkswagen.

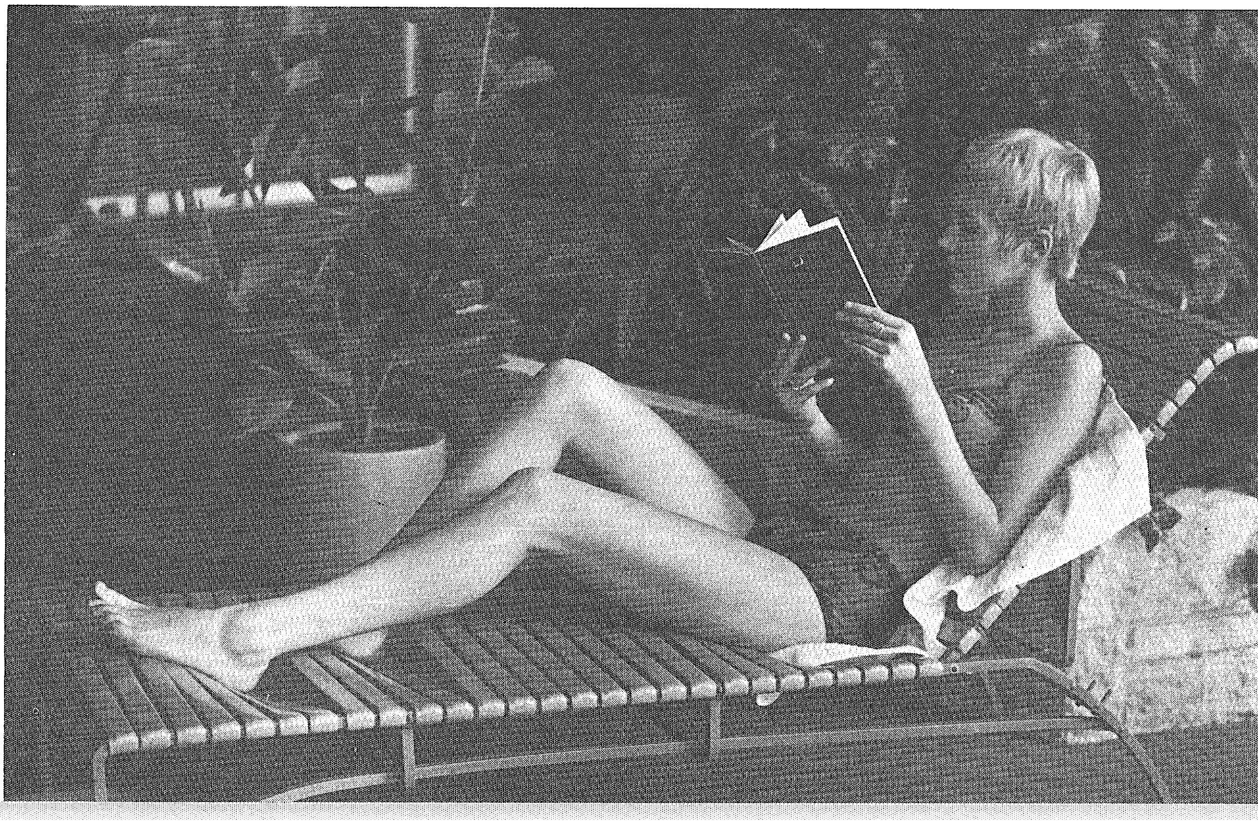
We do thank her for the tour of the other twin city.





Photos by MARLIN REKOW



What's New in Science and Engineering

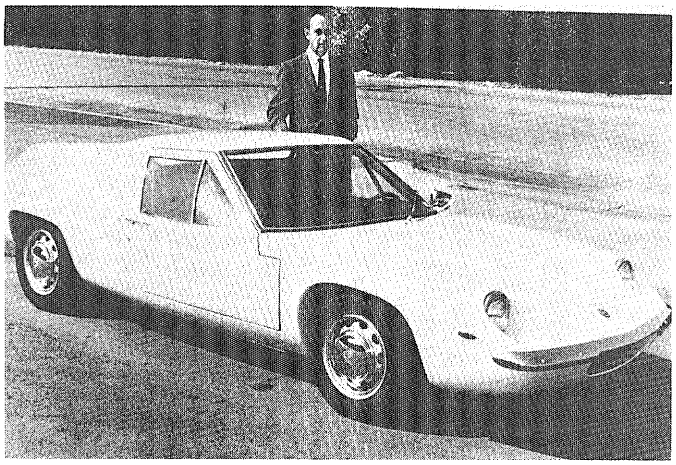
by JOANN HAWKINSON

Electric Cars

Supposedly bumped off the road by gasoline power early in the twentieth century, the electric vehicle is alive, well, and working.

The key to the future of the high-speed, over-the-road electric automobile is a highly efficient, long-life, lightweight power source inexpensive enough to make that type of vehicle practical. Until such a power source is available, the Westinghouse Electric Corporation is concentrating on improving vehicles now in commercial production. These vehicles include eleven basic models ranging from one-man plant-personnel carriers to golf cars to surrey-top buses roomy enough for ten motel guests and their luggage.

The Westinghouse electric fire truck is built at Redlands, California. Designed to meet in-plant emergencies, the vehicle uses six six-volt lead-acid batteries and can



travel 12 miles an hour. It is outfitted with all the equipment expected on a fire truck from a full-size siren to fire extinguishers and resuscitation equipment.

Despite its slow speed, this vehicle has a lot going for it. Like other in-plant vehicles, it doesn't need to be warmed-up before it takes off, it produces no fumes, and it can maneuver easily on the factory or warehouse floor.

Copper Peak Ski Hill

Structural steelwork is finished on the giant, 469-foot inrun slide of the first ski flying hill in the U.S. being built at Copper Peak near Ironwood, Michigan.

The slide is known as a ski flying hill rather than a ski jump because it is longer than the standard 90-meter slide, allowing longer jumps, or "flights."

Built entirely of Cor-Ten, weathering steel produced by the Inland Steel Company, the slide soars 275 feet above its base and 241 feet above the crest of 345-foot Copper Peak.

Cor-Ten, which oxidizes gradually on its surface to form a protective coating against further corrosion, resists atmospheric corrosion five to eight times longer than plain carbon steel. It can therefore be used in an unprotected condition.

Starting from chutes cantilevered behind the 206-foot main support tower, ski fliers will zip down the 120-meter inrun and soar into space at 65 to 75 miles per

hour over a 500-foot landing slope down the hill, for a vertical drop of 605 linear feet. An 810-foot chair lift and a 176-foot elevator shaft within the main support tower will hoist competitors to their starting positions.

Over 300 tons of structural Cor-Ten steel were used in erecting the Copper Peak slide.

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(Act of October 23, 1962; Section 4369, Title 39, United States Code)

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SPLINTERS From the Log

by CLIF OLLILA

—vilitas et crudus semper eternam

To advertise its new wide-mouth beer bottle, the Schmidt Brewing Company of Minneapolis/St. Paul plastered the following billboards all over town: BIG MOUTH IS COMING . . . (three days before it was announced Spiro would be in town for a fund raising dinner)

• • •

A burlesque is a kind of a take-off.

• • •

Chivalry is the act of a man who gives his seat to a lady in a public convenience.

• • •

A senator is a horse's-ass (according to Greek Mythology).

• • •

The only sign of life in the Siberian tundra are a few stunted corpses.

In a hundred years, Spiro Agnew will probably be a folk hero to rival Daniel Boone (or should I say Phoebolt Phoeboltson) with his daily feat of daring.

• • •

Should the Attorney General of Minnesota secure the Republican nomination for governor, he will undoubtedly have the support of all the hippies on West Bank. Just think of it, a "HEAD" running for governor.

• • •

The last time I had a cold, the doctor said that there was no cure, but I would feel much better if I took two tabs of acid (salicylic acid, that is).

• • •

No two people are alike, which makes us all happy.

Some of the rock concert prices are getting outrageous. The "Special Presidential Section" tickets for one were $9 apiece . . . which meant that you got to look up their nasal passage for two-and-a-half hours. It's even spilled over into the next avant-garde play; there's going to be a cesarean section.

• • •

In the days before the pill, a girl had to have much greater self-control. Just as an angry man was supposed to count to ten before acting, a young girl was advised to count to twenty-eight.

• • •

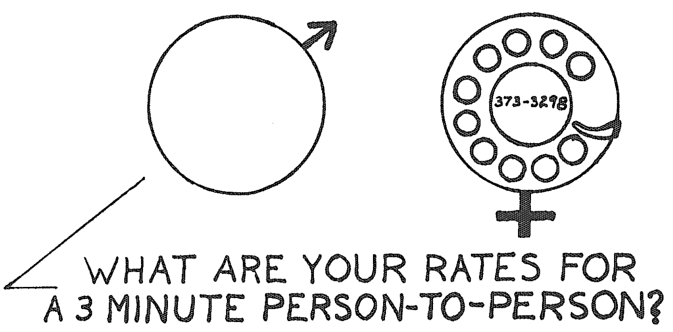
"Doctor," said the young mother, "I'm alway worried about my baby. I'm afraid to leave him alone for even a minute. For example, I'm even afraid to leave him in the bedroom for fear I won't hear him if he falls out of his crib!"

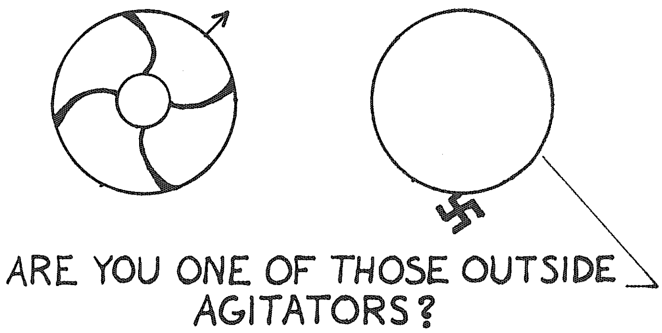
"Well, you can remedy that easily," said the doctor. "Just take the carpet off the floor."

• • •

Foreman: "Has the mechanic told you what to do?"

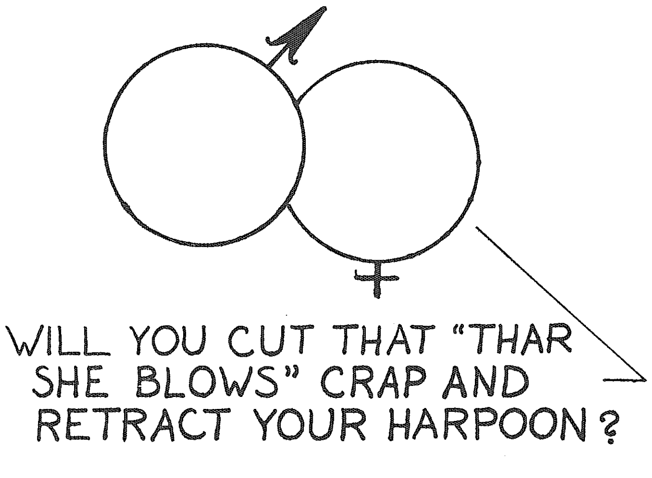
Apprentice: "Yes, sir. He told me to wake him up when I heard you coming."

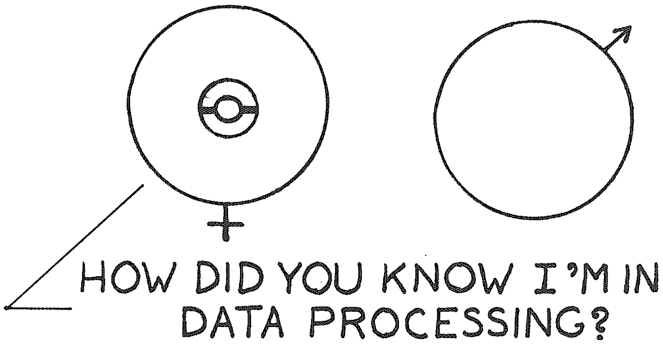




THE SYMBOL THINGS IN LIFE

by CLIF OLLILA





Two small boys at school hated each other so much that they would never speak. Years went by and the boys did very well for themselves. One became a bishop and the other an admiral. One day while waiting for a train in Chicago, the bishop saw his former schoolmate all dressed up and could not let pass the temptation to get his goat. He tapped the admiral on the sleeve and asked, "I say, porter: what time does the next train to New York depart?"

The admiral looked at him and quick as a flash replied, "Madam, I haven't the foggiest . . ."

• • •

A tourist stopped where a farmer was erecting a building. "What are you building?" he asked.

"Well," answered the farmer, "if'n I can rent it, it's a rustic cottage; an' if'n I can't, it's a cow shed."

• • •

After much debate, the cantankerous customer finally decided to buy a small item.

"It isn't what I want, but I guess it will have to do," she told the clerk. "Charge it to my account."

"Very well, madam," said the salesgirl. "Will you take it with you or should I send it direct to the exchange department?"

• • •

The accused had been duly convicted and was about to be sentenced when additional evidence was introduced to prove he actually had been in jail at the time the crime for which he had been found guilty had been committed. "Why didn't you say so?" the astonished judge asked.

"Well," the prisoner replied, "I was afraid I might prejudice the jury against myself."

• • •

A new dress is not only a tonic for a woman, but it makes her feel strong enough to carry a new suit and four pairs of shoes home.

• • •

In the United States, a man can only have one wife. This is called Monotony.

Chem. E: "If I had a million dollars, do you know where I'd be?"

Coed: "Sure I do. You'd be on our honeymoon."

• • •

The very small boy came home dejectedly from his first day at school. "Ain't goin' tomorrow," he sputtered.

"Why not, dear?" his mother asked.

"Well, I can't read, and I can't write, and the teacher won't let me talk, so what's the use?"

• • •

M.E: "For a million dollars, would you go to bed with me?"

Coed: "Well, yes."

M.E: "How about for five bucks?"

Coed: "What do you think I am, a prostitute?"

M.E: "We've already established that; all I want to know now is the price."

• • •

In Minneapolis, the hotel rooms are so quiet that you can hardly hear the pile driver in the vacant lot next door.

• • •

Mama called down to her daughter from upstairs: "Is that young man of yours there yet?"

"Not quite," the daughter called back gaily, "but he's getting there."

"The people upstairs are very annoying," complained the tenant. "Last night they stomped and banged on the floor until after midnight."

"Did they wake you?" asked the landlord.

"No," explained the tenant, "luckily I was up, playing my tuba."

• • •

No driver who has a horn and a ten-ton truck needs manners.

• • •

"Mother," the new bride inquired, "what's the best way to protect a wedding ring?"

"Well," replied the mother sagely, "just dip it into dishwater three times a day."

• • •

If you wish to know how she will talk to you after marriage, listen while she talks to her younger brothers.

• • •

When a girl marries, she exchanges the attentions of many men for the inattention of one.

• • •

A man was being interviewed for a job, and the personnel director asked brightly: "Are you married?"

"No," the applicant said, "but I can take orders, if that's what you mean."

The school teacher had just finished telling the boys in her class the story of a lamb that had strayed from the flock and been eaten by a wolf. "You see," she said, "had the lamb been obedient and stayed in the flock, it would not have been eaten by the wolf, would it, Willie?"

"No Ma'am," answered the small boy. "We would have eaten it."

• • •

A truck driver, hauling clay for a fill, backed his truck too far over the dump grade. The weight of the load being dumped lifted the front end of the truck several feet off the ground.

"Now, what are you going to do?" he was asked.

The driver eased out of the cab and said, "I think I'll grease it . . . I'll never get a better chance."

• • •

Never put off until tomorrow what you can do today. There may be a law against it by that time.

• • •

Have you heard about the dashing millionaire sportsman who had just bought his best girl a bikini and was looking forward to seeing her beam with delight?

On your way up in engineering, please take the world with you.

The best engineers are far from happy with the world the way it is.

The way it is, kids choke on polluted air. Streets are jammed by cars with no place to go. Lakes and rivers are a common dumping ground for debris of all kinds.

But that's not the way it has to be.

Air pollution can be controlled. Better transportation systems can be devised. There can be an almost unlimited supply of clean water.

The key is technology. Technology and the engineers who can make it work.

Engineers at General Electric are already working on these problems. And on other problems that need to be solved. Disease. Hunger in the world. Crime in the streets.

General Electric engineers don't look for overnight solutions. Because there aren't any. But with their training and with their imagination, they're making steady progress.

Maybe you'd like to help. Are you the kind of engineer who can grow in his job to make major contributions? The kind of engineer who can look beyond his immediate horizons? Who can look at what's wrong with the world and see ways to correct it?

If you are, General Electric needs you.
The world needs you.

GENERAL ELECTRIC

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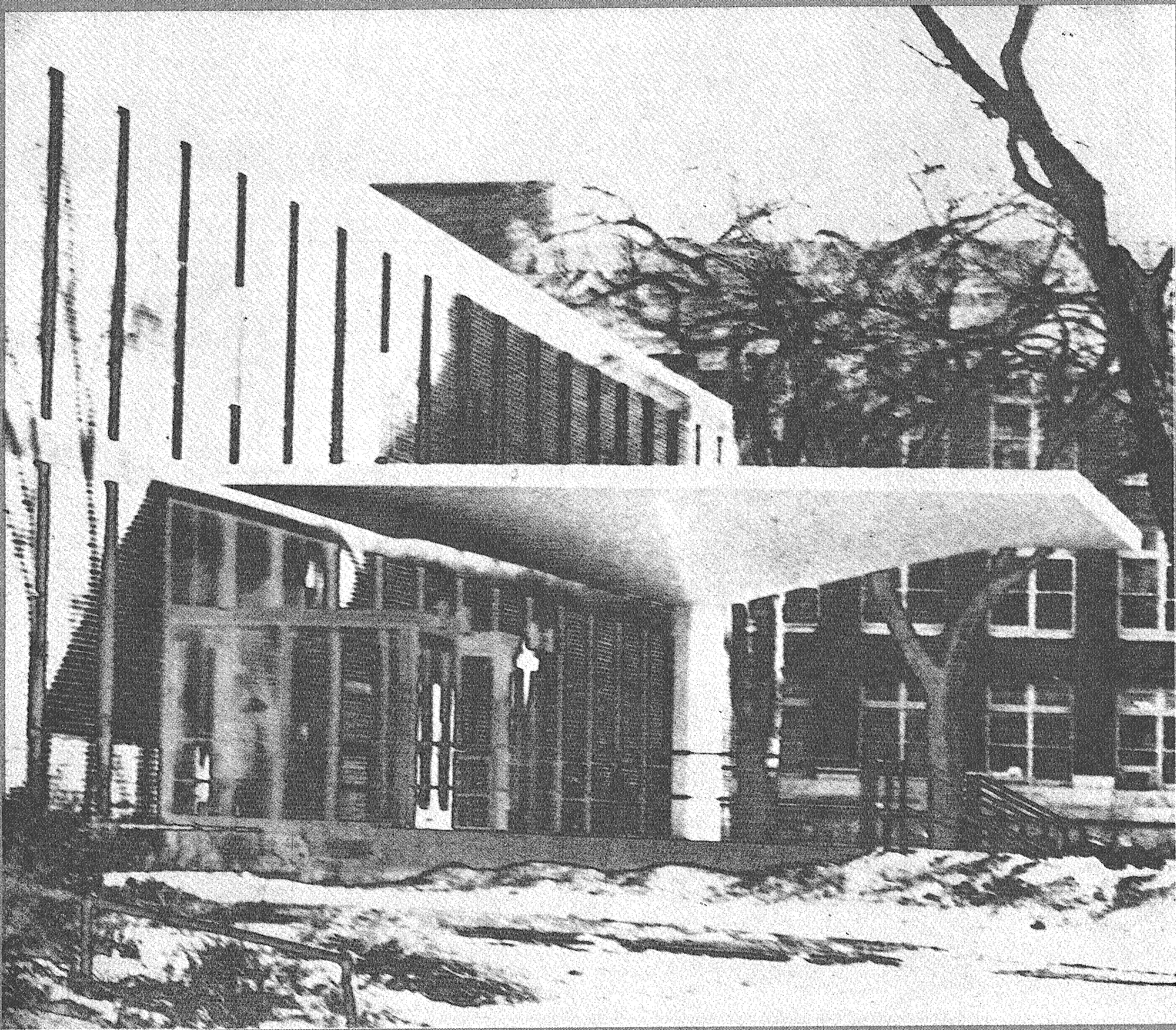
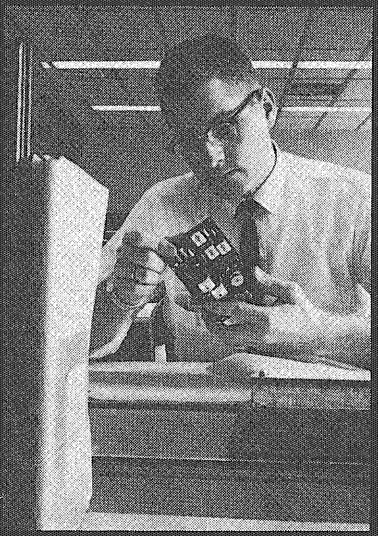
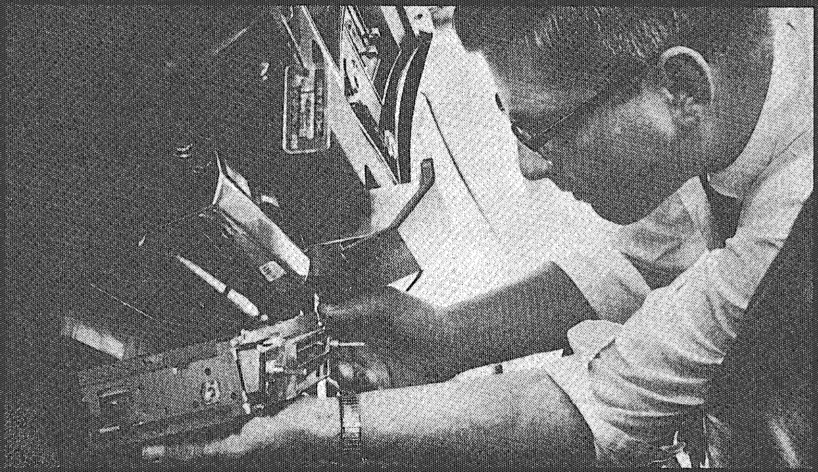
TECHNOLOG

APRIL, 1970







Mondays never look the same to Bob Byse

When you're breaking ground on a new idea at Delco, you don't see a lot of your own desk. For Bob Byse, design engineering means work with two dozen solid professionals . . . people whose specialties range from microelectronics to model making to production. Wherever the project leads, Bob Byse is on his way. And every skill is at his disposal. Right through full production. And beyond. If there's trouble shooting under dealer warranty three years from now, Bob Byse is still the man we'll call for. That's why no two Mondays ever look alike to Bob Byse and his colleagues at Delco.
The question is . . . can you say the same? Take a good hard look at how your responsibility shapes up, compared with Bob's. In fact, why not discuss it with us. By letter or telephone. Collect. Area Code 317/459-2808.
Contact: Mr. C. D. Longshore, Supervisor, Salaried Employment, Dept. 300, Delco Radio Division of General Motors, Kokomo, Indiana.

DELCO RADIO

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DIVISION OF GENERAL MOTORS
KOKOMO, INDIANA

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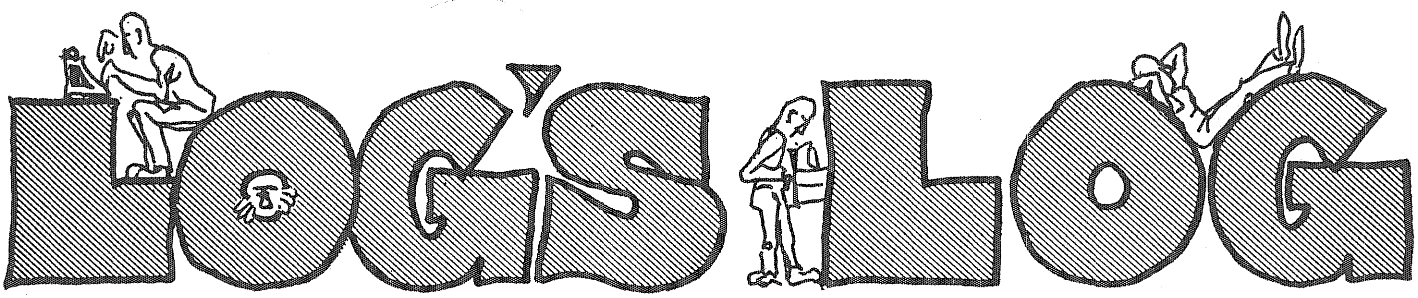


The Engen-Kehrberg Report

Introduction: Many of our readers have written in to ask, "What manner of man is the Engen-Kehrberg Report?" Well, if the covers were un-ed, Dave Engen is a leg man while Dan Kehrberg has his sights set higher. Which goes a long way toward explaining why our prickly pair seldom sees eye to eye. But the recently past decade which saw topless fashions and the micro-mini skirt was also seen and enjoyed by the might E and the wee K. But there were also the inevitable disadvantages. For example, Dan discovered many a promising bosom, only to find that the mountains had gone to Mohammed. And after a particularly discouraging day of fat calfs and bony knees, Dave was overheard to say, "the last time I saw a leg like that there was a message tied to it." The message follows.

Trans-Mission Impossible

This last quarter break, we decided to re-visit the scene of our mis-spent youth, Hurley, Wisconsin. We decided to travel by car since as they say in Hurley, "you can't get there from here."

Well scarcely had we entered the moo state when our 1953 Chevrolet super sport began to protest with all sizes and shapes of sounds. We immediately pulled over and discovered to our amazement that the previous owner had put a Ford engine into where our GM six-banger should have been. Nothing to do now but make the best of a bad situation. And a bad situation it was too. As soon as our minds had come to accept the merger under the hood, we were confronted by the Man, complete with siren, cherry, and big iron on his hip (spray, steam, and dry).

While waiting for one of Wisconsin's finest to figure out how to shut off his siren, we mused on the reason(s) for being stopped. Burning oil? Tail light out? Driving a race car in the city limits? Our mood grew uncertain. (We had seen *Easy Rider* the night before.) Dan, who was driving, took both hands off the wheel and began writing a sequel to "Alice's Restaurant." Dave, chief navigator and holder of the bag, began searching for a place to cool "the bag." Dan, the poor man's Cmdr. Bucher, ordered Dave to eat the contents. And being an agreeable type, Dave complied.

Well Mr. Long Arm of the Law, knuckles dragging on the blacktop, finally made it over to our car and asked Dan what we were doing. "Taking a trip," Dan replied (with a straight face).

"Why's your friend Frenching the glove box light?" (the only option our Chev had).

"Because it's his turn," replied the highly indignant Kehrberg.

"Oh," said the dairy deputy who then walked back to his car and disappeared into the glove compartment. Which left a considerable mystery as to why he stopped us but then it must have been to welcome us to the state or something like that.

Resuming our journey through cow pasture country, we began to be greeted by all those exotic smells wholly unfamiliar to the city resident. Dave started coming around at this point and just as soon began rummaging around in "the (now empty) bag." "Well, there's no point in going on, is there?"

"And whose fault is that?" accused Dan.

"I was just following orders," Dave replied. "I'm a sucker for a guy with a German name."

"Now I think throwing my national origin at me is a bit low. And dangerous too. You still have relatives in the old country."

"No I don't. You had them all killed the last time I popped off."

"Well that still doesn't change the fact that we're a long way from nicotiana glauca."

No it doesn't. And so we did a 540° right right on good ole highway 77 and headed back toward Hayward and home and work (selling pot & pans door-to-door). And while we didn't make it to Hurley, we sure had fun getting there.

Frat Rat

During Greek Week there is a gaggle of activity by the officially sanctioned fraternities and sororities. And sort of left out in the cold by all this is the underground fraternity. No, that is not, Mu Omega Lambda Epsilon (MOLE) but you're close. In fact, you are so close, we're going to count it. And at last count there were eighty-three underground fraternities and sororities. And digging through the permafrost, we find the following:

Gamma Rho Alpha Iota Nu Beta Epsilon Lambda Tau: This is the geology fraternity on campus. Membership is open to all (students and non-students) over 21 who want to get a head. The main (only) activity consists of getting stoned.

Rho Rho Rho: This is the NROTC fraternity on campus. Membership is open to all undergraduate students enrolled in NROTC who are in the upper third of their class and able to carry a tune without going overboard.

Sigma Kappa Iota: This is sort of a Polish B'nai B'rith. Its membership is open to all graduate and undergraduate students willing to admit Polish ancestry.

Delta Omega Gamma: This is the sorority of the IT co-ed. Membership is open to undergraduate and graduate female students in the physical sciences. A physical exam is not required.

Omega Upsilon Tau: This is a fraternity for losers. The only requirement for membership is two or more refusals of admission by other fraternities. Meetings are held twice daily in the O.U.T. House.

Pi Omega Tau: This is one of the problem fraternities. It was originally chartered to serve the needs of cannibalistic foreign students. Recently a new house mother, Mary Jane, has changed long standing policies and now American students are really going to Pi Omega Tau.

Kappa Iota Sigma Sigma: This is a fraternity/sorority for students of French and any other tongue. Meetings are held as required, almost everywhere and often and frequently don't end with only a Kappa Iota Sigma Sigma.

Omicron Omega Pi Sigma: This is the universal fraternity/sorority. Some members include: the Arab armed forces, the 1968 Democratic Convention site selection committee, and former members of Pi Iota Lambda Lambda. There are no meetings, dues or membership requirements. In fact, nobody will even admit belonging, but they do.

Really Built

As we wend our way (which isn't easy flat on your back) the E-K Report often pauses to reflect upon the achievements of past students in the eye of T. The success and prominence of U of M alumni was recently demonstrated at the International Architectural Competition sponsored by the ASA. Prizes were awarded in several construction and design categories.

Winning the award for "Most Original Construction in the Field of Penology" was Mr. I. Beam (Minn '33) for his unique concept of "the wall as a physical factor in the rehabilitation of the criminal mind." Or as stated on the plaque presented to Mr. Irving Shylock, dealer in stolen property, by the Sicilian Neighborhood League, "good fences make good neighbors."

And in the area of public housing, the top award went to Mr. Hi Rise (Minn '52) for his split level comfort station at the Keller golf course. Or as Mr. Rise proudly boasts, "its the only 18 hole-er west of Chicago."

And completing the triple crown for the U of M School of Architecture was Mr. C. Deuce (Minn '69), who submitted: (1) to almost anything and was named "Mr. Congenial" by his fellow contestants and (2) a miniature ticky tacky mousetrap. Mr. Deuce calls his ranch style design, "the selective service mousetrap." It works this way. The mouse is lured into this seemingly innocent box where he is processed and issued a draft card, classification 1A. The mouse is then let out of the box whereupon he promptly scampers off to Canada. And as they say in Fredrick Mann Court, "Build a better mousetrap and what do you get? More dead mice. Build sub-standard housing and what do you get? Rich!"

Official Daily Bull

Every now and again we catch ourselves concentrating too much on national issues and not enough on local affairs. In our own defense however, we have spent quite a lot of our off duty time engaged in local affairs. Though this has led to the current state (of affairs) which finds Dan out of the country and Dave out of the state. (We'll be back in a few months.) But our status as expatriates has given us a different attitude toward Uncle Harold, Minnesota's man for all seasons, mostly winter. **But seriously, Gov. LeVander is nobody's fool.** He belongs to everybody.

Keeping up with the several and sundry publications making the rounds on campus has led the E-K Report to an interesting discovery. It seems the latest successor to *Playboy* and the *Evergreen Review* is a magazine devoted to clothing for the well-heeled dog (canine variety). Frankly, we're amazed. We didn't think there was that much interest in doggie wardrobes. If any of you out there can explain this magazine's success, let us know. Oh by the way, the magazine? *Dog Fashions.*

April 16-30

16—Applause Day. Clap, until it hurts.
19—Pet Week. Do it on the paper.
23—Become an Acme Nut & Bolt employee. Get the (continuous helical rib with the cylindrical or conical shank from which it projects)[1] Day.
27—Barber of Seville cuts a fifth (man). Nick knack Day.
30—Booby Trap Day. Snare a pair.

May 1-15

1—May Day. Might Night.
5—Rome around Night. Where did the day go?
8—E-Day. Pray for reign. (Somebody get an umbrella for Queen Colleen!)
12—Mary-grow-round. Didn't stop Midway Day.
15—Cashew Day. Buy the nuts.

[1]Webster's 7th, 1963 edition, page 774.

Conclusion: As the E-K Report has long had the reputation, we thought it appropriate to be in on the IN scene in the NOW theater. And picking up our tuxes from Sheffield's and our minds from the gutter, we left on a jet plane for the Windy City production company's version of HAIR! Well as they say in the white slavery game, it was an evening. The first act unfolded with a couple of good musical numbers and a few telling comments on square America. But as they say in the prepuberty racket, the best was yet to come. And it came as they brought up the curtain on the second act. There on the stage were these five hairy dudes in the altogether. There's not much one could say but Dave turned to Dan and said it, "The guy on the right is Jewish."

Abroad! Abroad!

——A Log's Log Action Insert——

Having finally booked passage on a plane leaving Iceland, the E-K Report International Team (Dan Kehrberg and Dave O'Brien) finally make it to England and the London Holiday Inn where they get the last room. And so now you know who was to blame for there being no room at the Inn. And due to extensive in-flight refueling, the International Team concludes (involuntarily) for the evening and also for a large part of the next morning. But it is now New Year's Eve's eve day and time for the E-K Report International Team to wake up.

O'Brien has arisen first, and after stumbling over dapper Dan, can be observed chasing several suspicious-looking aspirins down with room temperature Scotch. Eventually Dan rises up, far enough to deliver a revengeful right hook to O'Brien's kneecap, then falls back, in a victory roll, onto the coffee table. At this point the maid enters with their breakfast. Coffee, orange juice, and rolls for those of you who may have been thinking something else. She was their first London girl at close range —sleek, graceful, sensual and too quick for O'Brien. As he skidded across the cold floor, he thought perhaps he had been too obvious. He'd try to improve his technique tomorrow.

Due to space limitations, the description of Kehrberg and O'Brien dressing and eating breakfast will be left out. It should suffice to say that although they are famous international correspondents for the Engen-Kehrberg Report, they still put their pants on one leg at a time.

Four legs and two zippers later, we find the International Team about to set off on a tour of London. And armed with cameras, Hawaiian shirts, and a book entitled, "A Tourist's Guide To London" by Joseph Goebbels, our heros' adventure begins. Following the directions of Herr Goebbels, O & K take in such landmarks as: Hermann Goering Platz (Trafalgar Square), Heinrich Himmler Einbahnstrasse (Carnaby Street), and Grosse Adolf (Big Ben). Dan, a neo-fascist member of the silent majority, couldn't put the book down. But O'Brien did. And so with tempers growing short and unseen landmarks dwindling, the International Team returned to their room. Once there, O'Brien proceeded to unload his cameras, Kehrberg pounded away on his portable typewriter, and both hit the bottle. All was going well and for several hours the typewriter clicked and the glasses clinked. Both were preparing themselves psychologically for the evening ahead. Then O'Brien spoke.

"Well here we are."

"Stoopid," screamed Kehrberg, setting the typewriter for a new paragraph. "We haven't got the space for dialog. You've got to make every word count if you must speak. Don't you realize there has to be a new paragraph every time someone speaks?"

"Gee, I'm sure sorry."

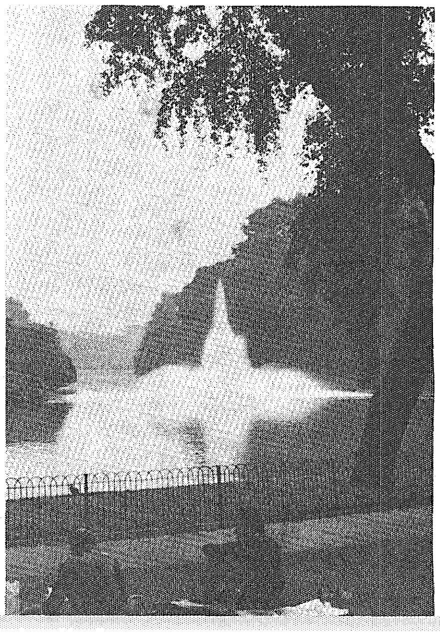
"Oooh, aah. Listen pal, don't speak, just nod, okay?"

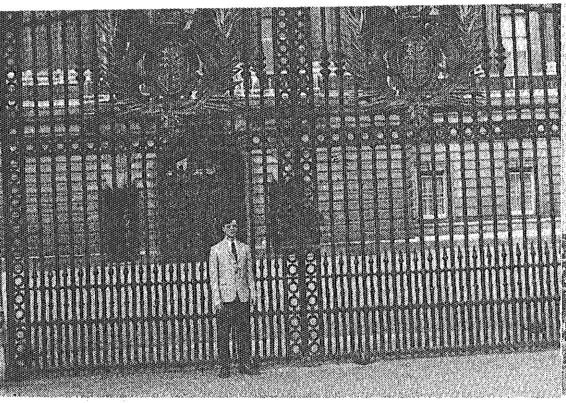
"Sure."

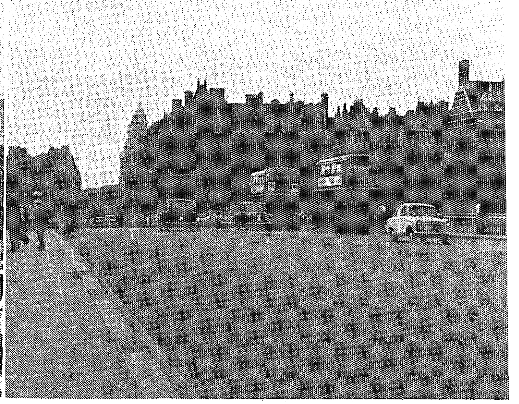
"Aaargh! What do you think we're working for, "The Atlantic Monthly"? We just haven't got the space to talk. Now pay attention. Today we saw the sights and cased the joint, right? (Nod) Now tonight we've got to hit the clubs, meet some chicks, and snowball them. We need dates for tomorrow night. Right? (Vigorous nodding.) And don't let these girls scare you, just cuz they're foreign and beautiful. They're just the same. Remember, you are a photographer representing a large United States college magazine. After "Blow-Up" these girls all worship photographers. Play it cool. You play the role and they'll respond just like in the movies. Anyway, tomorrow's New Year's Eve, the end of a decade. Hit them with the foreign-correspondent bit and follow it up with a-night-before-D-day attitude and they'll fall like bowling pins."

"But I can't work that fast. Guess I must be shy, or mid-western, or something. It doesn't seem right."

"Look, Dave," Kehrberg soothed, paternally, "I know how you feel. But you can't go through life worshiping women, placing them on a pedestal. Remember, stimu-







lus-response and reverse psychology and the whole bit. Remember London morals. It's the big time now, buddy. Listen, I tried the slow hustle once. The worship. The consideration. The whole bit, once. She was a pretty, young, blond car-hop in a White Castle. Her name was Lenny. I went in every night, smiled at her, and always tipped her two dollars on a 45c order. Well, it got so she knew me, and smiled back and gave me great service. This went on for three months just about every night. Lenny, two hamburgers, a coke, me, and a two dollar tip. Our love was blossoming. Then, one night she was gone. Know what happened? Another car-hop told me. Lenny had made so much money in tips off of some fish that she had bought a Honda and moved to California. Now doesn't that show ya?"

"I see what you mean," O'Brien, the sociology and psychology major, said. "Guess I can handle it. Anyway, we're doing this for the *Technolog*. I suppose it is sort of expected then."

With the International Team now psychologically prepared and physically bombed—they were ready for the task ahead. They dressed and caught a London cab for the ride down to Picadilly Circus. It was the night before New Year's. The clubs were packed and London was swinging.

They made the rounds: "The Scandinavian Club", "The Red Garter", "The Sussex Gardens", "Le Bataclan", and on. All the clubs were small, noisy, crowded, and modern psychedelic. Our two romping playboys finally came to rest at "The Black Sabbath", a discoteque near Carnaby. There the hunt began.

Operating from a corner table, the International Team stalked their prey. O'Brien had danced and talked with several girls before Kehrberg was sufficiently primed to leave the corner and approach one.

She had caught his eye upon entering and he had continued observing her distantly for the past hour. Black short hair, a petite little body, Greek facial features—very appealing. He approached her.

"Hi." (That's quite a line, Kehrberg.)

"Hello. You're an American."

"Yes, and you're beautiful."

"Thank you."

"Would you like to dance?" (Kehrberg was doing great, really burning up space with clever dialog.)

"Sure." (Our goddess isn't helping either. Oh well, from little acorns and all that.)

They danced two fast songs. Then a slow song was played. She came into his arms, stiffly.

"My name's Dan."

"I'm Ruthie."

"I'm a student on vacation."

"I know," said Ruthie, "and you're here representing a large university magazine—you're a correspondent or photographer or something. I'm beautiful and you want to immortalize me in the American press, possibly introduce me to Hollywood and stardom, and show me your hotel room."

"Gosh, no. Whatever gave you that idea."

"I'm sorry, but I met your friend, Dave O'Brien, earlier."

"I don't know any O'Brien. I came alone. Honest."

"Really?"

"Ya, I'm nobody." She warmed visibly and melted into his arms. "Thank you O'Brien," thought Kehrberg, "for believing that textbook and Honda crap. Must have every girl in the place turned off. I've got it made."

It was now only 3 a.m. and the cock had not yet crowed once. Already Kehrberg had denied O'Brien three times. Yet, ultimately he returned to Ruthie and by closing time had a date for New Year's Eve.

Meanwhile, O'Brien had failed miserably. Dejectedly, he sat back at their corner table drinking himself into oblivion. It was then that fate, or human compassion, or divine grace, or possibly dumb luck took a hand.

"Why do you look so sad? Can I join you until you smile again?"

"Be my guest," O'Brien said as he looked up. Wow! 5 feet 6 inches of England's best. Blond hair, brilliant green eyes, and a suggestive but not pushy body.

"My name's Wendy."

"I'm Dave. Dave O'Brien."

"What's the trouble; animal, mineral, or vegetable?"

"I could answer animal, but that's too risky. Let's just say mineral," O'Brien answered.

"Going to lose your job, huh?"

"Not a bad guess, Wendy. You see I work for this magazine and . . ."

"What magazine?" said Wendy with genuine interest.

"You've never heard of it. It's called the *Technolog*."

"I sure have. Well, not really. That is, I've never read it, but I have read excerpts from the Engen-Kehrberg Report. Is that what you do?"

"Gee, wow, sure . . . I mean yes." Well, fate carried the ball through to a touchdown. Or rather, to a confirmed date for O'Brien on New Year's. Whereupon O'Brien woke up to discover that Dan and Ruthie had left the scene and the check. All of which confirms the ancient AFL adage, "He who scores last is left holding the ball."

And so we leave the International Team, with visions of things too naughty to print dancing in their heads. And by now I suppose you're wondering about Dave Engen and his misfortune to be left at home. Don't despair. Dave Engen is doing just fine with what Kehrberg and O'Brien left at home. And as Chef Marcel of the Sheraton-Ritz once said about leftovers: "You can't eat steak every night."

Log Line

IT Week Tournaments

Tournaments during IT Week are open to everyone. All students in IT may enter on an individual or team basis. If the faculty can gather up enough courage, they too can enter, not only participating in the tournaments but going all par by picking their own queen candidate, planning their own float, and entering their button design.

Fun is the whole idea of the tournaments and participation by everyone will mean fun for all. Softball, bowling, tennis, bridge, golf, and ping pong are all included in the tournaments. There is an activity for everyone. For more information on how you can enter, call the IT Week office at 373-7729 or just stop by at 114 Main Engineering.

J. Stusnick

E-Day Road Rally

The E-Day Road Rally on May 3 will provide thrills, excitement and maybe prize money to those engineering students and faculty members who compete in this IT Week activity. No previous rally experience is needed for the event which is not a race, but a measure of a driver's and a navigator's skill in keeping their car on course and on time.

Route instructions provided for each car will contain an odometer check so each car's odometer can be calibrated to official mileage, the route to be followed, and the average speed to be maintained. The 80 to 100 mile route will be over mostly blacktop roads.

Staying on course is the most important factor in winning the rally, but each car must also be on time. A car must reach each control point at a specific time. Penalties of one point will be tabulated at every control point for each 0.1 minute error in arrival time. With timing to the nearest 0.1 minute, cars using a tenth mile odometer and a navigator using a slide rule will be able to zero the controls.

The rally will be on May 3, starting from the river flats parking lot at 1:30 p.m. Registration will begin in Main Engineering 114 on April 15 and continue through April 30. An entry fee of $2.00 a car is required; half of this amount will be placed in the prize fund. Only two people will be permitted in each car. LeRoy Nyhus, chairman of the E-Day Road Rally, will answer any further questions concerning the rally which is limited to IT students and faculty.

LeRoy Nyhus

E-Day Forum

The E-Day Forum is a new and excitingly different event included in this year's E-Day festivities. Designed for engineering students in particular, the forum will feature three programs as follows:

"The Patent?—Whose Rights?" on May 5 at 2 p.m.

"Engineers in Politics" on May 6 at 2 p.m.

"Engineers: Builders or Destroyers?" on May 7 at 2 p.m. All programs will be presented in the Architecture Court.

Each program will be an hour long with half the time used for presentation of the various sides of the issues by different speakers and the other half used for panel and audience discussion.

Lively debate is expected as the differing views of the controversial topics are aired. You won't want to miss a minute of it!

Bruce Nelson, Chairman
E-Day Forum

LANDSCAPE ARCHITECTURE

and

POLLUTION of the MIND

by DAMON FARBER

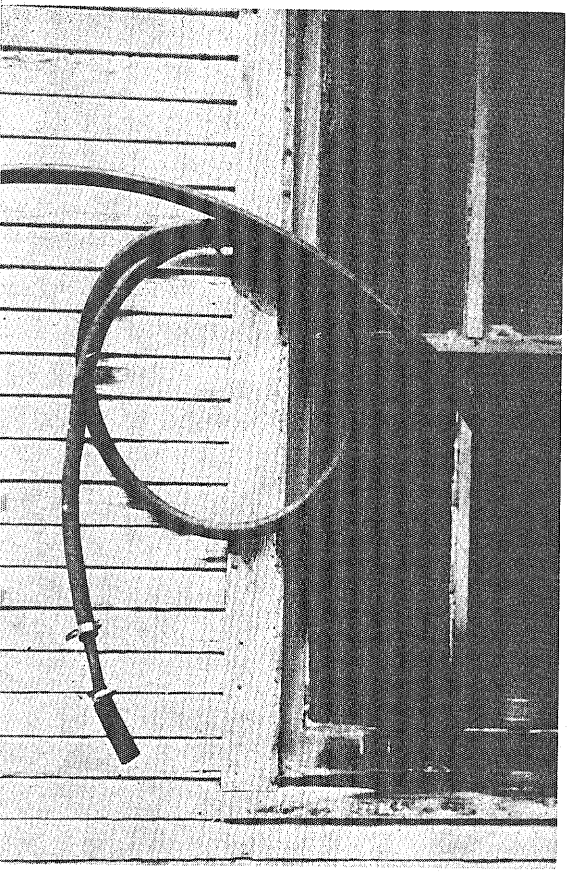
That a landscape architect deals in petunias and potted plants is a misconception that has persisted from almost the inception of the profession. The term landscape architecture is actually a misnomer; is it not possible to accept landscape architecture in a much broader sense rather than in such narrow terms? That a landscape architect is concerned might be a much better definition. Better perhaps, but more nebulous than petunias and potted plants. But it is that concern, that awareness that problems actually do exist and that these problems should be remedied which is an enormous part of landscape architecture.

Such a concern exists today in our cities—an environmental, ecological problem blights urban areas, areas that support an enormous number of supposedly intelligent and thoughtful people. That problem is pollution. Pollution not in the normal sense of the word but pollution of the mind. It is pollution of the mind because, until now at least, our mentalities have accepted the poor housing conditions, the overpopulation, the prostitution of urban open space, the fumes and carcasses of the automobile, and the horrendously ugly plasticity of our society. Like E. B. White, we are "pessimistic about the human race because it is too ingenious for its own good. Our approach to nature is to beat it into submission. We would stand a better chance of survival if we accommodated ourselves to this planet and view it appreciatively instead of skeptically and dictatorially."

In looking at our environment and its deeper meaning, we find it to be more than an identification with sheet erosion and deforestation. It has a much greater focus than that; it is the dehumanization of mankind. One of the primary factors that puts man above all other animals is the size of his brain and it is just that—his brain—that could easily cause his decline, his annihilation, as a member of the animal kingdom.

In that kingdom, there are four major elements that allow our civilization to exist: water, soil, vegetation, and animal life. We too often fail to realize, because we live in urban surrounding, that these four factors are essentials of our existences, or in some cases—subsistence. Darwin concluded that only those survived who were best able to adapt themselves to their environment. We understand, too late, that in the future we are not going to be able to simply adapt. We have gone too far and "bandaids" are no longer the solution. Agreed, partial adaptation or re-adaptation may be necessary but we must also call a halt; we must put our technological advances to good use and, instead of pouring crap into the air, learn how to reduce and, if possible, eliminate discharge of pollutants and the associated all too certain suffocation. The environment that supports us extends much beyond the vision or experience of the things that live there but we need go no further than that to realize the idiocy of our striving for a more technically advanced society when there is so much that we have chosen to ignore in our search for a "better life."

Politics, fortunately or unfortunately as the case may be, has entered the environmental scene also in search of a panacea. The Nixon Administration has done so, however, at the expense of many worthwhile governmental projects. This is not to say that the administration's environmetal involvement is not worthwhile, but it does seem to be nurtured not so much from a feeling of sincerity but from the political desire to have us forget that guns are killing men in Asia and have us believe instead that only smog and defiled rivers kill men. And yet, even with this approach the government is



pursuing a course of noncommitance. Perhaps it is not so much a path of being non-committed as it is an all too familiar strategy of not being fully committed. So we see that even the government can pollute our minds with promises and half-truths and this only tends to reinforce the theory of mind pollution.

But because we live in a large metropolitan area we are forced to see, to experience the manner in which we live. We are made aware—like it or not—of the until now ignored ecology of the city. No longer do we speak of ecology in terms of trees and twigs but specifically of our immediate surroundings. Surely we can regurgitate solutions both old and new, but unless we can instill a concern in the people, that problem will continue to exist—continue to grow.

To say that poor housing conditions do not add to the ugliness of our cities is ridiculous. Go to the corner of Lyndale and 14th Ave. North. Besides the fact that a forest was, in all probability, razed to build homes of this type, ask yourself what credance it lends to our environment. To say that overpopulation is not a cause for concern in our cities is absurd. Dis-incentive rewards, sterilization, birth control, abortion—all should be readily available. John Storer, author of *Man in the Web of Life,* suggests that "to survive in health, the population of the community must be kept in balance with the carrying capacity of the environment." To say that urban open space in our cities is plentiful is to be partially blind to the existence of concrete canyons and corridors that carpet the Twin Cities for miles. To say that fumes and carcasses of automobiles have not infiltrated into every corner of our cities is asinine. After the combustion engine has belched all the carbon monoxide and "harmless solid wastes" it can muster, then and only then will it be buried in open graveyards acres square and four or five cars high. But not as high as the smokestacks or as low as the sewage pipes of industry. To say that we live in a plastic society of pay toilets, pinball machines, neon signs, disposable clothing, synthetic foods, hunting movies "produced in good taste," Spiro Agnew, toy guns, aluminum cans, and no deposit-no return bottles, is an understatement.

There are many causes for concern—many problems. One such problem is pollution. Pollution not in the normal sense of the word, but pollution of the mind. Don't you think?

THE COMMUNITY INVOLVEMENT

A New Direction for Architectural

by ROGER D. CLEMENCE
Associate Professor of Architecture

Community involvement. . . .

The search for a better understanding of community, peers, self. . . .

A new awareness, relevance, a new dimension for architectural design education, a commitment. . . .

These are some of the components of the Community Involvement Studio, 1969-70, School of Architecture and Landscape Architecture.

Students in architecture have traditionally been required to devote large blocks of time to "problem solving," learning situations in a design studio, as part of their professional education. Occasionally the projects selected have required close contact and interchange with "real people" in "real communities." But much more frequently there has been a simulation of the real world in studies conducted almost entirely in the studio.

In recent years, this approach to design education has come under increasing attack from those who seek new roles for students and practitioners in a society burdened by problems of race, poverty, and associated social and physical blight. The contention is made that architects, landscape architects, and planners must become more deeply and passionately involved with the real issues that tear at cities and even threaten their dissolution. The implication is clear. If he wishes to learn first hand what the problems are and how to work with the people whose lives these problems affect, the student, as a practitioner, should be spending much of his time in low income neighborhoods, working directly with and for indigenous groups on problems which the residents define as relevant.

Recognizing the need for this new dimension in its studio offerings, the School of Architecture proposed a community-based learning experience for the 1969-70 academic year for a limited number of students desiring this type of education. The program had two stated objectives including:

1) *The provision of a valid and relevant educational experience for students seeking closer contact with low income communities; and*
2) *The development of a student service corps with the capacity to help the community help itself.*

Officially, the Community Involvement Studio (or Experimental Studio) began on September 29, 1969, when thirty-seven students from the Architecture and six students from Social Welfare had their opening class meeting with nine resource advisors from Architecture, Social Work, Living Learning Center, and University Community Development Corporation in the basement of the Chateau Coop at the edge of Dinkytown. Now, some six months later, the group has stabilized with thirty-six students from Architecture and Landscape Architecture serving various community groups from four field locations in the St. Paul and Minneapolis Model Cities Neighborhoods, the Minneapolis Southeast Community, and the municipality of Stillwater, Minnesota.

The students have worked on a one-to-one basis with individual homeowners in need of simple, inexpensive remodeling ideas. They have served as teachers for elementary and secondary school students trying to expand their visual awareness of the colors, shapes, and textures which make up their neighborhood environments. They have designed model neighborhood logos. They have undertaken broad-scope neighborhood planning studies to give citizens a better sense of various plan alternatives and their implications. They have worked with Blacks, with Whites, with Indians, with Chicanos. They have shared ideas with businessmen and with AFDC mothers, with citizen planners and with bubbling third graders, with teachers and with students and in so-doing have found a new dimension in their education. They have spent hundreds of man-hours at community meetings gaining an understanding of the needs and desires of countless concerned citizens. They have struggled to shed middle-class, architecture student biases without losing all sense of self-identity. They have asked for the chance to help and at the same time, learn and, in virtually all cases, their request has been granted.

But learning is a very personal type of experience, especially when you seek it in the context of the Community Involvement Studio and it can be frustrating as well as rewarding. One student may undertake three or four different design projects over a period of weeks in this type of studio and actually have the thrill of seeing one or more reach the construction stage. Another may work on half a dozen schemes and find progress on every one thwarted by lack of funds, difficulties in arranging meetings with his "clients," or his own inadequacies as a designer on the given project. If he is "product oriented" in the traditional sense, a student may become upset by the fact that his output of drawings has fallen below the normal level for this time of year. On the other hand, he may be grateful for the freedom from required "eyewash" and may be finding a great satisfaction and growth in working directly with community residents.

There is simply no adequate way of documenting in writing the range of positive and negative experiences for students and community residents which have or will come from the Community Involvement Studio. But some idea of

STUDIO

Education

reactions to the fall quarter may be gleaned from the following excerpts taken from mid-December progress reports prepared by students of the Studio.

"So, when we gathered in the Chateau basement for the first time, I was there feeling quite insecure because I didn't understand the program, had had no part in instituting it, and thought I was hopelessly unprepared for what I saw I was getting into. I was a little bit afraid that I would not be able to relate to those I was working with, to say nothing of my fears of community relations."
Saint Paul

"My major fear at that time . . . was how I could possibly relate to the people of the neighborhood. At first I had a fear for my physical well-being. The windows had been smashed with rocks and there was a bullet hole in the back window and one of the walls. Then this fear was sublimated to another. Young kids would come in, and all I could see was hostile, loud, pugnacious people. I was uncomfortable because I felt I was being taken advantage of. It took quite awhile for me to see the essence of what these kids really were. The basic element was that these were kids."
Saint Paul

"Only in the last couple of weeks has a question of structure come up seriously. In my proposal I had indicated that we should have had more of it from the beginning, but I doubt it now. I think that if I had been able to persuade the group to structure itself from the beginning, it would have prevented us from starting at the bottom as well as we did. We would have had a basis of operation and efficiency much sooner, but we couldn't have developed the foundations of sensitivity that we needed . . . but as it turned out, our freedom to grow and develop in a casual and unfettered way gave us a strong foundation which is now naturally generating the structure of the group. Instead of leadership having to be allocated, it develops naturally . . . the idea of deadline is beginning to find its place. It's not because it was imposed on us as a means of regulating our output. This kind of imposition could have yielded considerable waste as its output. Because we have been free to discover the value of deadlines for our own purposes, we can work because we want to and not because we have to. I think that only in this spirit can a community oriented project survive."
Saint Paul

"The class does not begin, it does not end, and it will stay with its participants for the duration of their lives. I found myself in a class where my outside interests . . . play an important role . . . those experiences I define as valuable are those that had to do with myself and the concept of the studio. I found a place to analyze my effectiveness and lack of it, and to be confronted with my limitations."
Chateau

"For the first time in all my quarters of experience in the design studios, there was a significant cause for me to achieve something. In past quarters, motivation came from competition with fellow students for the best grade. Being forced into this type of situation I was forced to give up many original ideas to fit into the competitive stream that accepts only one definition of architecture. To me the fall quarter was beautiful because it allowed me total freedom. Total freedom can only lead to total creativity. . . . The primary need I think was to search out and define for myself what architecture really should be. Another was to search out and find a place in the profession that can satisfy me."
Chateau

"The Experimental Studio project has taught me more about myself and my relations with other people than any previous 'schooling.' This new type of learning experience has changed my views of the educational process. School has now became an alive and self-perpetuating medium. The educational process is now a vehicle for learning experiences rather than the path to knowledge. I feel through this experience I was given the chance to truly evaluate myself. As an architecture student I am disappointed to see that the quarter was not totally productive architecturally. I can only blame myself for that, but I don't. I feel that it takes a long time to really get into a project, for the motivation to come from within rather than from a critic. . . . The feeling of accomplishment which comes from seeing an idea take shape and get put down on paper is a meaningful one. I feel I have missed that. I know that I need the experience of drawing and designing which the traditional studio offers. My only criticism of this program is that so far it lacks that element of architectural education. I feel it is important for me to improve my drawings and presentations. I have missed the interaction and closeness which is part of the traditional studio. It may seem funny but I miss the all-night sessions before a project is due, the frustrations and elation of solving a design problem. I hope that in the coming quarter we can develop that kind of an atmosphere in our studio."
Mpls. Model Cities

"Thought → Plan → Resistance → Fear → Stumble → Thought → Change → Play → Resistance → Stumble → Change → Stumble → Faith → REALITY."
Mpls. Model Cities

"The one deficiency I sensed during the quarter was a lack of unity between myself and the other students in, not only my studio, but in the other two as well. . . . But there were times when I felt as though I was in a studio by myself, completely removed from the activities of the other students of the Lake Street studio. This problem was much more noticeable with the other two studios because of the distance between them. I don't mind working solo, but I like to relate those things I have experienced with others and, even more so, I want to hear what others have been experiencing. . . . Thus, in summing up the quarter evaluation, I would say it was a good quarter for me, personally, but I feel that as a total achievement in inter-studio relations, there was a deficiency." Mpls. Model Cities

"Concern distinguishes the group and community participation enhances each member's experience . . . we have been responsible for creating and working with problems both internal and external to the group . . . the architectural programming of a project in overview form has presented obstacles that would have been easily overcome in the usual school situation. The attempted solution of these programming problems I feel is essential to my education. . . . Throughout the history of education, change and experimentation have led the way for progress and development. The experimental studio is a valuable educational laboratory that will prove to be extremely valuable to the students involved, the university concerned and the community which we serve." Chateau

"In previous years I was always in competition with my colleagues to present the best 'eye wash' job on my drawings in order to obtain a good grade. . . . The most outstanding thing is that I am starting to scratch the surface of human understanding and human needs. . . . The new type of learning experience is most intriguing and the desire to know more seems ever increasing within me. The opportunity to produce something with my hands has been a great personal satisfaction. . . ." Saint Paul

"The Experimental Studio at the University of Minnesota, created this year in conjunction with the Living-Learning Center, is probably one of the most significant and innovative learning ideas to come out of the University for a long time. First of all, methods of learning and directions of learning are radically being tested here. Secondly, students are encouraged to learn on their own through discovery and inquiry, rather than having the information poured into them while they sit back passively. Thirdly, unlike learning in the past, the students share experiences and in essence become great resources of information and learning. It is this community, inside and out of the studio, which Experimental Studio stresses as a major method of learning. Fourthly, the teacher becomes more of a guide than a 'teller.' In fact the teacher may learn as much from the student as well as the student from them through the exchange of ideas. Lastly and probably most important of all the student, unlike in the past, is allowed the 'real thing'—the actual venturing out into the real architectural field and dealing directly with the people, a group which the architect has traditionally ignored in favor of the client. . . . Thinking becomes more intense and therefore experiences become more meaningful. Students become independent as far as area of study goes, and therefore learning experiences become very personal and gain more significant. Problems are not given to them, but rather, the student must discover the problems, understand the parameters, propose responsible solutions, and actually execute them. All in all, the underlying result is to get the student involved in his own education. Responsibility of one's own success is dependent upon himself and therefore, learning becomes significant in accordance to the individual's desires and capabilities. . . . Fifthly, freedom of area of study is another good quality of the theme of the Experimental Studio. Liberalization of study not only prepares the student for a lifetime of learning, but also promotes curiosity and imagination in the individual's areas of interest. Self-investigation and direct experience with the physical world provides a more concrete basis for learning then the typical 'spoon-fed' information. In short, the phrase 'learn by doing' comes into play . . . although many frustrations have arisen during the quarter, I feel that this is a positive characteristic not a negative one. If there were no frustrations, there would be no sense of learning. Being initially frustrated presented a healthy challenge for the mind to investigate, to grasp, and conquer. Probably one learns best from these frustrations and mistakes. So indirectly I think the Experimental Studio was good in that it presented some challenging frustrations." Mpls. Model Cities

"We slowed up the process of actions and getting things down on paper for fear that it might not be the right method or that if it were started too soon we would miss the learning process we were going through. This is a natural outcome of being forced up to now, in the design labs to make a quick statement and get it down on paper to have something to show . . . I have always preferred the individual action and initiative. But through this quarter's actions I was forced to act and react with the group. I now have the knowledge of the problems, and solutions and community interactions that other members of the group discovered."
Chateau

"But at the same time, . . . there were some students . . . that felt frustrated at the lack of a more definite direction that we had become accustomed to in the traditional school. This balance between freedom and control is a delicate situation. Of course, there's the argument that a person without sufficient self-direction has no place in the Experimental Studios to begin with. In the future it seems critical that the balance between freedom and control be closely watched in order to head off academic floundering . . . Of course, good as these experiences are in terms of sensitivity and awareness, we shouldn't forget that we still are students of architecture who should be experienced in the use of a pencil. Hopefully, this is the point where we are at the present. There comes a time when one has the burning desire to do something 'concrete', just as we had the desire to get involved in real-life design situations . . . But this uncertainty, or perhaps we should call it open-mindedness, has been one of the strong points of the experimental organization." Saint Paul

One of the resource advisors for the studio, L. Scott Helmes, also prepared a comment on the experiences of the fall quarter.

"One of the more significant elements of the Community Involvement Studio can only be explained in a synergistic way: the parts do not totally reflect the whole. As a resource person I have different ideas about what happened and what should have happened. There was a dichotomy about the experiences gained: To me the important thing is working with people, not the techniques for designing. Consequently, the past quarter will reflect two primary directions that will begin to come together as the winter quarter progresses. On the one hand, the

Experimental Studio provided a tremendous individual learning about oneself. If education could provide only this in a valuable way it could discard the artificial methods now employed to goad, incite, excite, and propel students towards knowledge. This is the real difference between learning and educating. On the other hand, it pointed out some valuable insights about the traditional design process. Students found out there are a variety of valid ways of doing things. Students this quarter discovered the real value of design, not the artificial one imposed upon them by a group of others. They are only beginning to discover this aspect of the Experimental Studio. This is where I feel one has to begin. Understand yourself—then begin to understand what you want to do and how you want to go about doing it. The question now is not what happened last quarter but, with the insights gained and learned, what will happen next quarter? Although the resource people will spend more time with the students, it is still not their role to influence the direction of the students. They can only facilitate and provide when asked to. Many of the students already know what the difficiencies were last quarter. It is their responsibility to correct them, not ours. Consequently, the excerpts from the students' reports don't say what they did or what they are going to do. Instead they say what students felt was important. We don't feel an accounting is necessary. Hopefully as you read these excerpts you may discover something you might have thought for yourself, but didn't have the guts to say. To me, this is a real learning experience. What follows will continue beyond school and this is one of the real values of the Community Involvement Studio. If you have any questions, ask any of the students involved. They are pointed in the right direction."

Obviously, the evaluations made in mid-December differed. Some found the Experimental Studio a liberating experience, a rewarding challenge which opened new perspectives on life, on self, on our urban world. Others found themselves adrift in a tossing sea and felt the need for greater guidance. Virtually all members of the class expressed the need to push ahead with realizable projects during the winter and spring.

Now winter quarter is also history and the second round of progress evaluations from students has been received. Over a hundred projects have been undertaken. A handful have actually gone into construction. Others should reach this stage in spring or summer. Contacts with the community have been enlarged and the fall quarter beginnings of trust, mutual respect and genuine friendship have been strengthened. The following excerpts from a few of the winter quarter progress reports should give some sense of new dimensions developed since December.

"The experimental studio continues to be frustrating and challenging, but during the quarter a growing amount of order became apparent. This pattern provided structure to the confusion. I now feel better equipped to cope with situations and problems which at first appeared unrelated and undefinable.

"One of my problems had been opening channels for communication between myself and the Model Cities staff. This is no longer the barrier it once was. I am working on a project now which requires feed-back from all core areas. The information I require is not always available immediately, but as the project continues I find more and more ways to work with the core area personnel.

"My ability to develop 'direction' or more specifically 'direct action' for problem solving has been strengthened. As my ability to communicate increased, I found it much easier to accomplish objectives. Projects that were 'fuzzy' and 'anonymous' fall quarter developed into a wide range of interesting possibilities for intensive study spring quarter." Mpls. Model Cities

"Work with the Pillsbury Waite Cultural Arts Center has proceeded slowly but surely, and although in fact I am still working some details out, I anticipate implementation of my schemes during spring quarter. From a preliminary exterior identification scheme last December I developed cost estimates and re-studied the whole package; this led to development of a new scheme (the first one soured with cost estimates and 'post-Christmas break objectivity'). This second proposal has proven to be better; meetings with the director in conjunction with my design development studies have yielded a final exterior graphics proposal which we now plan to execute with the coming of warm weather. Teen-age artists from the center will probably do the actual painting, with my provision of the framework of drawings, the necessary specifications and supervision.

"The process of getting to this point has been rather drawn out, though, for along with the directors, the board's, and the budget's approval had to come approval of the building owner and the Minneapolis Zoning Board. I have had to check into paint costs, specifications, procedures, etc. (the building is of old, powdery, concrete and brick construction), and I have made studies of letter size, color, etc. on the building itself. Such processes have been real learning experiences for me, though, and understanding of the real procedures toward construction even on such a relatively small project as this is important. At times it appeared as if the proposal would never make it through the maze of approvals, requirements, etc., and it has been both interesting and heartening to watch the list checked off toward implementation. But I still won't believe it until I see it."

Mpls. Model Cities

"I have come to the realization that the percentage of time spent completing all of these tasks is greater than what is normally spent in the school design labs. More time is spent in setting up and attending meetings, establishing projects, getting help and background information on specific projects—but if it were not for this lab and the permissive atmosphere I would not have the opportunity to work with people in the community on a client basis nor have the opportunity to design and build a chair." Chateau

"Unlike the first quarter of Experimental Studio at Minneapolis Model Cities, which was basically involved in studio organization and program preparation, the second quarter, as I look back upon it, was quite successful in terms of actual program selection, comprehensive approach, and design development. One of the main reasons for this is the fact that it took nearly the whole first quarter to thoroughly understand the background and the complexities of the Model Cities program. Furthermore, by the start of the second quarter, I think we as students were able to become more familiarized with the Model Cities staff and residents, and, therefore, were able to discuss with and to obtain information concerning specific projects. Similarly, by that time the key people at Model Cities were able to become more familiar with us and the ways in which our talents could be utilized. Hence, beginning winter quarter many new programs begin to flow into our studio from the Model Cities staff and residents, providing unlimited potentials for student projects.

"Overall, the projects which I became involved with this quarter, I feel, were good in that they gave me an all-around range of experience and variety in terms of subject matter, scale, people, and complexities. For instance, while one project dealt with the total Lake Street commercial picture, involving an infinite range of complexities and people, another dealt with the immediate Black community at a small residential—business scale. Requirements for my projects ranged from drawings, to sketches, to cost estimates, to models, to displays, and to system studies. Some covered areas of residential scope, others covered areas of industry and commercial, and a few covered the community in general. All in all, I think that this quarter was a very satisfying and successful one for me." Mpls. Model Cities

"Working in the Experimental Studio and in the Model Cities area has given me valuable insight into many areas. I have learned something about city planning, citizen's organizations, philanthropic organizations, government programs and agencies, and most of all, people. I have acquired knowledge regarding researching data and communicating with others in doing this research. I have become aware of the true scope and scale of architecture problems and have experienced some programing." Mpls. Model Cities

"In preparation for the upcoming elections, MC planned to have an orientation for the planning and policy candidates. I was asked by Corrine Rihl and later Bruce Larson and later yet Mike Miller to assist in the construction and design of information booths for the orientation session. But in time and with the changes in coordinators the following responsibilities became mine: arranging the exhibition at the hall, ordering of the materials, coordination of the financing of the materials, picking up of the materials, gathering of the information and brochures from each of the 11 agencies participating, building and designing of the displays, arranging for a 1950 Studebaker truck to transport the display, setting up and taking down of the display and the returning of any borrowed materials. Because of the unanticipated responsibility and the amount of time spent on administration rather than design and construction, the quality of the display suffered. We arrived late at the orientation and set up in the hallway of the St. Stephans School instead of the auditorium as originally planned. The low attendance at the orientation, the inadequacy of the hall space, as well as the difficulties in transportation were negative experiences." Mpls. Model Cities

"Looking back upon the quarter I think the immediate demands of MC can be challenging but at the some time disruptive. As an organization MC is still in the programming stage about to receive funds and implement. Their biggest problem appears to be communications. This is their immediate need as demonstrated by the projects I participated in. As the summer approaches the implementation of these programs will get underway and the need for more detailed design studies will become increasingly important. It is difficult to proceed in advance of MC because of our dependent relationship even though it would be to our advantage and theirs if we did." Mpls. Model Cities

"There is a need for the critic to aid in the acquiring of information, to anticipate problems individuals are going to have or are having and help them resolve them, and to give guidance and direction. In general a more aggressive position should be taken by the critic to relate and involve themselves with the students *architectural* development." Mpls. Model Cities

"This quarter we've become active! For the first time as a group we knew where we are and what we had to do. Last quarter we were bombarded with information, references, new ideas, and problems. For me it took until this quarter to understand our significance and relationship to the area and each other. We now have our chosen directions and are able to deal with the problems in a much more meaningful way. Last quarter we talked about what we wanted to do and evaluated how we could best accomplish it. Now we are doing it! Things are starting to happen—ideas are being changed into drawings, commitments are being fulfilled. I can see the excitement and concern in what we are doing grow like a budding flower.

"In these past months I have become active in areas which previously have held little opportunity for such interest. Areas like remodeling a black business building, holding lectures and showing films on architectural barriers to the handicapped, helping church groups demonstrate their Christianity by helping the poor, and actually working with the health facilities in the area in trying to humanize and make them more enjoyable and receptive." Mpls. Model Cities

"Remodeling was the first project for this quarter. Bill English came to Mark and myself with an interesting project in which he wanted us to remodel a black business office in such a way that the people in the area would recognize and identify with it. The extremely small building was once a barber shop in the heart of the black area. After a few meetings with the clients we learned that very limited funds were available and whatever we should come up with still had to be approved by the owner who they were renting from. Mark and I each designed about three different alternatives which were presented to Bill and the clients. There was a consensus that a combination of our designs would offer the most pleasing effect. Cost estimates were taken and they seemed to be within reason. Mr. English then took our designs and is still trying to get permission from the owner to start remodeling. Mark and I had originally hoped to do the remodeling ourselves but the delays, weather and the trip seems to have worked against that notion." Mpls. Model Cities

"A question: Should this community involvement experience be delayed until a student has a fuller architectural background?

"I can only say that actual problems with physical or realistic ends spur me onto driving myself harder. Presentations have to be made clearer. Problems have to be better understood; research made more complete. A quality standard for the Studio has arisen with each individual caring about the quality of all studio work. This, I doubt, could happen in the normal design studio, but this does not deny the need for the normal design studio. The juxtaposition of the theoretical and the practical is essential. Theory without the practical is just as absurd as the practical without theory, for each cultivates the other. As for the continuation of the program, I feel it must go on, but it should not become a 'University thing'. In this I mean that the program should depend on the individuals and not on the greatly diversified programs supplied by the University. For instance, Design 1039 has gotten a name (good or bad) for itself, and it is up to the individuals of that studio to keep it going. O.K., So students come and go; if Design 1039 is to remain, other students should be brought into it this spring and next fall to replace those who have gone on to other projects or graduated. We owe the people of the community quality work and we owe them more than just a short stay, for in a sense, through our present existence, we have promised them something. Although we have not verbally promised anything other than sincerity of commitment, we still must show them that as architects of the future, we care about our environment, our cities, our fellow men.

"There have been individual committments made this past year for individual projects. Why cannot we make some more permanent commitments? Why does a program go only from quarter to quarter and not any farther? Architecture is a way of life—not a periodic thing. Students could and should, be inspired by the University to carry projects on for a whole year or even longer. In the summer students could be paid for their efforts on projects instead of their normal summer jobs. The University should subsidize such efforts and not rationalize another program's existence for lack of students in the summer." St. Paul

"Tony Holmes, former Minnesota architecture student, works for T.C.O.I.C. They had rented an old building in south Minneapolis for a recruiting and advertising office, but it was not being used because of the building's physical condition. I was excited because I saw the chance to help the community in an architectural emergency and also, the opportunity to design and construct something in brick and mortar (well, really paint and wood).

"I measured the building and took photos. Then I moved my studio up to T.C.O.I.C. to get a feel for what they do. I worked there for a week in Tony's classroom and then presented my design possibilities to the Board. They liked the designs but money is tight now for some federal programs under Nixon. Would I put this in a display for the green tea, (the fund raising endeavor of the year?)

"Tony and I decided that we'd really do the exhibit right. Not only did they need a fixed-up recruiting center, the whole T.C.O.I.C. operation is in a rented, run-down building. We got the display panels and arrows from our Model Cities studio and put up my boards of the recruiting center design plus boards on what a T.C.O.I.C. center could be like. The boards showing the possibilities of a whole new center were theses from school, professors projects, my Indian center.

"I understand the fund raising was a success. Anyhow the recruiting center renovation has begun. The paint and materials to fix the outside have been purchased. We'll paint over vacation if the weather is good.

"This project went along very smoothly and was quite successful. I think the main reason is that the project was clearly defined from the beginning and the agency had someone that understood what an architect could contribute toward that goal." Mpls. Model Cities

"All of these projects have one thing in common. They were done for a real client and they will be or are being built. The thrill of discovering your own projects and then bringing them to fruition can not be put into words. This program is a unique experience. The possibilities for self affirmation and growth are boundless. The opportunities to get to know and help poorer people on a one to one basis are here. The chances for different groups of people to work together are great as projects begin to dovetail and take on a life of their own. The whole thing becomes an aesthetic experience in itself."
Mpls. Model Cities

As Coordinator of the Community Involvement Studio, I have difficulty giving an objective assessment of the sum of its positives and negatives for students and community. I can see growth; I can see disappointment. I can see the frustration of one day replaced by the successes of the next. But this is not a ball game and box scores seem out of place. This is an experiential dimension in the lives of a number of people from University and community who previously had little sense of each other's needs, desires, abilities. It is an opportunity for mutual growth and mutual service. It is a chance, a chance to be taken.
March 19, 1970

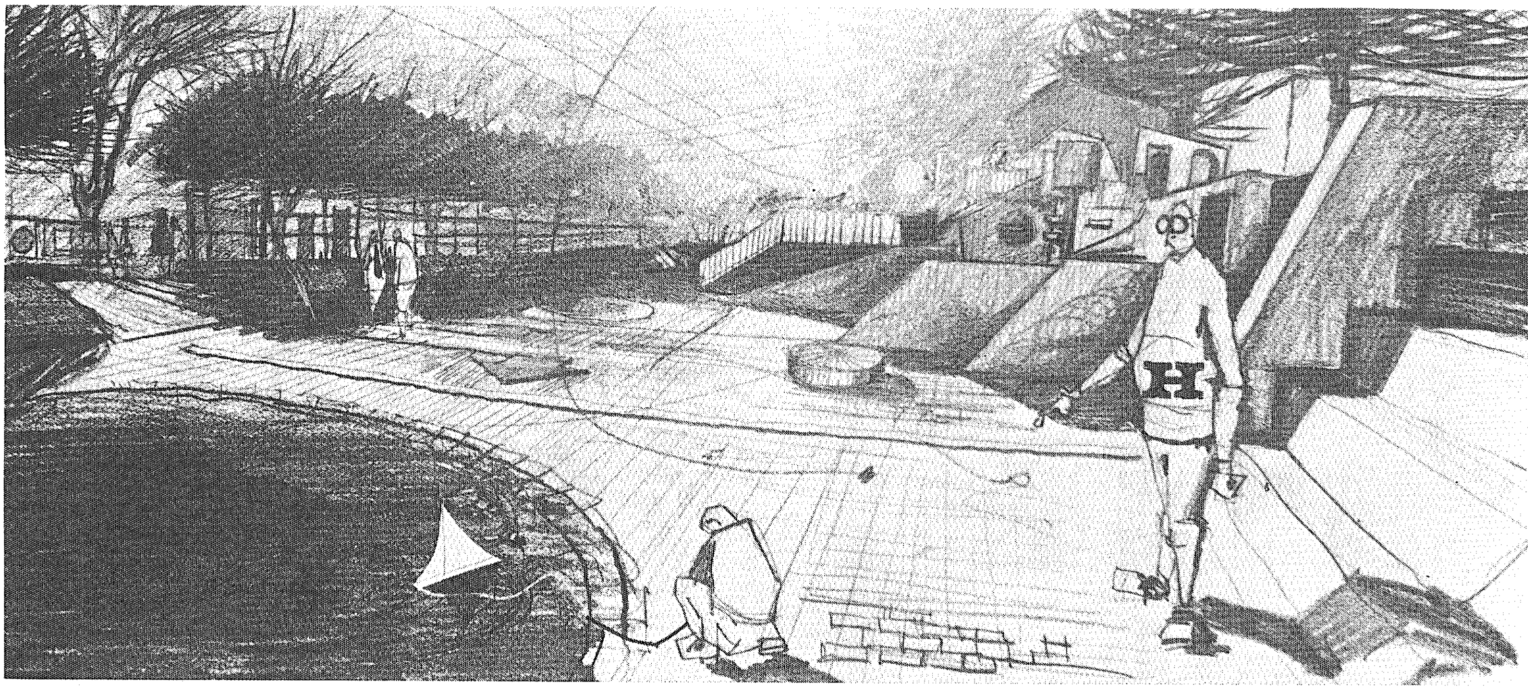
STUDENTS OF THE COMMUNITY INVOLVEMENT STUDIO ARE:

Grade IV Design	Grade III Design	Grade II Design
Ronald Auerbach	*Derwin Bass*	*Steven Buetow*
Robert Burt	*Richard Craig*	*John Idstrom*
Michael Czarniecki	*Stephen DeLapp*	*Barry Jenson*
Carolyn Dry	*Greg Dumonceaux*	*Merrily Kolstad*
Scott Halweg	*Damon Farber*	*Thomas Lander*
Kenneth Johnson	*James Heroux*	*Neil Libson*
Charles Kubat	*Jay Johnson*	*Richard Putnam*
Richard Lieder	*Philip Johnston*	*Michael Shields*
Glenn Metz	*Ian MacTavish*	*Jon Skyberg*
Bruce Simonson	*Mark Matsumoto*	*Arnold Thies*
	Leland Meyer	*Jeffrey Willius*
	Patrick Munter	
	Theodore Steiner	
	Neil Weber	
	Stephen Weeks	

Resource Advisors are:
Roger Clemence, L. Scott Helmes, Robert Morse, and Robert Schimke (with additional assistance from B. Warner Shippee and Thomas Walz).

Introducing . . .

Landscape Architecture



By KATHY FROMMER

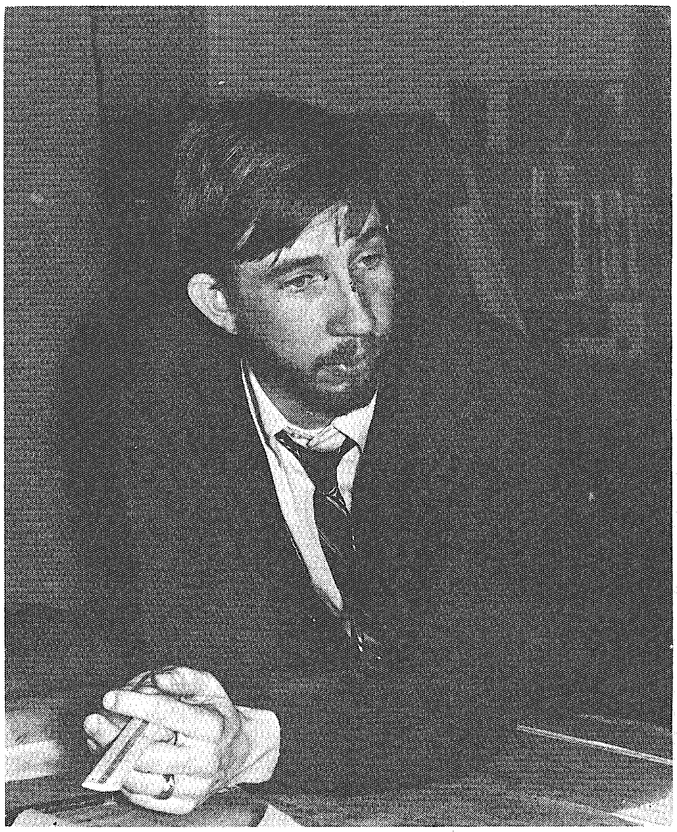
DEFINITION: To Landscape: To ornament with plants. Apply this definition to a landscape architect and you will imply an insult upon his profession. It is this confusion, in using the word landscape, that has clouded the issues as to the real concerns and abilities of a landscape architect.

The main crux of the profession is the "quality of land development," said Professor Roger B. Martin, Director of Degree Studies in Landscape Architecture. The 4-year-old program's purpose is to stimulate the student's ability to perceive visual and functional problems within the environment and then make rational decisions necessary in finding a solution to the problems.

The technology of the program, which has design overtones, emphasizes training in land surveying, grad-

Left: The model for a Community Park in St. Paul is studied by designer John Heuerstadt (left) and Ken Pekarek.

Below: Jerry Furritran, instructor in the Department of L.A., explains the goals of his class.



Opposite Above: Professor Roger B. Martin, Director of Degree Studies in Landscape Architecture, discusses one of the programs available to the L.A. student.

Opposite Left: Part of a project presented for an Urban Park Competition in the Spring of 1969 by James Robin. The drawing is an example of how to provide an active use area as a connecting link between a housing and a commercial development.

photos by MARVIN VIKLA

ing, drainage, road alignment, and land use analysis techniques.

Studies preliminary to the professional study of Landscape Architecture involve courses in biology, geology, ecology, and assessment of natural systems. In the applied sciences, required courses include horticulture (how plants survive, how they reconstitute the soil) and civil engineering (understanding techniques of working with the land).

The series of design theory courses are essential in helping the young designers clarify their own specific interests and abilities.

Two approaches to this program are available to students. A six-year program has been set up in CLA with emphasis on design theory. However, it takes longer to get a professional degree in the CLA program than in the 5-year program set up in IT.

The issue of today revolves around environment and it is the landscape achitect who is involved in this issue. He is concerned with the malfunction of society within its environment.

Professor Martin pointed out that man is the product of evolution. "Man needs a relationship with the environment as not to alienate himself from the process that spawns him. He needs a subconscious relationship to the natural elements to live a fulfilled existence," said Martin. It is the fundamental drive of the landscape architect to help man find this new relationship with the environment, a relationship that has too long been neglected and misunderstood.

The landscape architect is trained with creativity and sensitivity to assess the extent to which the symbolic, timeless values of the landscape can be used and still retain ecological balance.

With this sensitivity, the landscape architect can apply design, texture, form, composition, harmony, and balance in organizing (three-dimensional) space in relation to the layout of residential, commercial, institutional, and industrial facilities.

Work in a Going Growing Minnesota

What company produces two-way radios for more kinds of users than any other company in America?

Wrong!

Whatever your guess . . . the chances are about 50 to 1 that it wasn't E. F. Johnson Company.

For over 40 years we've quietly gone about our business manufacturing not only millions of electronic components, but more kinds of high performance two-way communications equipment than any other manufacturer in the United States including all the big names that come to mind.

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• • •

As a comedian remarked on TV the other night: Pres. Nixon says that the end to the inflation is just around the corner—unfortunately that corner is in Saigon.

• • •

Golfer: "Yes, Pete plays a fair game of golf—when you watch him."

It finally happened; yesterday my wife asked me to "help" her rearrange the seats in our car.

• • •

"Open wide," demanded the dentist as he began his examination. "You've got the biggest cavity I've ever seen."

"You don't have to repeat it," snapped the patient.

"I didn't," answered the dentist. "You heard the echo."

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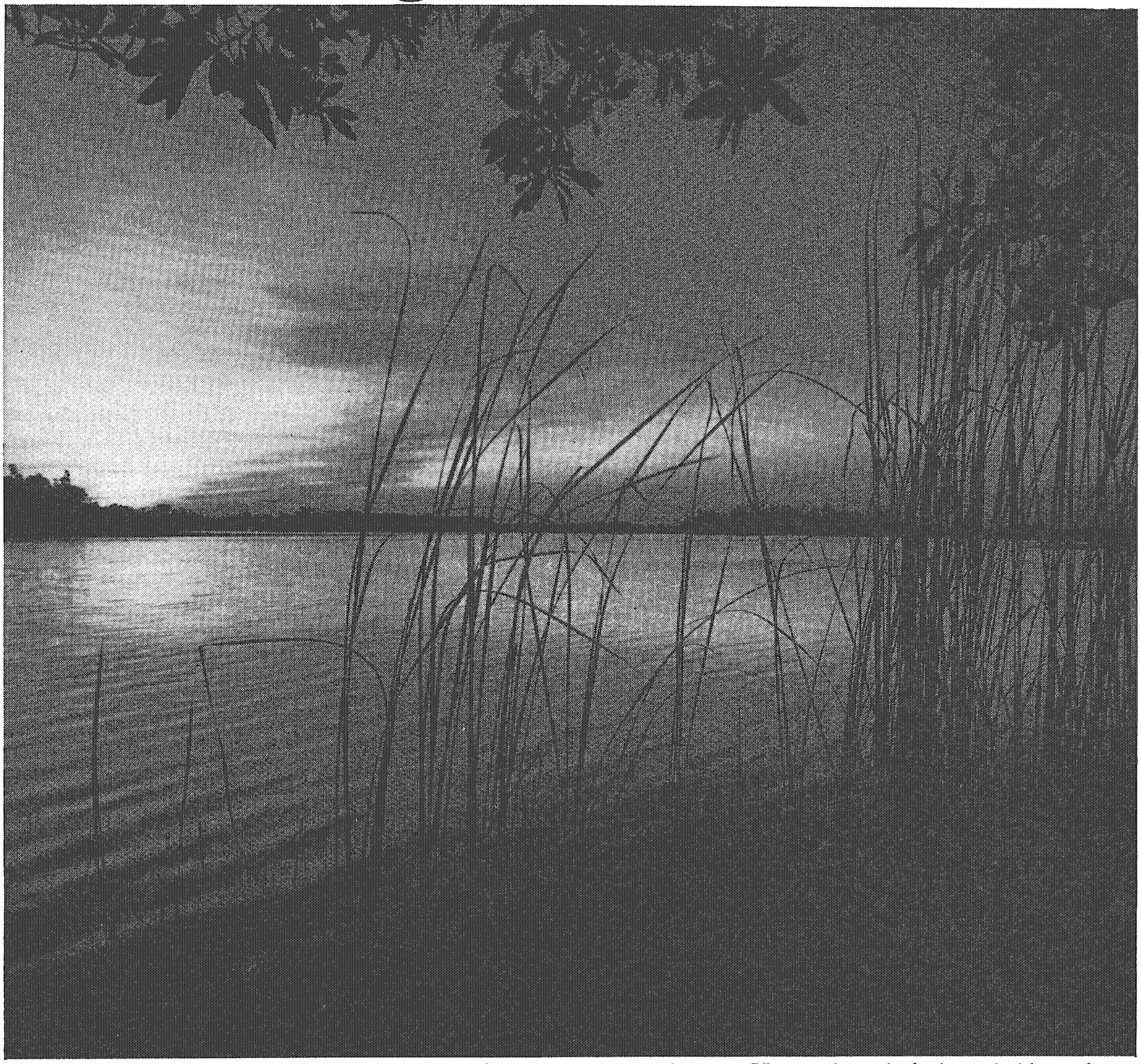
Bugs ate this lake clean.



In every lake or river or stream are tiny little microorganisms that eat pollution.

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But sometimes the water gets too polluted. And the little bugs start starving for air. And stop reproducing and eating.

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You should see the way they stuff themselves once you whet their appetites.

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Until our engineers went to work on the problem, cutting down on engine noise always meant cutting down on power. But no more.

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And NASA has chosen General Electric to find ways of cutting engine noise even further.

It may take an engineer years of work before he can work out the solution to a problem like noise in jet engines. And it may be years before his solution has any impact on the environment.

But if you're the kind of engineer who's anxious to get started on problems like these and willing to give them the time they take, General Electric needs you.

Think about it in a quiet moment.
Or, better yet, a noisy one.

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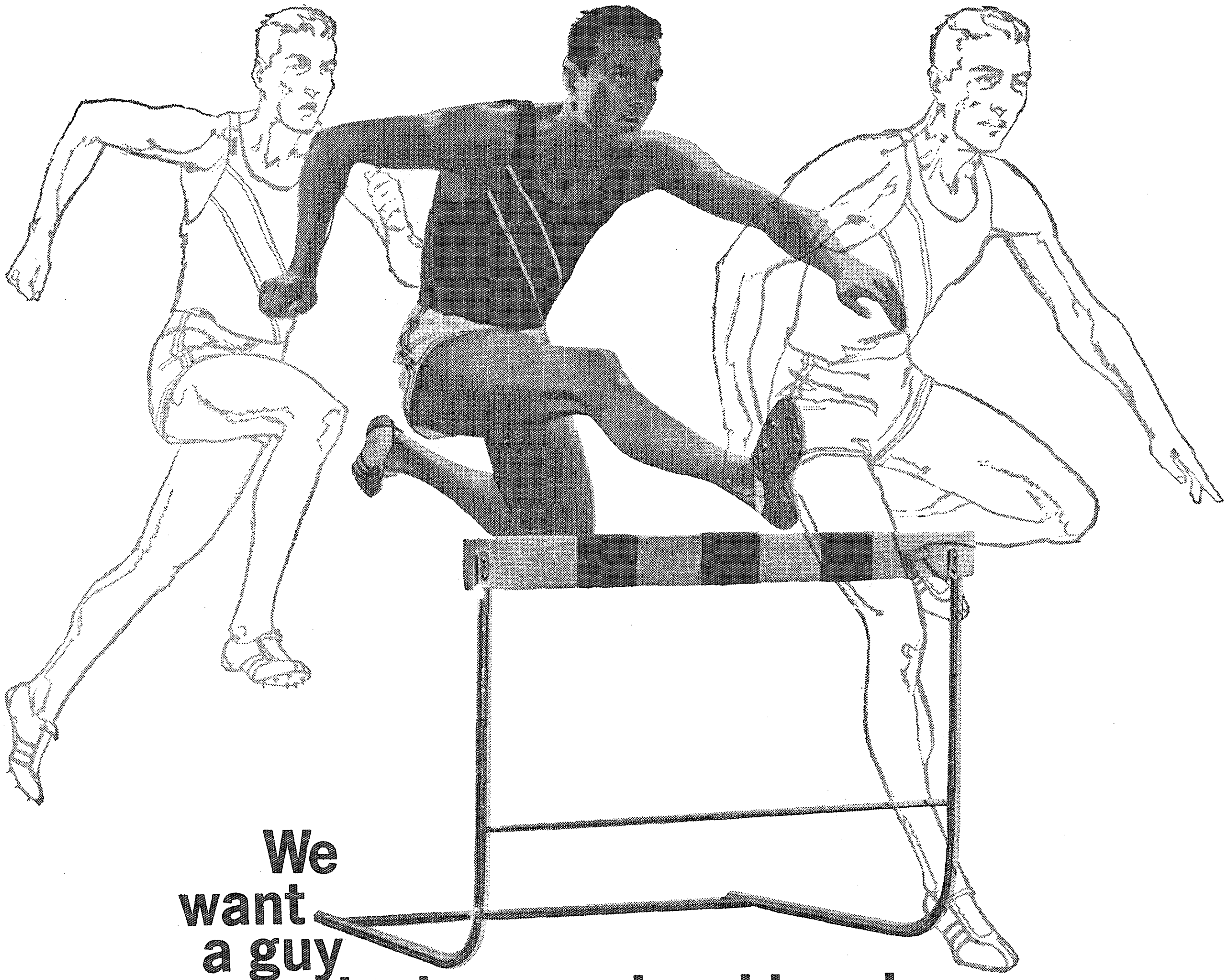
TECHNOLOG

MAY, 1970



We want a guy who keeps a level head.

Dictionaries define hurdling as jumping over a hurdle in a race. Obviously, Webster never made the track team.

"A good hurdler never jumps," the experts tell us. "He tries to duplicate the movements of sprinting. The head stays level. It's never higher over the hurdle than it is between them."

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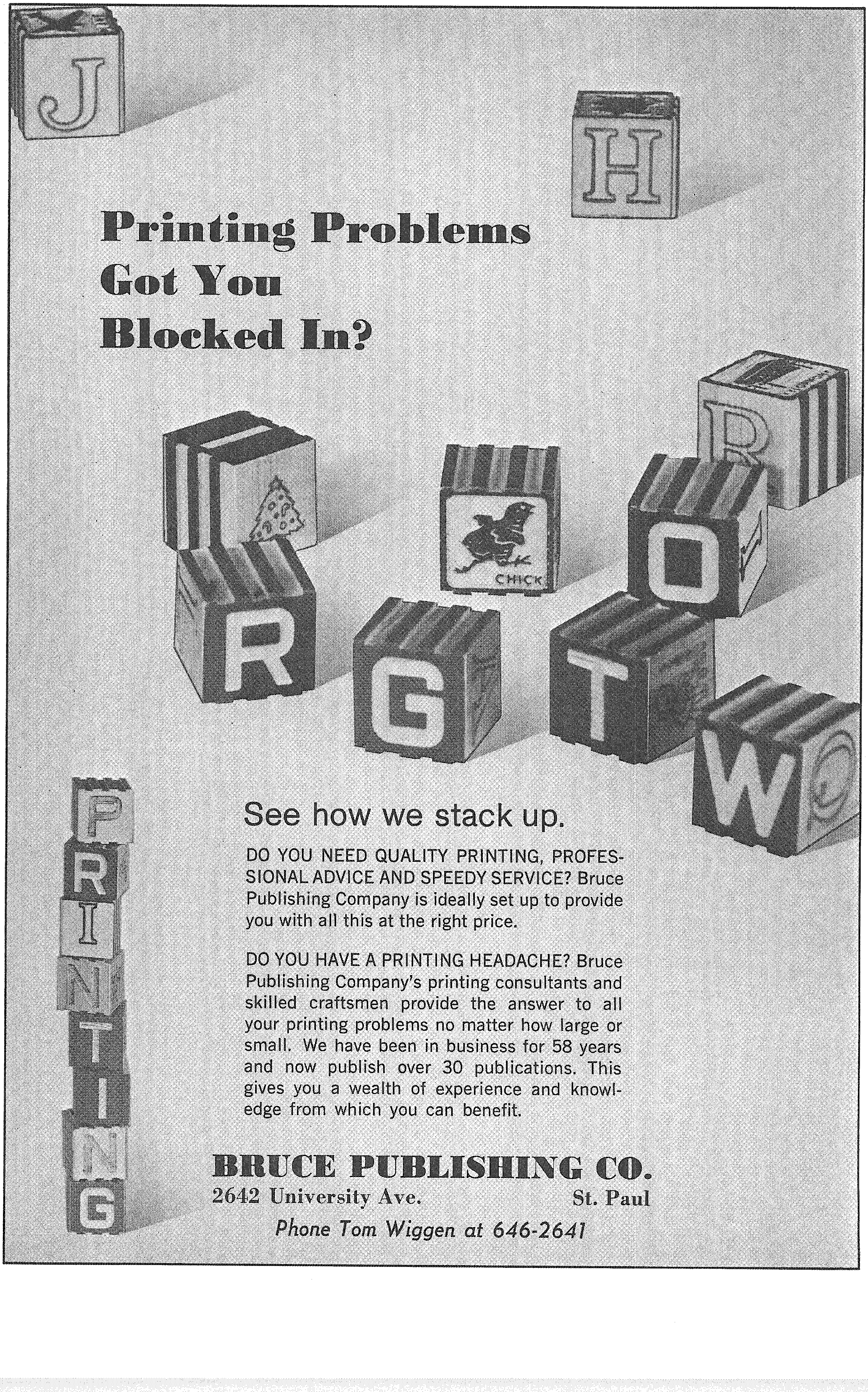
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TECHNOLOG

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

COVER: Impressions of this years E-Day as seen by the artist. Drawing by Don Neal

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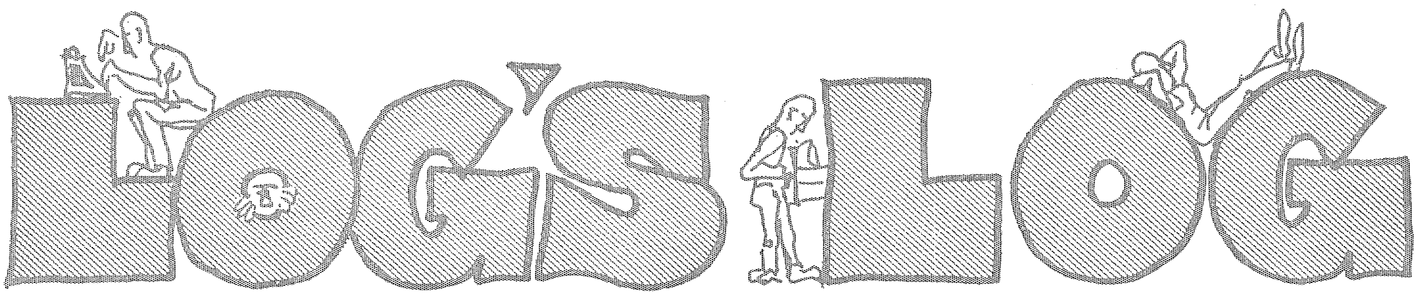


The Engen-Kehrberg Report

Introduction: E-Day has been. And whatever it was, is or ever hoped to be, is now neatly pressed into our high school annuals—right next to the bill for Susan Handelman's corsage. Actually, we rather thought that E-Day had been cancelled and replaced by a Druid festival. But then it had been awhile since we had been to an E-Day and the lack of relevance confused us. The problem with E-Day, of course, is that it is all good, clean fun in an era of jaded lust. And the results have been as predictable as the solution is not. But our IT leaders and University Administrators are trying. What? Our patience.

Basic Black

For the entire history of America there has been a dualism, in reality two Americas. One black and one white. We all know about white history and we've all heard about the demands for an increased emphasis on black history. And to do our bit we are presenting, in capsule form, the Black History of the United States.

It all began, of course, in Africa. There, naked men and women were running around, doing what naked men and women usually do. Into this pastoral scene came the white missionary, with his bras and loincloths—thus ending the fun and games. Other men came and, if you excuse the pun, chained the black man to the future of America.

After the boat landed and all who were going ashore went ashore, the (happy in his ignorance) slave met his (sharp as a whip) master. Let's just say it wasn't love at first sight. Well, everyone soon settled in for a cotton pickin' good time.

The first black man to make it into white history was Chrispus Attucks, the first man to die in the American Revolution. And if we are honest, that's the kind of honor one could live without.

Well from here to 1954, black history fared little better than the bus company, settling for a few tokens. We all know the names. George Washington Carver, for example, discovered that there were 3,281 things one could do with a peanut. One of which is used today (i.e. the digestion thereof). But the lot of the average black man could be summed up thusly, "You're a 'boy' until you're 55; then you're an 'uncle'."

In 1954 the Supreme Court did its thing and at that point black history merged with white history. And the lesson to be learned from a study of black history, even ours, is that two Americans are not better than one.

A Noble Tradition

There are few old timers left around the Log Office today, but those who remain can still recall some of the growing pains which the *Log's Log* and its later ill-begotten, wonder child—"The Engen-Kehrberg Report"—experienced during those glorious formative years. If asked today, any of the assorted remaining, somewhat aged and musty old timers, would probably first mention the E-K "fourth hour gross-out sessions." But later, inevitably, would come an account of that day long ago when Kehrberg was beset by a vicious cold.

The entire story began with Engen badgering Kehrberg to start stroking it on some copy for the forthcoming issue and the already passed deadline. "You don't seem to understand," Kehrberg moaned between coughs and nose floods, "I'm dying."

"So what."

"So, I don't want to die. I want to sleep. I want to get rid of this cold. I want to live to see that you only get your half of the money."

"So why don't you take a damn pill," Engen replied dead serious.

"I already emptied my bottle of Excedrin, and I'm still going to die. I know it."

"Excedrin is for headaches, fool," Engen stated, giving everyone present the benefit of his television medical training.

"Alright, rag, what would you use?"

Assuming a pose Ben Casey would have used had he ever been prevailed upon to prescribe a cure for a diseased Aardvark, Engen dictated the cure. "Take one Contac, two Alka-Seltzers, and two aspirins . . . and get back to work."

For lack of a better metaphor, Kehrberg, crouching there somewhat like the previously mentioned diseased Aardvark, murmered, "But I haven't got any of that."

Engen did. "I'll give you enough for now."

"No," pleaded Kehrberg, "sell me a whole bottle of each. I don't want to postpone it. I want to cure it. I want to live."

"No. It's not that I don't want to sell you some; it's not the money that matters; it is just having them around when I need them that matters to me. I won't sell you any."

"But I'm dying."

"What does that have to do with it?"

"But I don't want to die."

"Oh damn, I'll give you enough for now and in the morning," Engen conceded, secretly proud of this negotiated settlement with his sickly partner.

"Are you sure it will work?" Kehrberg asked eyeing the pile of pills.

"Of course it will meathead. Look at me. Do I have a cold?"

Kehrberg had to admit it. Engen didn't seem to have a cold.

After taking the cure, Kehrberg was able to return to work on the magazine and it reached the press that month. However, our tale of woe doesn't really conclude here. Although today Engen still swears by his remedy, Kehrberg has never been convinced. He still has a cold occasionally—and is positive it is the same one. All of which only goes to prove: Faith can move mountains, but if you're lucky, it will move Jane Fonda into that vacant apartment next to yours. And then you can give her your cold.

Two Saints

In the beginning, there was no Minneapolis or St. Paul, only a bunch of freezing Indians waiting to be defeated by whitey and sent to a warm reservation in Arizona. Well whitey came, in the summer and he confronted the same tactics that saw crime-ridden Manhattan Island traded for oil-rich Oklahoma. And whitey lost again. Well, whitey soon discovered for himself the tragedy in five acts known as winter in Minnesota and he clustered together for survival.

One of the first places he clustered in was named St. Paul (after the famous church in London). Well anyway, this community soon developed until one day somebody said: "Wouldn't this be a great place for the state capitol?" And it was agreed, St. Paul would indeed be the ideal location for the state capitol. After all, who would argue against St. Paul? Only the agnostics. But they were prominent in Minnesota, attracted in large numbers by its many God-forsaken qualities.

Meanwhile across the river, some other people were clustering in a place called St. Anthony (named after the famous Falls). But the agnostics, joined by the atheists, complained and so the name of the town was changed to Miami Beach. (It seemed our Scandinavian founders were following the example of Lief Ericson's naming of Greenland.) Trouble arose, however, when a committee of townspeople went to register the change of name at the new capitol in St. Paul. It seemed that the registrar of towns had examined a bottle of Hudson's Bay rum a little too closely the night before and erroneously recorded the new name of St. Anthony as Minneapolis. Which really worked out for the best anyway. Because if the registrar had recorded the change correctly we would all be attending classes on the Miami Beach campus of the University of Minnesota. But come to think of it. . . .

A Pinch in Time

While the problems of the menopause and growing old gracefully seem a long way off for most college undergrads, the Log's Log would nevertheless like to present a case history of one old man and how he is spending his last few days. The E-K Report bumped into him in a soup line that wasn't moving fast enough to suit our tastes (or our dates' either). We shall simply call him "Pops".

One is immediately impressed by Pops. The first thing you notice about Pops is his age. He has quite a bit of it and it appears that he has undergone several unsuccessful wrinkle transplants. But it is after all Pops' story that is of prime interest to us.

When Pops was young he lived in the woods. But when Pops was young, everybody lived in the woods. His early life and the years up to 1959 were quite uneventful and unspectacular. But in early '59 it dawned upon Pops that the whir of the embalming tank motors was getting louder and louder.

His decision was to emulate Ben Gazzara and try to crowd a lifetime into his few remaining years. Unfortunately for Pops, he had just exceeded the statute of limitations on his pension and was in desperate need of fresh batteries for his pacemaker. Faced with this desperate situation, Pops could do nothing but move to skid row and debauch himself on cheap wine.

That pretty much is Pops' story except for one incident which goes a long way toward explaining his philosophy and may be of help to some of you later in your own lives. As we were leaving (having finished our soup), Pops turned 'round and pinched the behind of one of our dates. And, with a wink of his ancient eye, Pops exclaimed: "Even dirty old men need love".

Sand Trap

Open Letter To Metallurgical Engineers:

Since you have shown an interest in metallurgical engineering and since we at Death Valley are extremely anxious to maintain the high quality of people we have in residence (90% of whom work at independent mining operations) we of the Death Valley Chamber of Commerce wish to extend our warmest invitation to you and hope that after graduation you will select the Death Valley metropolitan area as your work location.

We are confident that you would find Death Valley an interesting and friendly place to live and work and in this connection would like to give you some information about our area. Death Valley City, a community of 500 located in southeastern California, is a perfect example of the beauty to be found in the Golden State. We are a small community whose people have their roots sunk deep (annual turnover of population being only 1000). We enjoy the simple pleasures of a sunrise and the 120° plus temperatures which accompany it. We enjoy excursions and outings to the many natural beauty spots which surround Death Valley for hundreds of miles. Two good examples of these are the La Benta Tar Pits and Alkalai Flat, long renowned as a drying-out place for drunken Indians. The community spirit is also strengthened by the many search parties for lost townspeople. A large part of the town turns out for these and the local church ladies aid usually serves a potluck supper at the inquest.

Even though we are a small community there is a cosmopolitan air which we get from the many widely traveled residents and from the nearby Indian reservation tanning factory. Our business community provides all of the necessities of life at reasonable prices: meat, fish, fruit, and vegetables being rather scarce however. Our single school is consolidated to provide the highest quality of education through all four grades. Housing, long one of our more serious problems, has recently been alleviated by the closing of Resurrection City and the resultant availability of high quality, single-family dwellings.

No doubt you are now quite interested in Death Valley, even from the brief rèsumè presented in this letter. We would therefore like to extend an invitation to you and your family to visit us here soon. We would suggest however that you arrive during the dry season (August thru July) so as to be able to see Death Valley for what it really is. We will be happy to make any plans in advance of your arrival and this is advisable as our only hotel is often closed for descorpionizing. See you soon!

Sincerely yours,

SOURDOUGH PETE CARSON
President, Death Valley
Chamber of Commerce
812 Market Street
San Francisco, Calif.

Let's Split

With the rise of technology in the early '50's there also arose a phenomenon known as the flying saucer. We at the E-K Report take the position that if there are little green men or 40' women or super-intelligent algae, they certainly would not come to Minnesota. But California is another story. And to demonstrate that, we are printing three current theories on alien life, coming out of the Golden State.

Theory #1 is based on the fact(?) that every air force in the world has reported UFO's except that of Canada. This theory then leaps to the conclusion that Canada is conducting some super-secret project which explains all the unexplained sightings by everyone else. Seeking to verify this, we went to see Maj. Pierre Nanook, Public Information Officer for the Royal Canadian Air Force. His explanation was that his pilots were far too busy drinking Canada dry to go up in those funny-looking round things in the hanger. But then major, what can you expect from green pilots?

Theory #2 is called the atom theory and its basic premise is that the solar system is just a small atom in some larger universe. And the question raised is: When will that atom be split? The E-K Report hopes, that if indeed we're an atom of some larger world, we're an atom in a bottle of vodka.

Theory #3 is known as the chicken farmer premise. This results from the strange fact that flying saucers, *et al.*, seem magnetically attracted to contact chicken farmers, car hops and other such intelligent life whenever they land. But then, maybe the peeps from outer space just want something to eat.

But then you say, "What about the many seemingly legitimate reports? The E-K Report, daring to rush around like the proverbial Rhode Island Red sans that which sits atop a stein of beer, would like to relate a personal incident. One day, as we were tramping through the woods, we saw a flying saucer take off and we mistook it for swamp gas. So, who can you believe?

Official Daily Bull

Time has run out for us. But for a few members of the senior class who have not yet found or decided upon gainful employment, may we recommend AT&T? For despite the fact that we are in a recession, people are still gonna talk.

And if you have noticed the decline of job opportunities in technical fields, have you also noticed the breakdown of law and order and the incumbent rush to the bar? And tho Mr. C. Dickens said, "the law is an ass", many have ridden it to prosperity. And so if you desire a piece of the action, we invite you to exercise your gray matter on the E-K Report Legal Dilemma of the Month: Is sexual assault on a prostitute, rape or theft?

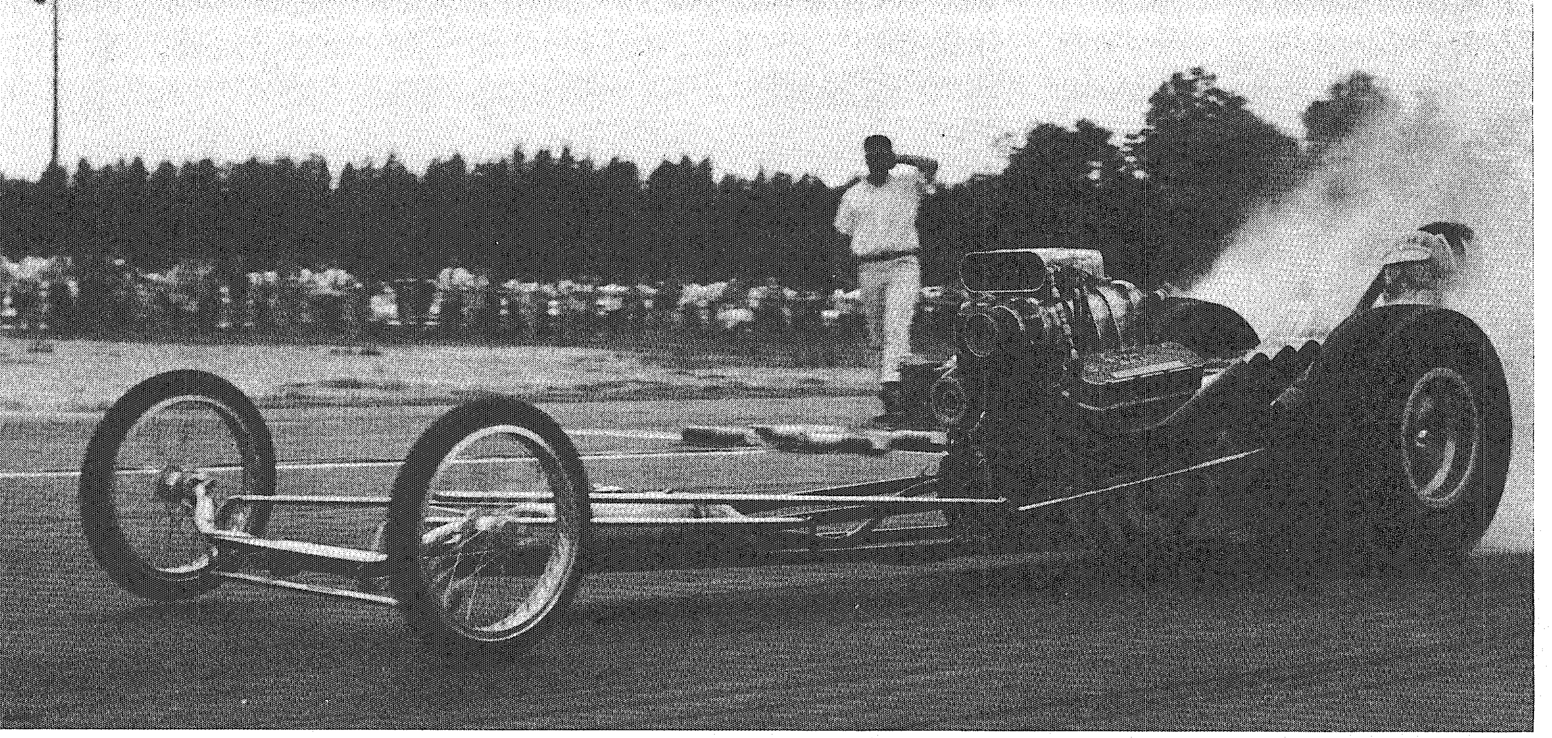
May 16-31

16—Hold a candle to Raquel Welch. Not in the dark Day.
20—Miss-in' linen Day. No pill, oh! No sheet?
24—Hire on with Zinsmaster. Ask for less dough and more bread Day.
27—A pepper Day. A salt Night.
31—*Ivory Tower* Babels Day.

June 1-13

1—Half two Day.
4—Lottery Day. Take a chance on any army blanket.
8—Scotch Week. But French strong Day.
11—Fire Mitchell, Dump Agnew and Dick Nixon Day.
13—Adieu Day. Do you?

Conclusion: Since this is our last chance at you and a public audience, we would like to tie up a few of our loose ends. First, Dave would like to inform Miss Sylvia Anderson that despite what Mr. Engen asserted previously, the elevator operator at the Sheraton-Ritz is *not* like the captain of a ship and *cannot* perform marriages. We would both like to thank the U of M vending machine service for those many undescribable cups of coffee that fortified us during the many hours spent in late night study. If we were to describe the coffee, we would liken it to making love in a canoe (i.e. f-----g near water). Last and leastly, we should like to state that all guests of the Log's Log were flown to Minneapolis via Iberia, the Spanish airline. We would especially like to acknowledge the pilots of Iberia. Spanish flyers really did a great job. We hope the E-K Report of 1969-70 did the same.



A Future Engineer Looks At *Drag Racing*

by TOM FERRIN

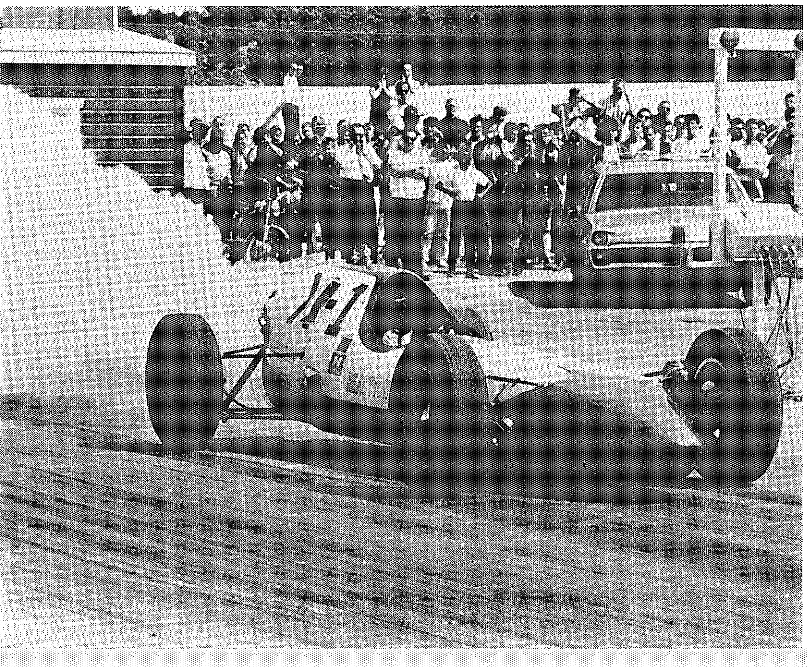
Drag racing: a term used to describe a test of acceleration between two cars driving a measured distance of ¼ mile along a straight line, from a standing start, in the shortest possible length of time, and at the highest possible rate of speed. Say drag race to people and you'll no doubt get a different reaction from each person. A few people view drag racing as nothing more than what kids do on the streets when they get into their souped up hot rods. Others admit they know it is an organized sport but they know nothing about its rules. Still others view a drag race as a special thing of beauty. These are the people who look at a race car as an elegant piece of machinery designed to do one thing—win; and winning can mean more than a trophy or personal recognition—a winner of a major drag race can walk away with $15,000 or more in his pocket.

It all began in 1951 at Pomona, California, when a group of enthusiasts, with the cooperation of the local police, took over an abandoned airstrip in order to have some place to race other than in the streets. At first they simply raced the cars they drove on the streets; but before long the sport began to grow up.

Today special chassis, special engines, fuels, tires that won't disintegrate at speeds well over 200 mph, safety devices including parachutes for quick stops, safety helmets, safety harnesses, goggles, fire extinguishers, and fireproof clothing are standard equipment for the serious drag racer. Elapsed times, the length of time it takes the car to travel the ¼ mile, have dropped from 20 odd seconds to less than 6 seconds for some jet and rocket dragsters. Top speeds at the end of the ¼ mile have increased from under 60 mph to over 290 mph.

Engines today fall into a wide range of classifications, from Volkswagens to Chevrolets to Chrysler hemi's to J-47 jets and even to rockets. Fuels range from pump gasoline to alcohol to nitromethane to even hydrazene

Below: The X-1 rocket car, formerly owned by Reaction Dynamics of Chicago, Illinois. This "car" holds the elapsed time record of 5.41 seconds and the top speed record of 294 mph for the ¼ mile.



Left: The Michaelson-Bissonett-Ferrin supercharged gas dragster with Bill Bissonett doing the driving honors. This car has turned an elapsed time 8.34 seconds with a top speed of 181.07 mph.

Above and above left: The "C" altered owned by Pellicci and Mann of Minneapolis. This car has a best E.T. of 10.35 seconds and a top speed of 131.95 mph. At the time this car was running (1968) the national record for its class was 10.33 seconds.

and hydrogen peroxide, the latter being used in the rocket engines. Stock engines which normally put out 300 to 400 hp have been specially modified to put out 1500 hp or more. Drag strips have progressed from abandoned airfields to custom-built race tracks composed of special asphalt compounds for maximum traction. Other advances in drag racing have led to special lightweight alloy metals that can withstand tremendous stress, special tires built for maximum traction and safety, and special transmissions that can transmit maximum power to the rear wheels.

What does all this mean? Probably not much if you have no interest in ingenuity, competition, mechanics, travel, or fun, but if you do like any of these, then drag racing means a lot, and if you have an aptitude for engineering it means even more. Then you can play around with things like aero dynamically designed air foils that force the wheels of the car down on the track to improve traction or streamlined bodies to reduce air drag. A well known drag racer (and an engineer, too) even designed a giant vacuum cleaner that mounted beneath the car and was supposed to force the car against the asphalt harder and thus provide more traction. If you're an E.E. you might have some idea for an electric dragster. The present world's land speed record for an electrically driven vehicle is 136.82 mph, clocked at the Bonneville Salt Flats in Utah. Power was obtained from 20 lead-acid automobile storage batteries. Sound far out? Not really though, for electric motors have a higher starting torque and are much more efficient and safer to operate than any internal combustion engine.

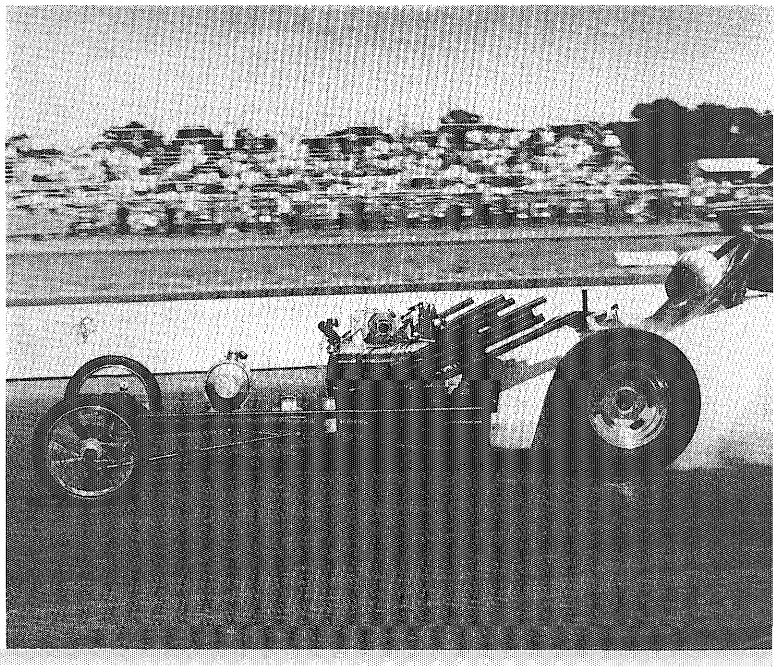
If you're going to be an Aero, rocket power may be your thing. One rocket powered dragster (which uses hydrogen peroxide as a monopropellant) has an elapsed time record of 5.41 seconds and a top speed of 294 mph for the ¼ mile—and it did that with the engine shut off after 1,000 feet and coasting the rest of the way! (Incidentally, this car is being modified by a snowmobile manufacturer in the Twin Cities for use on snow. He wants to bring the world's land speed record on snow, now 95 mph, to Minnesota.)

M.E.'s are right at home in drag racing—how about redesigning parts for an engine or even coming up with a new design for an engine (how about one of the new rotary engines)? Or how about a way to make an engine "*live*" longer? With the amount of power being extracted from an engine that was designed for much less strain, dragster engines are short-lived and usually give up the ghost by scattering their parts all over the track.

Ch.E.'s ought to have some idea for a new fuel—or at least safer forms of the old. Some drag racers cool their gasoline just before it enters the carburetor with an ice bath. The idea is to make the gasoline more dense so that more can enter the engine. And gasoline is not the only fuel used for drag racing, nitromethane has been used for years to increase the power output of an engine by 50 percent or more but anyone who has ever seen a supercharger explode knows that nitromethane is not the safest fuel to use. Another trick drag racers use is to tune their engines to the exact atmospheric conditions with an air density gauge. This aids them in adjusting the air-fuel mixture so that they can obtain the maximum power from their engines.

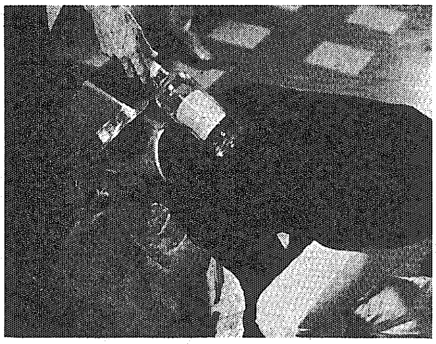
All this has but touched on the highlights of drag racing. Drag racing can be a sport for everybody from the guy who paid $200 for a used Volkswagen that he drives to work during the week and races on the weekends to the professional racer who owns a $10,000 supercharged fuel dragster and lives by and for the sport, knowing that winning is what supports him. But by far the majority of drag racers are in the sport for its fun. To them the money is only secondary. These are the people who watch a drag race and see it as a thing of beauty because it's the ultimate test of both men and machinery.

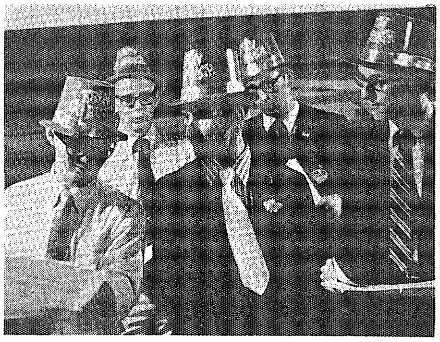
Below: The Bissonett-Nelson-Swedberg injected class "B" gas dragster. This car has a best time of 9.50 seconds, 151 mph.



E-DAY '70

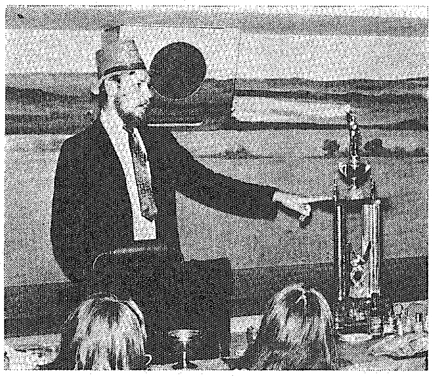
THE BRAWL

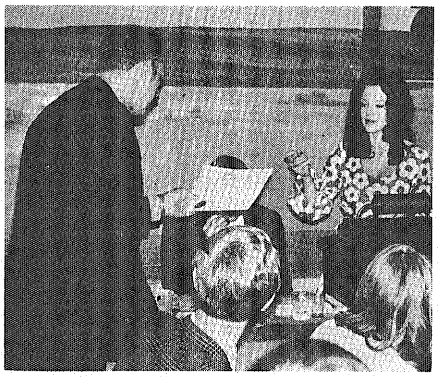




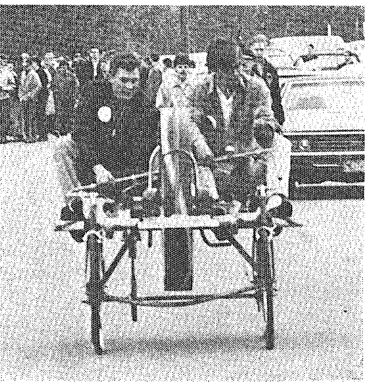
The Engineers Song

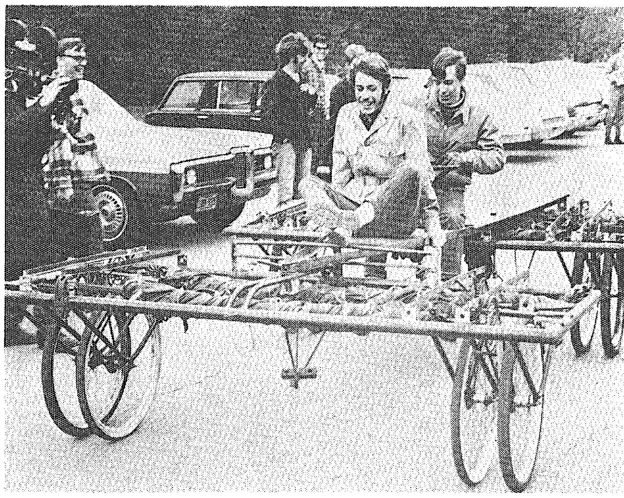
St. Patrick was an engineer, he was, he was
St. Patrick was an engineer, he was, he was
He invented the davenport so engineers
Could have their sport
Erin go Braugh, Rah for the engineers
For he invented the electric light
so engineers could study all night
For he invented the calculus
And handed it down to us to cuss
For he invented the stress and strains
So engineers could rack their brains
For he's a king who liked his beer
So why not drink with an engineer



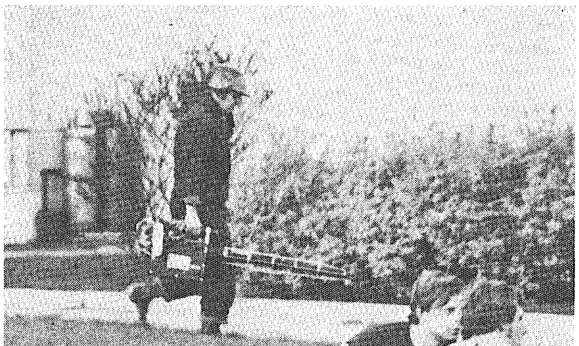


THE HOMEMADE CAR RACE





THE STRIKE



THE CORONATION

Queen Colleen

Queen finalists: (top) Wendy Weisberg sponsored by Alpha Epsilon Phi; (bottom left) Linnea Lindquist sponsored by ASAE; (bottom right) Carol LaFave sponsored by Kappa Eta Kappa.

Before the Brawl began, a few anxious moments were enjoyed as Kris Deeds, 1969 E-Day Queen, selects the new queen. The crown, robe, and flowers, make the new reign official.

Gail Bull, 1970 Queen Colleen, was sponsored by Theta Tau. An eighteen-year-old freshman, Gail's major is the common "undecided." Her usual friendly personality tends to bubble over during the summer since she thrives on swimming, horseback riding, and water skiing. She's a great choice.

After performing their royal duties, both Kris and Gail take time to chat with friends, enjoying a few relaxing moments.

Your money and your life.

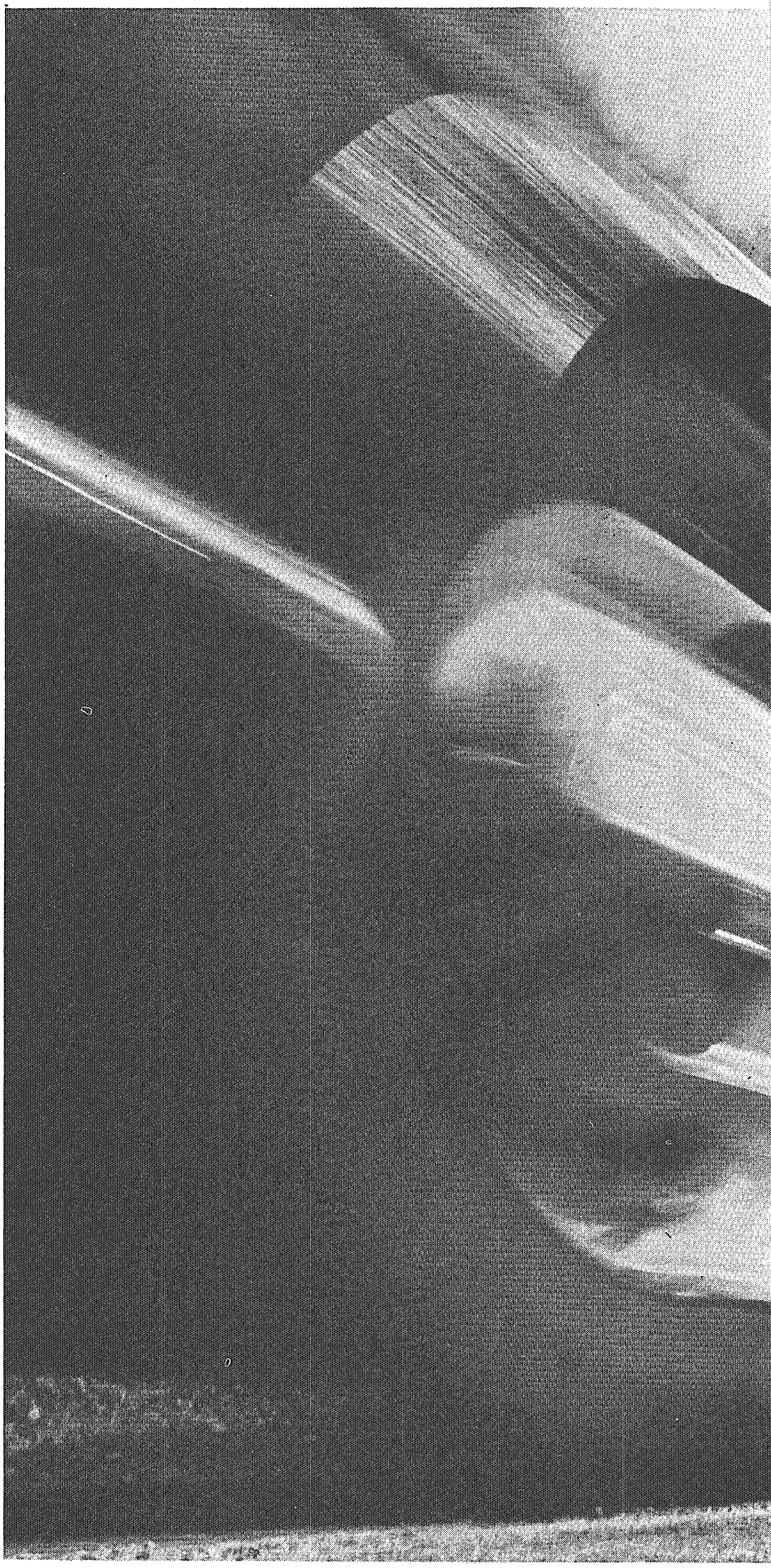


PHOTO: ERNEST BRAUN

You're living dangerously, and you love it.

You fought the professor all semester, and got an A in spite of it.

The girl you've been eyeing likes your style.

It's spring. That's dangerous.

But the one place where you shouldn't have to live quite on the edge is on the road. Now you don't, thanks to new safety features in cars . . . and the remarkable radial tire.

Radials are a marvelous invention in rubber and rayon cord. They last twice as long as regular tires, and even give you better gas mileage. On wet, slippery pavements, they grip like fly paper.

A point of interest—The Dynacor® rayon cord in radial tires is made by FMC Corporation, the same company that makes rayon for the "throwaway bikini" your date is working up courage to wear.

This same company that builds egg handling systems also builds fire engines.

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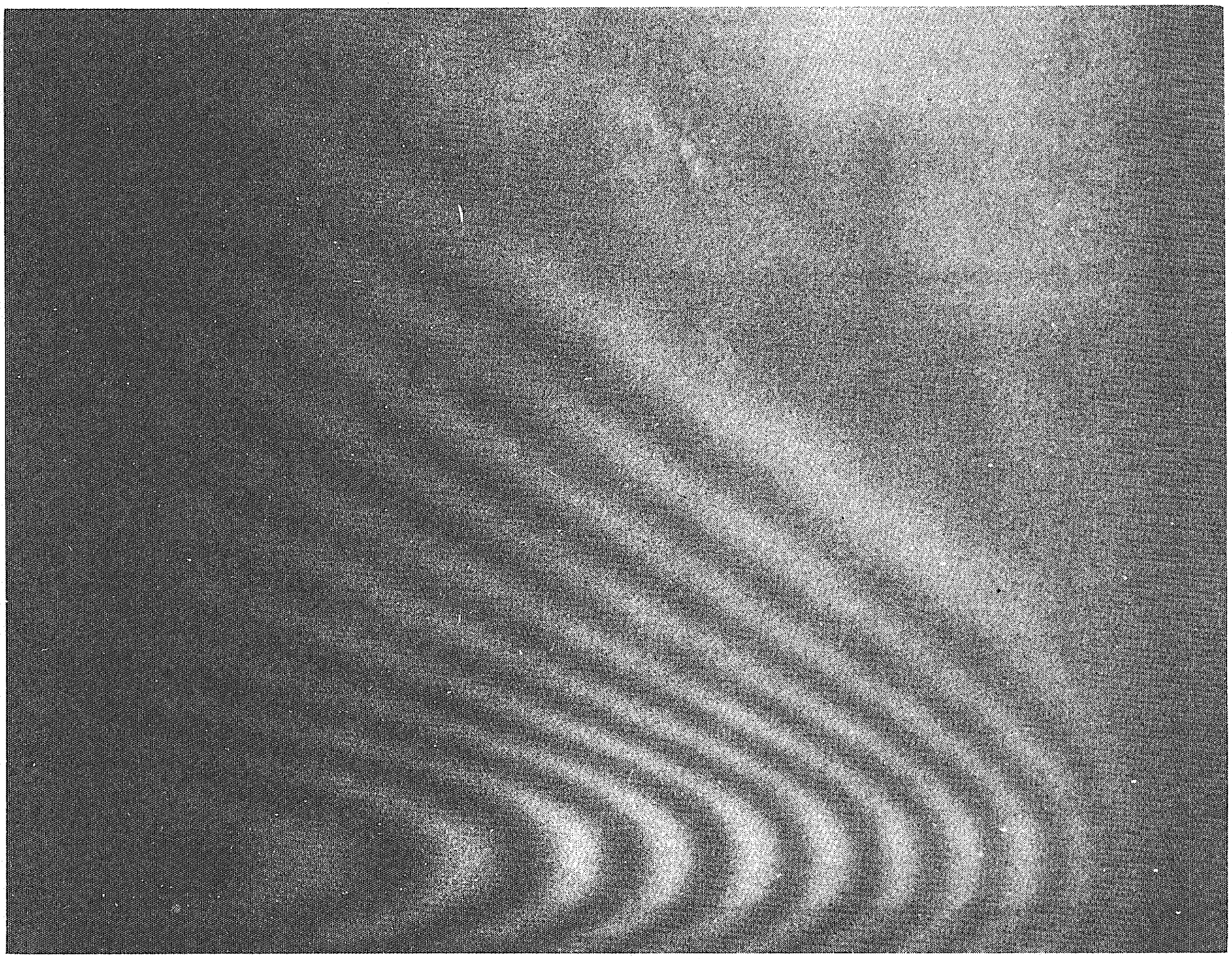


Introducing...

The Impact Studies Lab

by BECKY PHILLIPPS

If while walking through Aeronautical Engineering, you happen to hear thunder, as though the University dwarves are playing ninepins in the basement, don't get shook, you're not about to go to sleep for twenty years. It is just someone experimenting in the Impact Studies Lab. This project, under the direction of Dr. Robert Plunkett, is designed to study the plastic behavior of metal plates when hit by high speed projectiles.

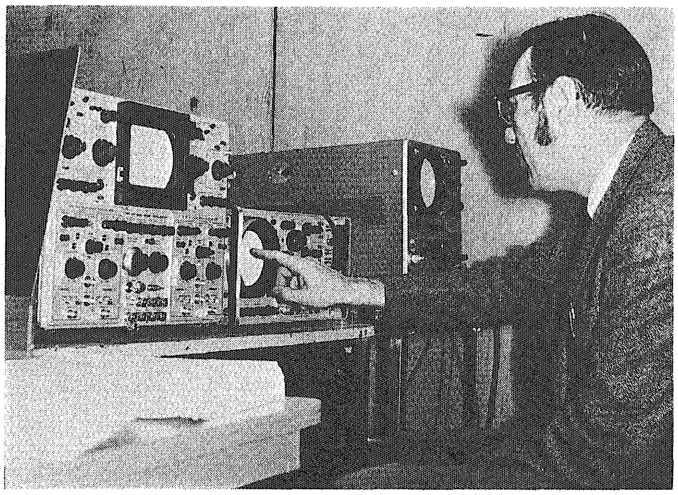
The first research on plastic behavior was performed about 25 years ago. Since this research was involved with beams, the results do not apply to the current research on plates. Plates stretch like membranes when struck while beams tend to bend. Dr. Plunkett, along with several students, is attempting to discover the factors involved in the stretching process and how each of these factors is related to the amount of distortion of the plate. The main variables in the project are the projectile velocity and weight and the dimensions of the plate.

The production of the results is not the hardest part of the project. It involves a gas gun and a plate. The gas gun was designed by one of the students who worked on the project. The pressure in the gun can vary from 5 psi to 2500 psi, thus creating a wide range for the projectile velocity. Along the path that the projectile follows there are two photocells. The time it takes the projectile to cross the distance between these cells is recorded on an electric counter. This gives an accurate measurement of the velocity (within 0.5%). Shortly after passing

Left: Photograph of a 2-inch bullet hitting a 15-inch plate. In this photo, the sweep speed of the camera is 2000 per sec. The whole picture took 5236 micro seconds. Only a quarter of the plate is shown, since results are symmetric.

Above: Dr. Plunkett fires a gas gun. He wears ear muffs as a precaution against the sound waves resulting from the projectile hitting the plate.

Below: An oscilloscope and other electronic equipment are used to maintain accuracy in the experiment. A safety precaution, a plywood wall, protects Dr. Plunkett from ricocheting projectiles.



photos by BRIAN JOHNSON

the second photocell, the projectile hits the plate. To maintain a lasting record of the deformation, the lab photographs the plate at the moment of impact. A moire screen is placed in front of the lense. This is an optical means of bending the light rays reflected off the plate, creating a pattern of light and dark lines on the photograph.

Originally the setup for the experiment was relatively simple. However as the experiment progressed it was necessary to perfect certain aspects for more accurate results. The major change was in the method of photographing the plate at impact. The first method was to take single pictures of different plates at different times after different impacts. This was not very successful, as it was difficult to maintain all variables at the same level for each series of shots. To solve this problem the shutter of the camera was removed and replaced by a cylindrical mirror. The mirror has 66 parallel faces and is rotated by a motor attached to the top of the camera. A strobe light is used as a light source and it is timed so that it flashes at the same rate as the mirror rotates. This way the light is constantly sweeping the image past the film. This produces one picture showing the entire progression of the impact. From the constant progression of the deformation lines on the photograph Dr. Plunkett can discover the relations between the deformation of the plate and each of the variables.

Dr. Plunkett reports that he is "amazed" at the results. Curves are calculated from predicted values gained through their first work, then the experimental data is also placed on the graph. The results are that the predicted values and the experimental values are almost identical. According to Dr. Plunkett, there is "virtually no fudge factor".

Discovering the controls of plate deformation will aid the design of space vehicles. These controls would provide guidelines to prevent punctures from micrometeorites, a hazard in space travel.

What's New in Science and Engineering

by JOANN HAWKINSON

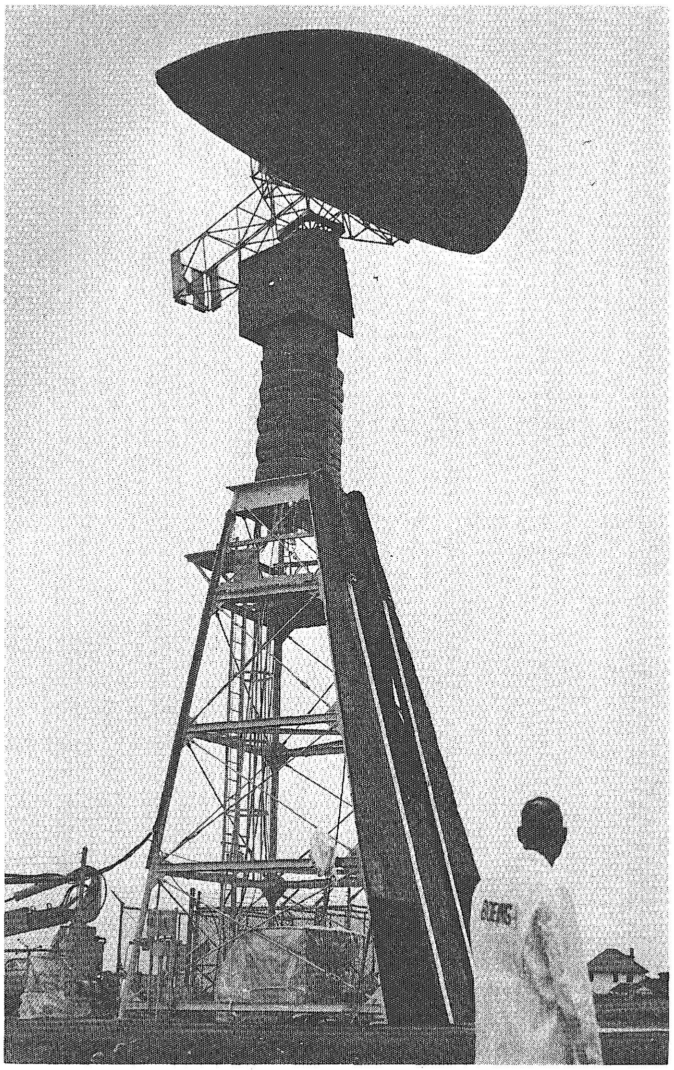
Eye in the Sky

The Boeing Company has completed and is testing what is believed to be the largest single-piece radome ever constructed.

Twenty-nine feet long and 12 feet wide, the fiberglass radome is mounted on a 50-foot tower at one end of a mile-long antenna range at the Boeing Space Center, Kent, Washington.

Under Air Force contract the radome is being used to test radar antennas being developed for the Air Force's Airborne Warning and Control System (AWACS), an "eye in the sky" aircraft for tactical and air defense forces. In actual AWACS use, the radome will be part of a huge rotation antenna housing mounted on pylons above the fuselage of the AWACS aircraft.

The Boeing radome is made up of two core sections, each with an inner and outer skin. Fabrication is conducted in four stages. Each stage requires curing in a



mammoth autoclave built for 747 jetliner metal bond work. The radome is the largest heat-cured honeycomb structure ever built.

Fabrication tolerances were a strict requirement. The total laminate thickness of the fiberglass shell was held to a tolerance of four-hundredths of an inch. Each of the 24 fiberglass plies making up the shell laminate was held to a tolerance of plus or minus one-thousandth of an inch in thickness.

Automated Transit System

The world's first completely automated rail transit system made its dry run on an underground blackboard in Oakland, California, as Westinghouse Electric Corporation unveiled its automatic train control and communications system designed for Bay Area Rapid Transit trains (BART).

The central control room is the system nerve center which will automatically supervise and dispatch BART trains keyed to passenger demands, safely, and with minimum delay.

In an adjoining room are the computers, essential brains of this coordinated transportation system. They must make judgments regarding peak hour train performance every half second, too swiftly for human response. Eighty-mile-an-hour top speeds will be attained by trains operatinging 90 seconds apart during some periods.

The console operator—space age dispatcher—can light up on the board any one of the five BART lines serving San Francisco and three counties. White lights along a track section indicate all systems are clear and the track unoccupied; red lights indicate the track is occupied.

In the event of any power interruption to the train control system, there are racks of storage batteries in a lower level room standing by to supply electric power instantly.

The trains will open next year to their first paying passenger on a 23-mile Oakland to Hayward run.

Space Shuttle

Two of the nation's leading aerospace firms, Boeing and Lockheed, have teamed to study a reusable, chemically fueled vehicle which would fly between Earth and low-Earth orbit.

The Boeing Company of Seattle and Lockheed Missiles and Space Company of Sunnyvale, California, will seek a space agency contract to study the space shuttle craft.

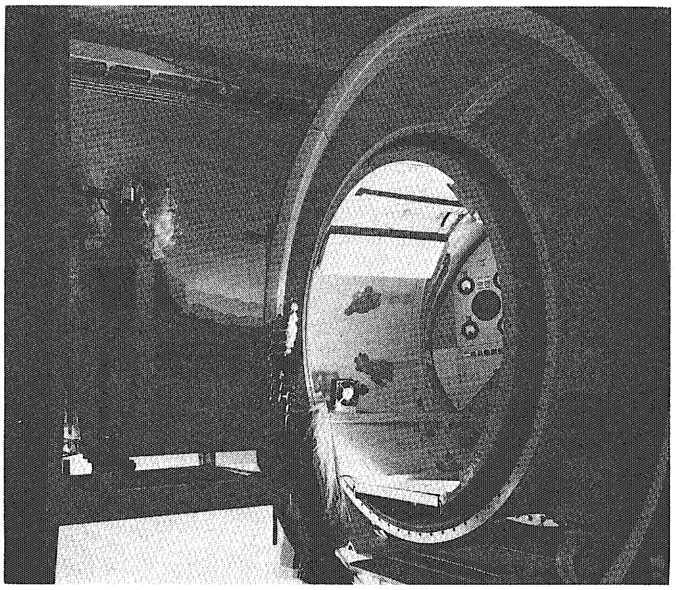
As presently envisioned, the space shuttle would consist of a large vehicle to provide initial boost and a smaller vehicle which would continue into orbit and perform space missions. Each vehicle, after completing its task, would fly back to an airplane-like landing.

In going after the space shuttle study which will combine elements of rocketry and airline operations, Boeing will be drawing on its experience with the Saturn V moon rocket, the SST, the huge 747 superjet, and its Apollo technical, integration, and evaluation work with NASA.

Lockheed, through its Air Force and NASA programs, has launched more than 250 of its Agena space vehicles. The company has also carried out independent research and development on the space shuttle over the past several years. Lockheed is builder of the supersonic all-titanium SR-71 aircraft and developer of the successful Polaris and Poseidon fleet ballistic missiles for the Navy.

Multi-stress Chamber

This Boeing research scientist is demonstrating the four-inch traverse of a pilot's seat mounted on a wall of the multi-stress chamber in Boeing's Space Center at Kent, Washington. Used to simulate the vibration of rocketship lift-off, the seat is normally enclosed within the chamber. The multi-stress chamber also tests man's reaction to heat (see paint scorched from chamber walls), altitude, noise, and gas content of the capsule during

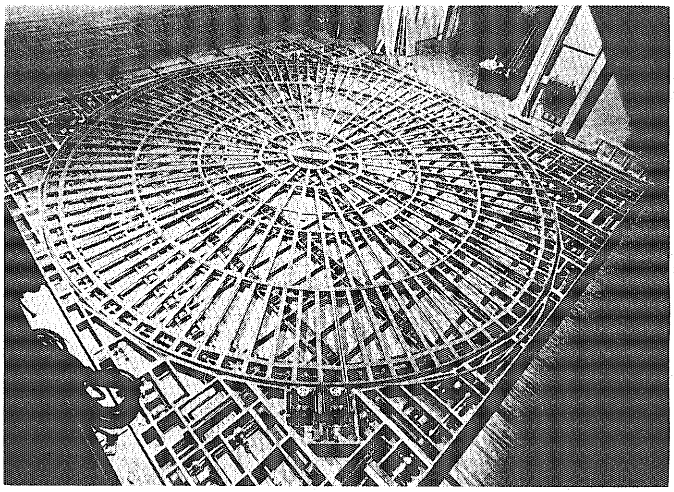


simulated space shuttle flights being test-flown in Boeing's human factors laboratory. Boeing is teamed with Lockheed Missiles and Space Company and Trans World Airlines in a NASA-sponsored competition to determine who will design and build the nation's space shuttle, a space transport which will carry up to 50 passengers into space and return them for an airplane-like landing. The shuttle is considered the first step toward development of a low cost space transportation system.

Revolving Stage

A new turntable and stage wagon recently installed by the Metropolitan Opera adds fresh dimension in the staging of certain productions, makes possible extra-fast and almost effortless scene changes when required, and is a marvel of engineering wizardry in itself.

Designed by the Macton Corporation, Danbury, Connecticut, at a cost of $200,000, the unit consists of a 60 x 60 foot square "wagon" or platform containing a 57-ft.



diameter circular turntable. The entire unit weighs 125,000 pounds, can operate with a 22-ton load, and is only 12 inches high thus conforming with other mechanical features of the entire stage. The wagon is powered by twenty-two one-horsepower motors and can move from the back wall of the opera house to the footlights at speeds up to 90 feet per minute. The turntable itself, which uses eight additional motors, can revolve at peripheral speeds from 15 to 150 feet per minute, and automatically indexes to any of 12 positions.

Tube Transit

Experts have shown a strong acceptance of an advanced transportation technique using propelled gravity and vacuum instead of other "exotic" transit schemes for heavily urbanized regions of the nation.

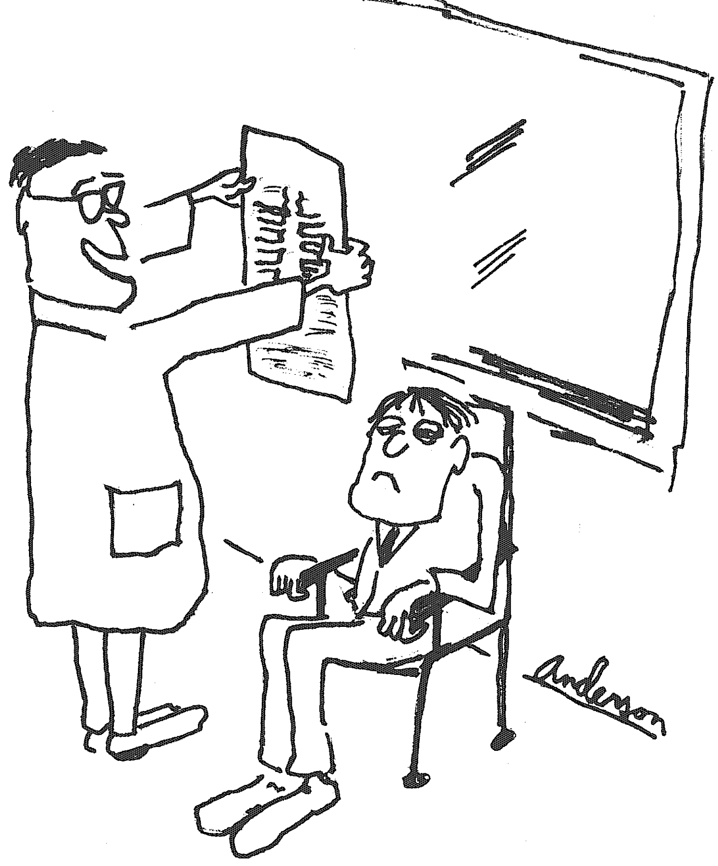
The gravity-vacuum concept, in which large trains speed through underground tubes at speeds up to 420 mph, is favored by a six-to-one ratio over STOL aircraft and seven-to-one over tracked air cushion vehicles.

More than 250 top-level experts in planning, government, education, and industry were polled.

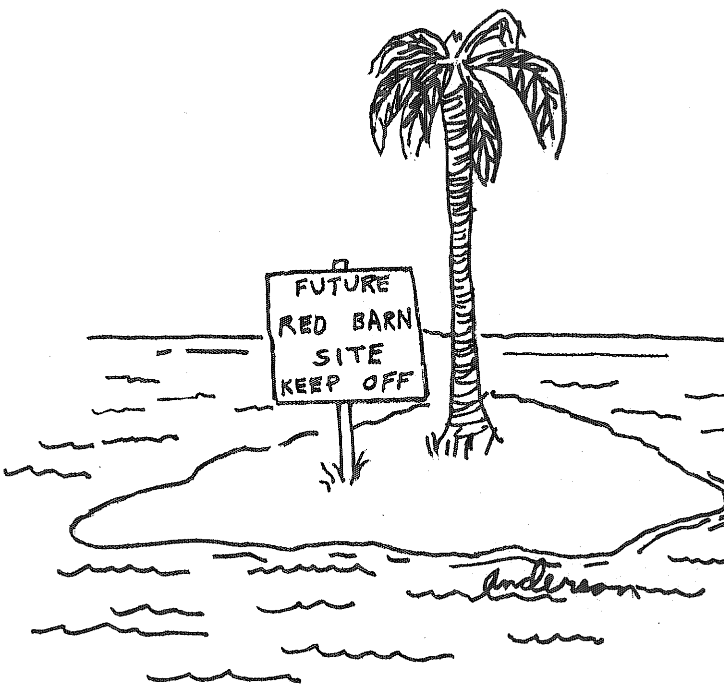
The primary goal of urban development for the next half-century will be to link suburban to exurban areas—outlying mini-cities to the central cores—by some form of new transportation development.

Tube Transit Corporation, underground transportation systems engineers, are developers of the Gravity-Vacuum Transit (GVT) underground transportation system, which relies on a combination of pneumatic, vacuum, and gravity forces to drive trains at high speed through underground tubes.

The Tube Transit's GVT system would make feasible a continuous belt of metropolitan areas along the Atlantic Region. GVT could return to downtown, or give to a new center, the access advantage that it enjoyed prior to the coming of the automobile.

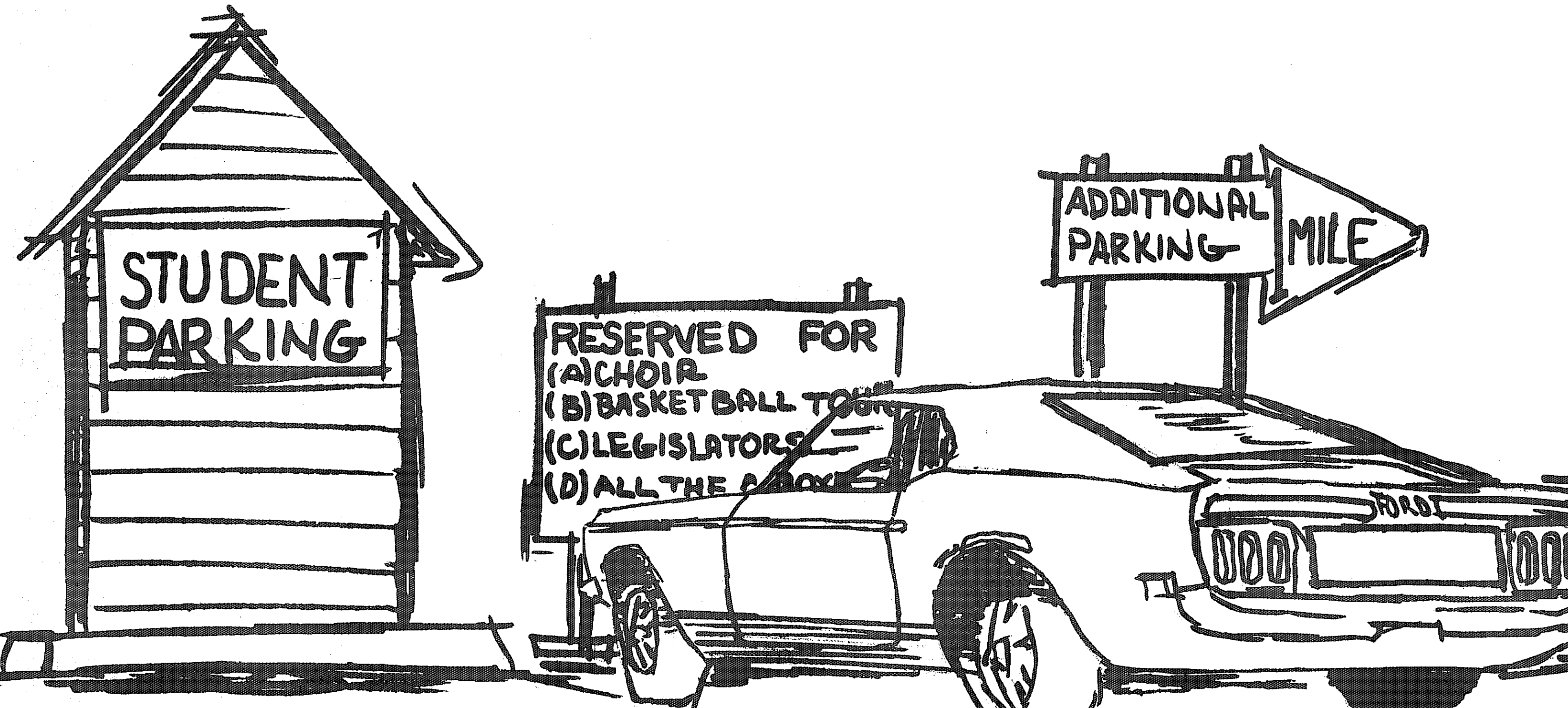


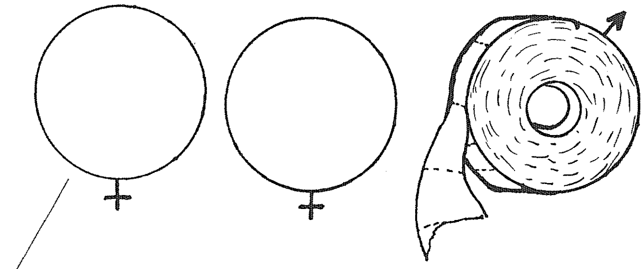
Your lungs are shot but you've got a layer of tar and nicotine that's holding up beautifully.



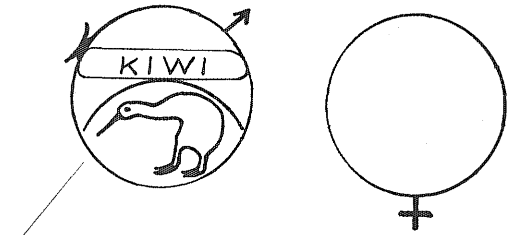
CARTOONS

by STEVE ANDERSON *and* STEVE NELSON





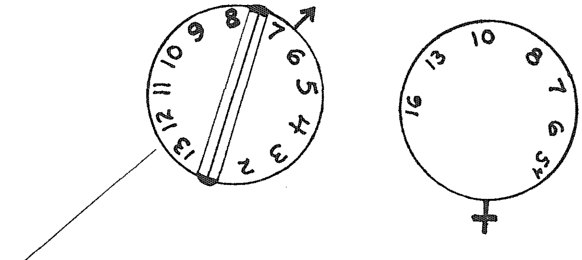
SOMETHING MAKES YOU WANT TO JUST HUG AND SQUEEZE HIM!



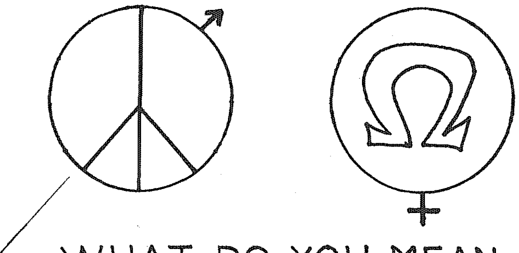
GOSH, MA'AM I'VE SORTA TAKEN A SHINE TO YOU

THE SYMBOL THINGS IN LIFE

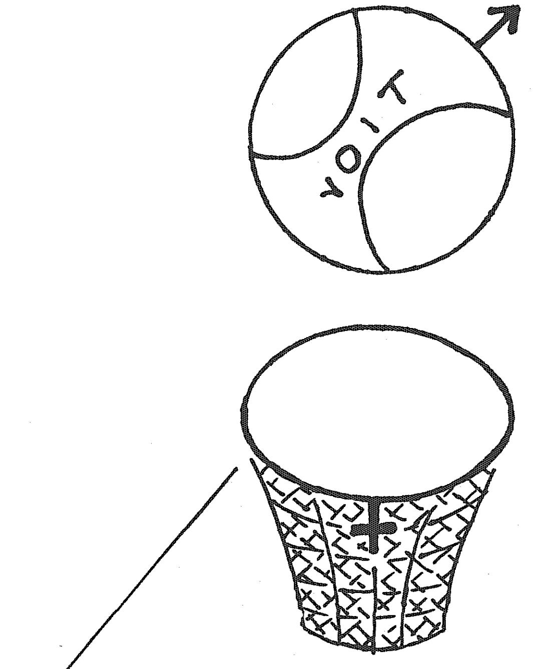
by CLIF OLLILA



I DON'T THINK WE'RE ON THE SAME WAVELENGTH



WHAT DO YOU MEAN, "NO"?



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SPLINTERS From the Log

by CLIF OLLILA

—vilitas et crudus semper eternam

A soldier called at the chaplain's office. "I just came to ask you," he said, "whether you think it's right for any person to profit by the mistakes of others?"

"Most certainly not."

The soldier brightened and held out his hand. "Then maybe you'll return the ten dollars I gave you last June for marrying me."

• • •

"You should have been here at nine, Miss Jones!" snarled the angry boss.

"Why? What happened?"

• • •

"Daughter," said the mother, "didn't I tell you not to let strange men come to your apartment? You know things like that worry me!"

"Don't be ridiculous, Mother!" laughed the girl. "I went to his apartment. Now let *his* mother worry!"

• • •

One stenographer to another: "You'll like it there—lots of opportunity for advances."

• • •

"The blonde took my pulse, the brunette accelerated my pulse, and the redhead repulsed my impulse."

• • •

The new minister of a small-town church was calling at several homes in an effort to secure more members for his congregation. In one home where the husband was absent, the preacher asked, "What makes you think your husband is religious?"

"Well," replied his wife, "I know he loves his enemies."

"That's fine. What enemies does he have?"

The wife said, "Whiskey and wild women."

• • •

Recent statistics show that only 50% of all secretaries can type, the rest are hunt'n'peckers.

• • •

A lawyer got a frantic call from one of his clients. The man said: "I'm in prison. They've shaved my head, cut a slit in my trouser, and rolled up my sleeve. What do you advise?"

"Don't sit down," the lawyer said.

• • •

During his campaign for governor of New Jersey in 1940, Charles Edison, son of the inventor, introduced himself by explaining: "People will inevitably associate me with my father, but I would not have anyone believe that I am trading on the name Edison. I would rather have you know me merely as the result of one of my father's earlier experiments."

• • •

A father put off telling his motherless daughter the facts of life as long as possible. But when she fell in love for the first time at 16, he realized that he had to talk to her.

"Jean," he concluded, "the best advice I can give you is written on the top of a mayonnaise jar—'KEEP COOL BUT DO NOT FREEZE.'"

• • •

Small boy to father: "Here's my report card and one of yours I found in the attic."

• • •

Item in the Grand Rapids *Herald:* "Miss C—— H—— reported to police the loss of $20 today. She said the money was concealed in her stocking, and the loss was discovered soon after the departure of a vacuum-cleaner salesman who had been demonstrating his line.

• • •

The bidding at the auction was furious when the auctioneer suddenly slammed down his hammer and announced: "A gentlemen in this room has lost a wallet containing $1,000. If it's returned, he will pay a reward of $200." There was a moment's silence and then from the back of the room came the cry, "Two hundred and ten!"

• • •

A fellow in New York, a couple of weeks before the holidays, went to where he keeps his automobile and found a card on the steering wheel. "Merry Christmas from the Boys in the Garage," it said. He liked the gesture but in the bustle of the season he thought no more of it.

Three days before Christmas he found another card in his car: "Merry Christmas from the Boys in the Garage—Second Notice."

• • •

It was almost midnight and the attractive, well-stacked gal had been standing at the bus stop for over half an hour, obviously several martinis past her limit, when up drove a personable chap with an offer of transportation home. Sliding into the seat beside him the inebriated miss managed to mumble her address, then slumped drowsily against the fellow's shoulder. Responding to the opportunity, the driver wrapped his free arm around his pretty passenger and pressed her closer to him, proceeding with as personal an appraisal of the terrain as was possible without taking his eyes off the road or his other hand off the wheel.

Quite flattered when he heard her mutter that he was passionate, he attempted to take further liberties but was promptly greeted with a stinging slap across the face. Stopping the car abruptly, he turned to her angrily and said: "Look, sister, on the one hand you tell me how passionate I am and with the other you slap me. Why don't you make up your mind?"

"What are you talkin' abou', mishter," came the slurred reply, "that was my house—I said you're pashin' it!"

• • •

EE: "Haven't I seen your face somewhere else before?"

Co-ed: "I don't think so. It's always been right here between my ears."

• • •

During the fire drill on a cruise liner, a number of passengers crowded around a lifeboat. "After women and children," an officer called out: "Will the 'Go Now-Pay Later Plan people' please go next."

• • •

"Can you help me?" asked the customer, "I want to select a gift for a wealthy old aunt who is very weak and can hardly walk."

The clerk pondered for a moment. "I have it!" he said at last. "How about some floor wax?"

• • •

A fellow was telling his friend about his car being stolen two weeks earlier.

"Haven't you reported it yet," asked the friend.

"I'll give it another week," was the answer. "My wife was in it."

Sign in a Florida cocktail lounge: "Please don't stand up while the room is in motion."

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Some years ago, a representative of Standard Oil in China returned to America for a vacation, in the course of which he met and married a lovely young girl.

"You'll just love Shanghai," he assured her again and again on the way out, "particularly my Number One Boy, Ling. You won't have to lift a finger. Ling runs the household."

They arrived in Shanghai, the bride met Ling and approved. The next morning her husband kissed her goodbye before reporting back on the job. "Sleep as long as you like, Darling," he told her. "Ling will take care of everything."

A few hours later she awoke again, to find herself being shaken ever so gently by the Number One Boy. "Time to get dressed and go home now, Missy," he said.

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Norman Ross, Chicago ex-long-distance Olympic swimmer, was swimming far out in Lake Michigan. Eventually he started back to shore and when he got fairly close noticed that a big crowd was watching him from the beach. This sort of thing had happened before; Ross knew that when he got to the beach he'd be asked a lot of silly questions. So he swam into the shallow water, stood up, shook himself and asked: "What city is this?"

Everybody hollered: "Chicago."

"Oh, hell, I wanted Milwaukee," said Ross, as he dived back into the lake and swam away.

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A customer ordered a pound of hamburger.

"One pound of enthusiasm," the clerk yelled to the butcher.

"How come 'enthusiasm'?" the customer asked.

"Because our butcher puts everything he has into it."

Even if you don't like the air you breathe, you can't stop breathing.

When was the last time you went out for a breath of fresh air and got it? How long has it been since the sky looked really blue?

Every day, our cities dump hundreds of thousands of tons of waste into the air. Carbon monoxide. Sulfur dioxide. Fluoride compounds. And plain old soot.

If something isn't done about air pollution in your lifetime, it may cut your lifetime short.

Air pollution can be controlled. The key is technology. Technology and the engineers who can make it work.

Engineers at General Electric are working on the problem from several directions.

Rapid transit is one. In many cities, the automobile causes more than half the air pollution. In some cities, as much as 90%. But engineers at GE are designing new equipment for rapid-transit systems, encouraging more people to leave their cars in the garage.

Another direction is nuclear power. General Electric's engineers designed the very first nuclear power plant ever licensed. A nuclear plant produces electricity without producing smoke. And as the need for new power plants continues to grow, that will make a big difference.

There are other ways General Electric is fighting air pollution. Maybe you'd like to help. We could use your help. But don't expect to come up with an overnight solution to the problem.

The solution will take a lot of people, a lot of talent and a lot of time. You'll breathe easier—once you get started.

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