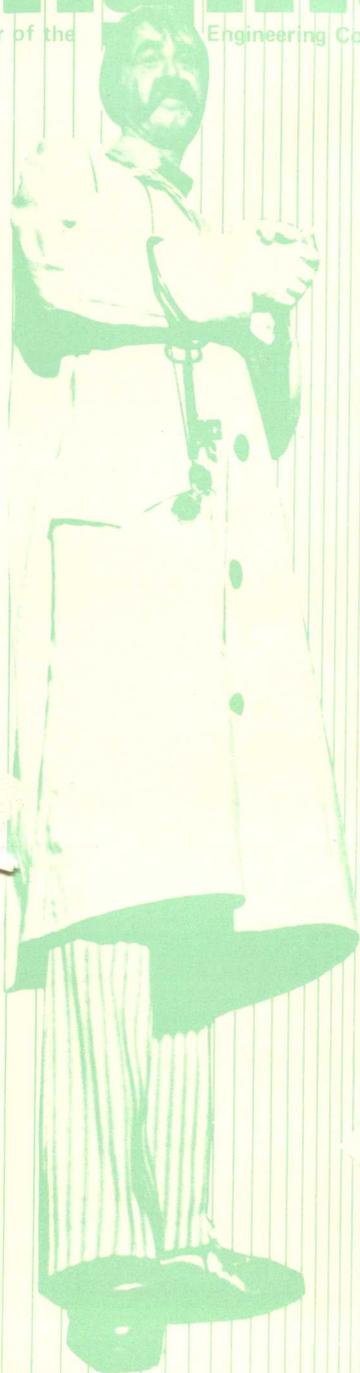


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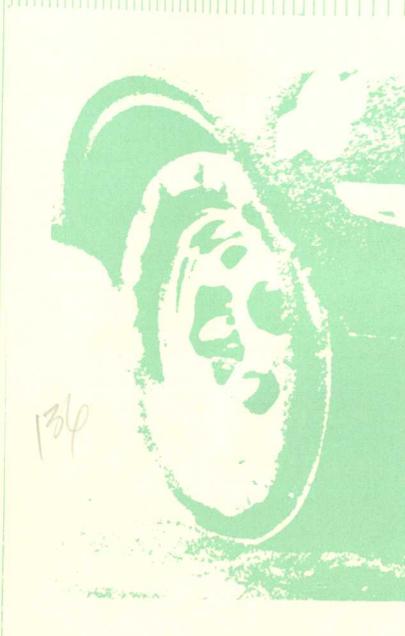
The Scientific, Ecologically Open Minded Magazine

engineer

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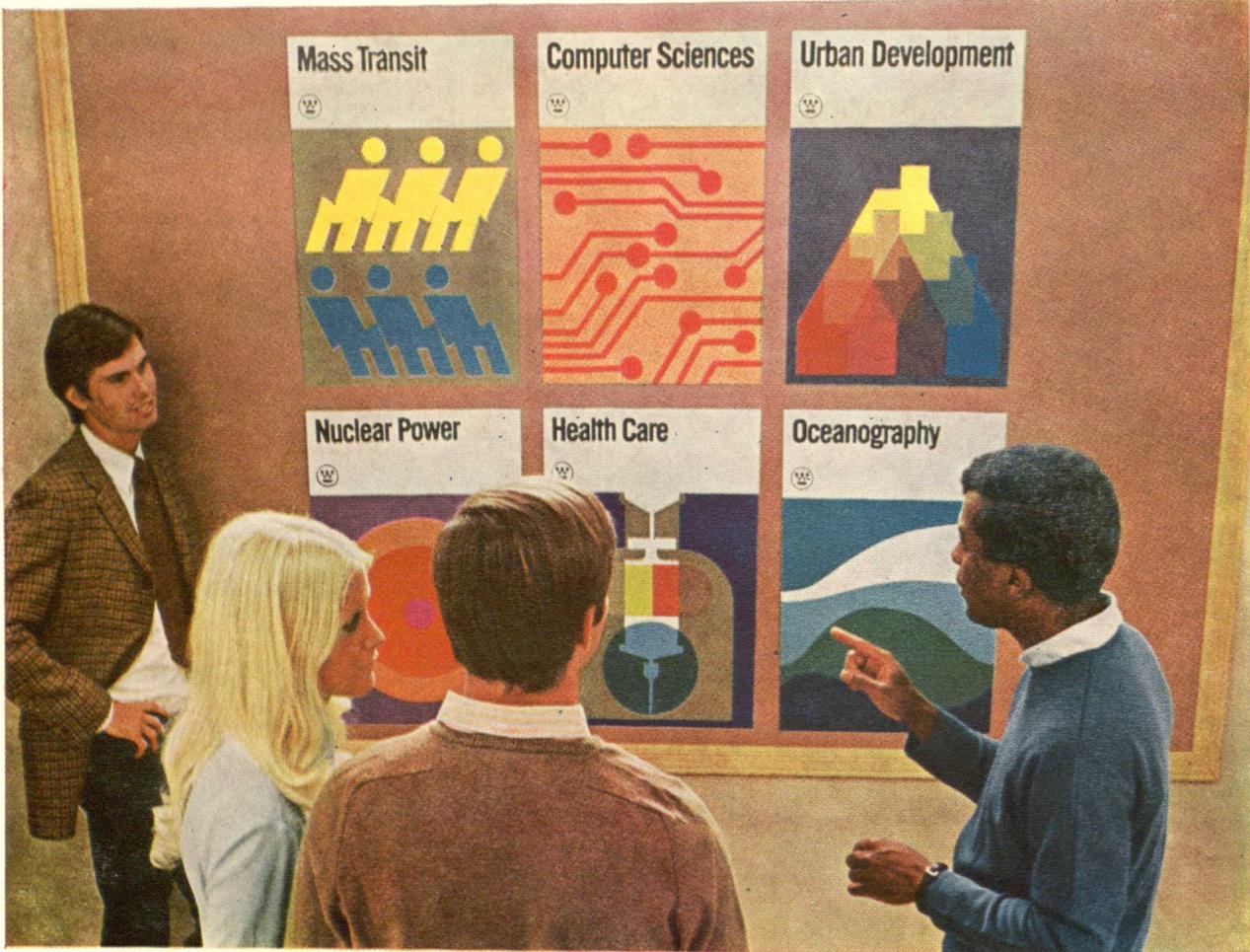
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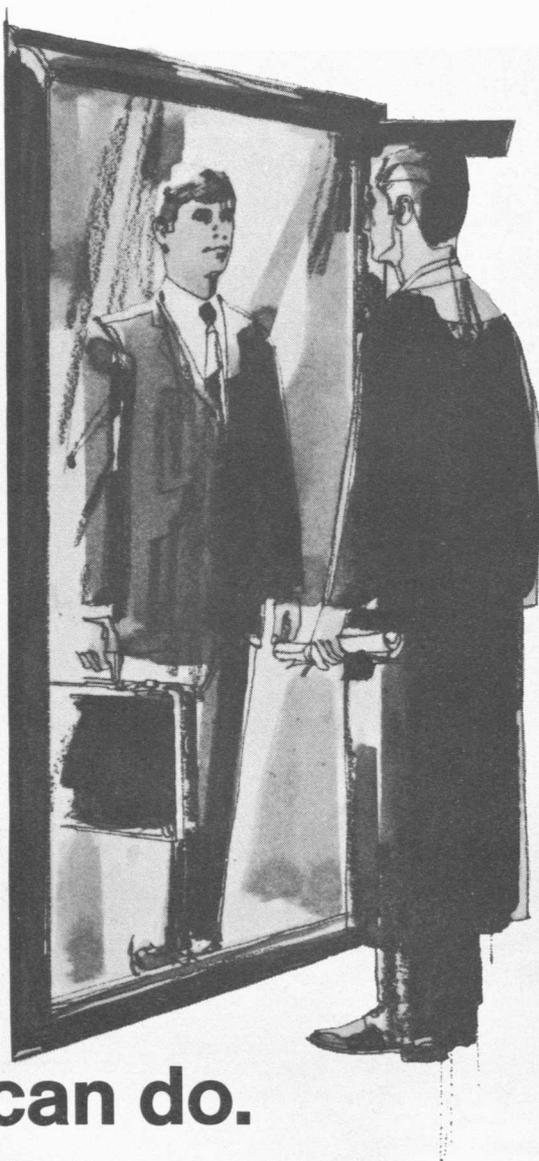
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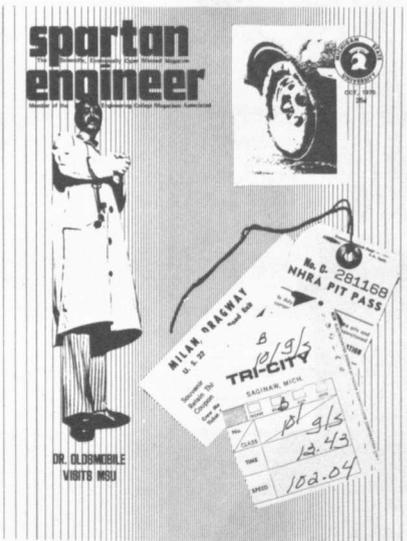


MICHIGAN
STATE
UNIVERSITY
VOLUME 24
NUMBER 1
OCTOBER, 1970

spartan engineer

The Scientific Ecologically Open Minded Magazine

Member of the Engineering College Magazines Associated



This month's cover, designed and photographed by Dave Karrer, features the MSU Chapter of the Society of Automotive Engineers' Dr. Oldsmobile W-31 Machine.

Member, Engineering College Magazine Associated / Chairman: Professor Gordon Smith Oklahoma State University, Stillwater, Oklahoma / Publisher's Rep: Littell-Murray-Barhnill, Inc. 369 Lexington Ave., New York, 17, N.Y. / 737 N. Michigan Ave., Chicago, Ill. / Published four times yearly by the students of the COLLEGE OF ENGINEERING, MICHIGAN STATE UNIVERSITY / East Lansing, Michigan 48823. / The office is on the first floor of the Engineering Building / Room 144, Phone 517 355-3520. / Subscription rate by mail \$1.00 per year. / Single copies 25 cents / Printed by Greenville Printing Company.

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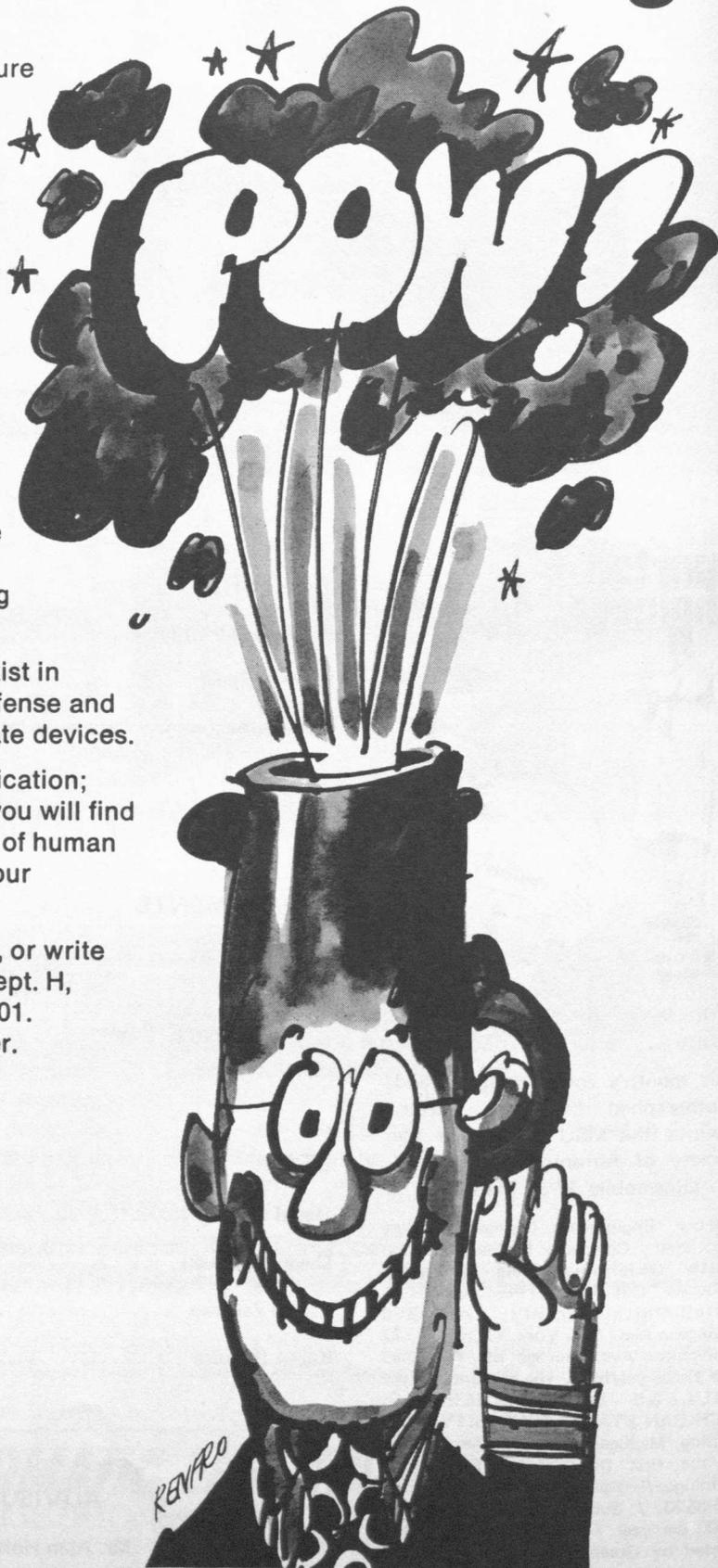
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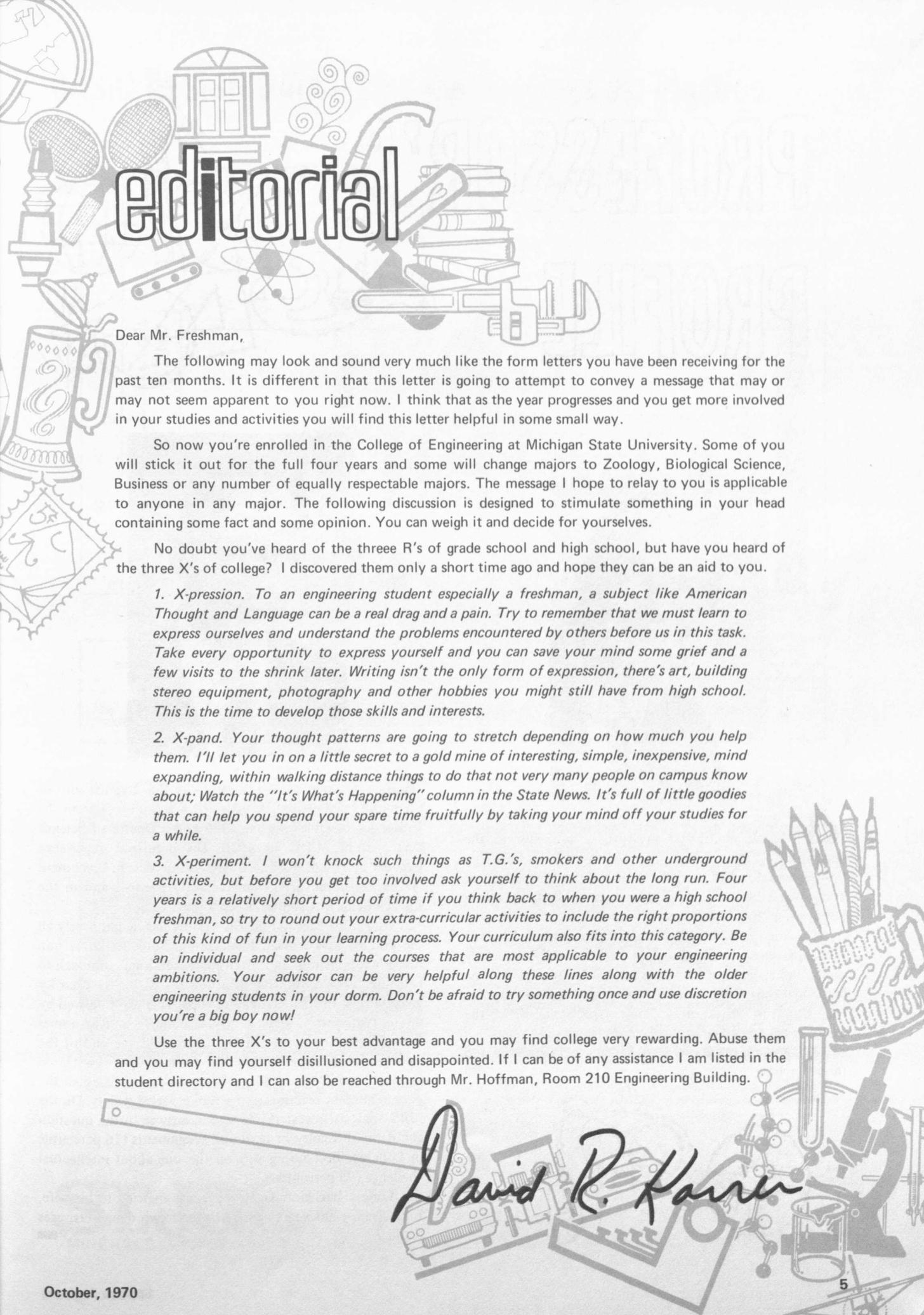
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editorial

Dear Mr. Freshman,

The following may look and sound very much like the form letters you have been receiving for the past ten months. It is different in that this letter is going to attempt to convey a message that may or may not seem apparent to you right now. I think that as the year progresses and you get more involved in your studies and activities you will find this letter helpful in some small way.

So now you're enrolled in the College of Engineering at Michigan State University. Some of you will stick it out for the full four years and some will change majors to Zoology, Biological Science, Business or any number of equally respectable majors. The message I hope to relay to you is applicable to anyone in any major. The following discussion is designed to stimulate something in your head containing some fact and some opinion. You can weigh it and decide for yourselves.

No doubt you've heard of the three R's of grade school and high school, but have you heard of the three X's of college? I discovered them only a short time ago and hope they can be an aid to you.

1. *X-expression.* To an engineering student especially a freshman, a subject like American Thought and Language can be a real drag and a pain. Try to remember that we must learn to express ourselves and understand the problems encountered by others before us in this task. Take every opportunity to express yourself and you can save your mind some grief and a few visits to the shrink later. Writing isn't the only form of expression, there's art, building stereo equipment, photography and other hobbies you might still have from high school. This is the time to develop those skills and interests.

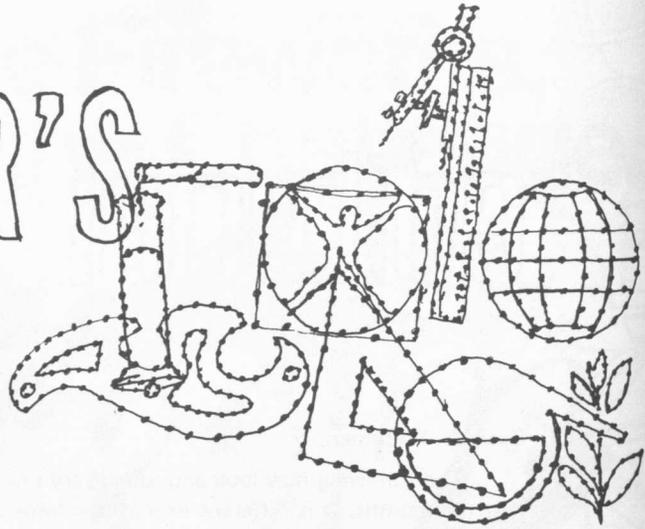
2. *X-pand.* Your thought patterns are going to stretch depending on how much you help them. I'll let you in on a little secret to a gold mine of interesting, simple, inexpensive, mind expanding, within walking distance things to do that not very many people on campus know about; Watch the "It's What's Happening" column in the State News. It's full of little goodies that can help you spend your spare time fruitfully by taking your mind off your studies for a while.

3. *X-periment.* I won't knock such things as T.G.'s, smokers and other underground activities, but before you get too involved ask yourself to think about the long run. Four years is a relatively short period of time if you think back to when you were a high school freshman, so try to round out your extra-curricular activities to include the right proportions of this kind of fun in your learning process. Your curriculum also fits into this category. Be an individual and seek out the courses that are most applicable to your engineering ambitions. Your advisor can be very helpful along these lines along with the older engineering students in your dorm. Don't be afraid to try something once and use discretion you're a big boy now!

Use the three X's to your best advantage and you may find college very rewarding. Abuse them and you may find yourself disillusioned and disappointed. If I can be of any assistance I am listed in the student directory and I can also be reached through Mr. Hoffman, Room 210 Engineering Building.

David R. Kauer

PROFESSOR'S PROFILE



dr. Gerald Pollack is presently a professor in the department of Physics. He received his B.S. at Brooklyn College and his M.S. and Ph.D. at California Institute of Technology. His area of specialization is low temperature Physics and Hydrodynamics.

Dr. Pollack is one of the more interesting teachers in the department of Physics. This year he will be teaching junior and senior level quantum mechanics. In past years he has taught the course concerning waves in the Berkely series on Physics and may be associated with the electromagnetism course of this series in the fall.

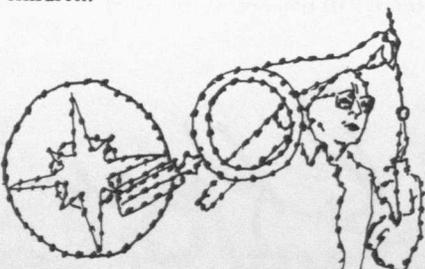
Dr. Pollack resides in East Lansing with his wife and three children. ■



Carl Cooper is a Professor in the Department of Chemical Engineering. He received a B.S. degree from the University of Oklahoma in 1936 and a Doctor of Science degree from M.I.T. in 1950. His industrial experience includes service as Technical Director of Vulcan-Cincinnati. He has authored articles in technical journals and in the Encyclopedia of Chemical Technology.

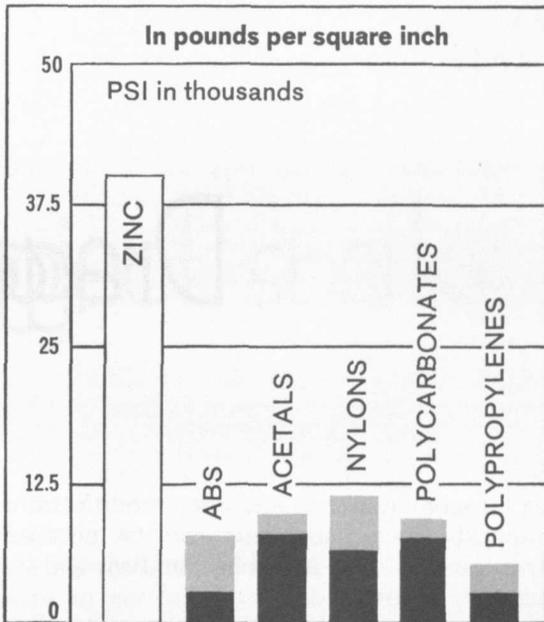
Over a 20 year period Dr. Cooper has taught nearly all the courses in Chemical Engineering. Students know him for an experimental and often unconventional approach to teaching. Last Spring he surprised his CHE 303 class by giving a quiz on the first day of class. This was followed by up to two quizzes plus an equal number of take-homes every week for the rest of the course. At the end of the term, the students presented him with a Detroit-Phone-Book sized grade book for recording all the grades. Student reaction to the course varied widely. On the SIRS analysis lowest rating was in answer to the question about the difficulty of textbook assignments (16 percentile in College). Best rating was on the one about intellectual challenge (95 percentile).

Long a bachelor, Dr. Cooper was married to his wife, Emmajean, eight years ago. They have two daughters, ages 6 and 7. ■

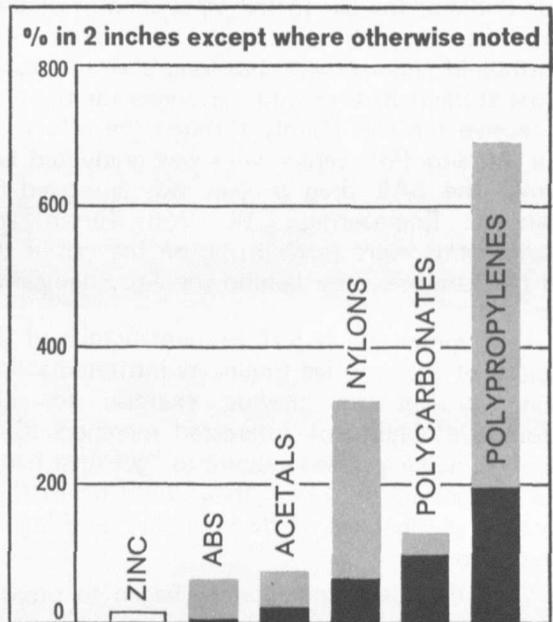


BASIC DESIGN DATA—Zinc Die Castings vs. Plastics

Tensile Strength



Elongation



ZINC DIE CASTINGS	TENSILE STRENGTH—psi	
	As Cast	After 20 yrs.
Alloy SAE903, ASTM AG40A, No. 3	41,000 ⁽¹⁾	32,000 ⁽²⁾

Source (1) ASTM B86 (2) Reports of ASTM Comm.

ZINC DIE CASTINGS	% ELONGATION 2 in.	
	As Cast ⁽¹⁾	After 20 yrs. ⁽²⁾
Alloy SAE903, ASTM AG40A, No. 3	10	14

Source (1) ASTM B86 (2) Reports of ASTM Comm.

SOME PLASTICS USED FOR INJECTION MOLDING	TENSILE STRENGTH ⁽²⁾ —psi	
	As Molded	After 20 yrs.
ABS { High Impact High Heat Resistant Medium Impact	3,500- 8,800	Not Available
ACETALS { Homopolymer Copolymer	8,800-10,000	Not Available
NYLON (Type 6, 6/6, 6/10)	7,000-12,400	Not Available
POLYCARBONATE (Unfilled)	8,000- 9,500	Not Available
POLYPROPYLENES (Unmodified Copolymer)	2,900- 5,500	Not Available

Source (3) Modern Plastics Encyclopedia- 1969-70

SOME PLASTICS USED FOR INJECTION MOLDING	% ELONGATION 2 in.	
	As Molded ⁽²⁾	After 20 yrs.
ABS { High Impact High Heat Resistant Medium Impact	3-60	Not Available
ACETALS { Homopolymer Copolymer	25-75	Not Available
NYLON (Type 6, 6/6, 6/10)	60-330	Not Available
POLYCARBONATE (Unfilled)	100-130	Not Available
POLYPROPYLENES (Unmodified Copolymer)	200-700	Not Available

Source (3) Modern Plastics Encyclopedia- 1969-70

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Project W-31 began during winter term 1970 when the local SAE student branch acquired a 1969 Oldsmobile Cutlass W-31. The car was a former engineering test vehicle at Oldsmobile Motor Division of General Motors Corporation and Olds donated the car to the MSU chapter of SAE for educational purposes. Jim Miller, an Oldsmobile engineer who has long been interested in the student SAE chapter, arranged for the club to receive the car. Mainly through the efforts of Paul Aurand (ME senior who was graduated last spring) the SAE drag project was approved by Dean of Engineering L.W. Von Tersch and arrangements were made to house the car in the old blacksmith's shop behind the Ag. Engineering labs.

Last winter the M.S.U. Student branch of the Society of Automotive Engineers initiated a drag racing project to provide exercise for the automotive talents of interested members. Club members had expressed a desire to "get their hands into" something in which they could invest their practical mechanical know-how and engineering imagination.

Club members immediately began to prepare the car for the spring drag wars. The car fits into the National Hot Rod Association's G/Stock class and much work was necessary before the car could be expected to run competitively in N.H.R.A. meets; the Olds W-31 350 cubic inch engine is rated at 325 horsepower. The car is equipped with close ratio "Saginaw" 4-speed and a 5.0-1.0 axle ratio. It weighs 3450 pounds ready to race. Contrary to common belief, *stockers* are actually quite far removed from showroom condition. True, the engine and driveline must be standard items offered for the cars in which they are run and no

Dragg

carburetor replacements or modifications are allowed. Shock absorbers can be changed and traction aids such as rubber air bags and traction bar may be installed.

The club lacked the money to buy the equipment necessary to prepare the racer so we members have appealed to manufacturers of racing accessories and speed equipment for components to build the machine. Although we have expected and received a few turn-downs, the results of this endeavor have been gratifying.

SAE members Rick Dolan, Paul Aurand, Jim Minneker, Bob Dennis and I worked steadily on the car throughout winter term with assistance from Dick Parnell, Bob Sedlak, Rick Sunamoto, Mike Miller, and Al Wilson. The engine and



project sparks SAE enthusiasm

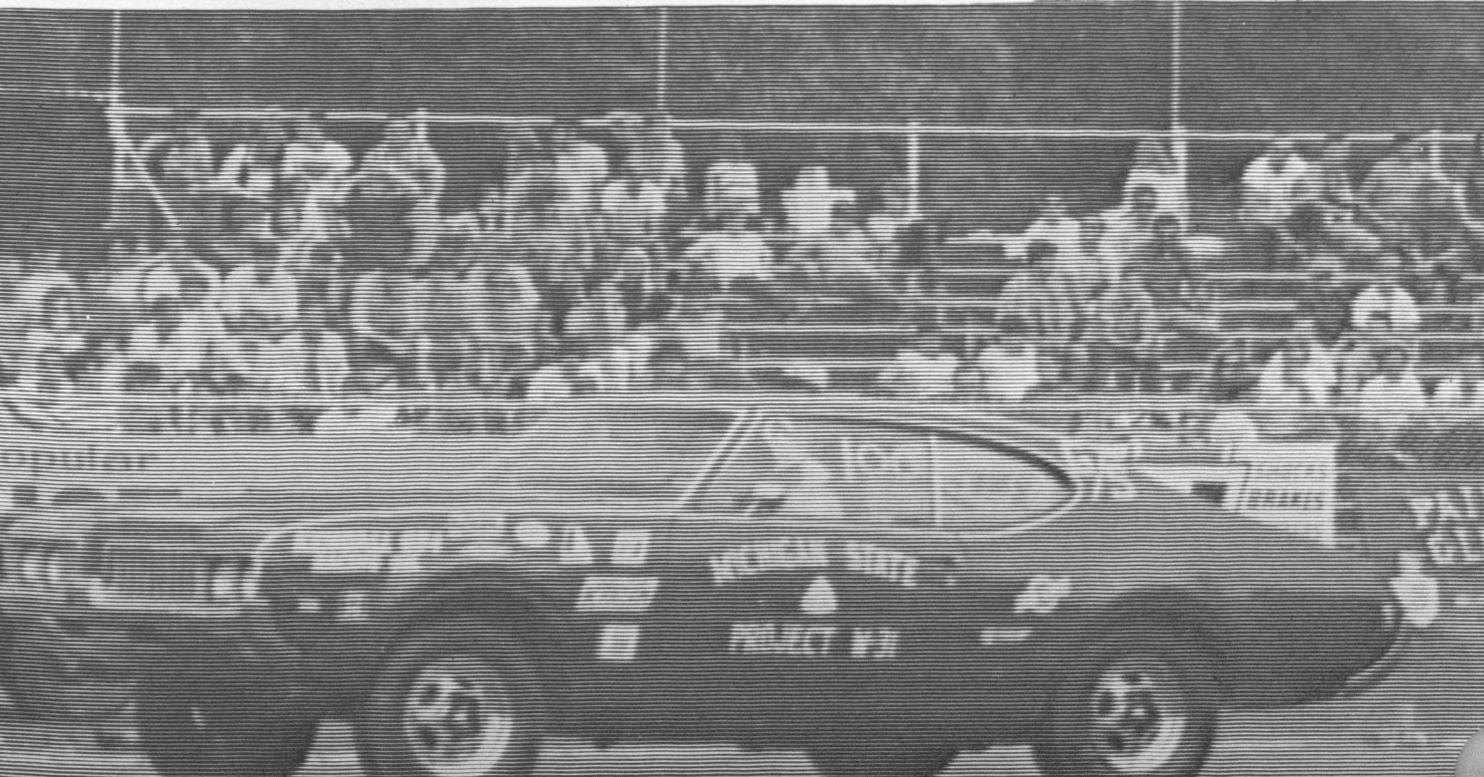
by Fred C. Bowen

transmission were removed from the car and disassembled. It was decided early that, wherever possible, SAE members would undertake all jobs necessary in car preparation in order to enhance the educational value of the drag project. Thus the only job that was *farmed out* was the blueprinting of the engine cylinder heads. Any transmission modifications are allowed as long as the gears run in the original equipment case so Paul Aurand built a *crash box* 4-speed transmission by removing all synchronizer clutches and springs and grinding every other internal tooth from all forward gears and every other internal spline from the two shift sliders. The result of his many hours of difficult labor was a transmission that can be shifted very quickly with ease at all engine speeds even without

use of the clutch! However, this modification renders the car totally unfit for street use.

The front springs were replaced with units from a six cylinder model Pontiac Tempest. The Tempest springs are longer and softer than the standard Olds springs and allow the front end of the car to rise more easily under acceleration—providing needed weight transfer. All power accessories were removed from the car and the interior was removed so that all body sealer, sound deadener, and undercoating could be scraped out to reduce weight. The heavy jute carpet backing was removed and the interior reinstalled—full interior trim must be retained in stock classes. The AirLift air cylinders were installed in the rear springs and a pinion snubber

Continued on page 12



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Continued from page 9

was added to control rear wheel hop under hard acceleration.

Gradually the racer took shape. The engine and drive train were reassembled by the middle of spring term and the car was ready for its assault against the time clocks. Some minor clutch problems were corrected and the car was taken to Onondaga Dragway on a borrowed trailer. The best time on the first outing was 13.70 seconds for the quarter mile at a top speed of 107 miles per hour with Paul Aurand driving. The car took its class trophy—running in G/SS because of the 8½ inch tread width of the borrowed slicks (stocker tires may only be 7 inches wide and our pair had not yet arrived). The trailer towed very badly so tow brackets were welded to the car's frame and a hitch was borrowed so that the car could be flat towed. The group enlisted the help of SAE member Al Wilson who towed the car to Freeland (near Saginaw) for its second outing—a two day bash at Tri-City Dragway. With Paul Aurand at the controls the car ran 13.40's at 102-103 miles per hour (the new stocker slicks needed breaking in for top traction and their larger diameter caused the drop in top speed) during time trials and unfortunately the car was eliminated during the first round of competition due to a cold engine. Several members camped overnight at the drag strip and lined up early to get many time trial runs for Sunday's races. Misfortune struck the group as the painstakingly modified transmission failed on the second run of the day. We towed the disabled car back to East Lansing for repairs.

OLDS TAKES FIRST TROPHY

A new transmission was located and was installed the following Friday night. The group took the car to Onondaga Dragway on Saturday night and made four runs during time trials—in the process ascertaining that the stock trans shifted too slowly to be competitive. We returned to East Lansing to make alterations. It took three hours to tear down the transmission and replace the stock synchronizer rings with the modified units from the broken transmission. By 11:00 p.m. the car was again in running condition and we rolled it out for a trail run; the trans shifted beautifully so we started for Tri-City Dragway. We arrived at 2:00 a.m., cooked some hamburgers and bunked at the pit entrance by 4:00 a.m. It was getting light.

At 8:00 a.m. we awoke and prepared to haul the car into the pits. Tri-City opened at 9:00 a.m.; we entered the grounds, installed the driveshaft, bolted on the slicks and rolled the car into the staging lanes. Problems cropped up. The battery, worn down from a nights towing with the lights on became increasingly enfeebled as the day wore on due to excessive accessory drive belt slip which couldn't be corrected. The air temperature increased into the mid-nineties and the car began stalling on top end because the stock fuel pump couldn't supply the necessary pressure (this was before the auxiliary electric fuel was installed.).

There were six G/Stockers at Tri-City that Sunday. With Jim Menneker at the wheel the car turned consistent 13.40's with speeds in the 90's due to the stalling problem. On the first competition run the Michigan State Olds faced a quicker and faster Camaro but Minneker caught its driver napping and *put a fender on him*—actually about two car lengths— and stayed ahead for the win. In drag racing whoever gets to the finish line first wins and thus a slower competitor can eliminate a faster and quicker opponent through skillful driving. It is most important to leave the starting line first. The W-31 drew a bye run for the second round and squared off against a 390 cubic inch Hurst S/C Rambler for the trophy run—the very same car which eliminated the stricken Olds the previous Saturday. Menneker charged through for the win as the Rambler shut off early due to handling problems. The G/Stock trophy was ours.

Since then the car has run at Onondaga Dragway, Tri-City Dragway, Brohman M-37 Dragway, and Martin US 131 Dragway. It has won three class trophies so far. Its best run to date has netted a 13.15 second elapsed time and a speed of 105.38 miles per hour at US 131 Dragway. We now believe that with some careful suspension and engine tuning the car should be capable of sub-thirteen second blasts down the 1320. Weaknesses are spotted in the car nearly every weekend and corrections are constantly being made.

Hopefully, if parts can be located, the club would like to build a new stocker engine this fall with *trick*, yet N.H.R.A. legal, parts for the 1971 drag season. The project, which is the first of its kind at Michigan State, is now off the ground. The group believes that, with enough outside support it is capable of building a car that could run near the national record and be competitive at N.H.R.A. World Championship Series points meets and could possibly qualify to compete at the N.H.R.A. World Finals. A car must accumulate 500 points at local division points meets by setting a record or winning eliminator rounds to qualify for the World Finals. Michigan is located in N.H.R.A. Division III which includes Missouri, Ohio, Indiana, Kentucky, Illinois, Wisconsin, and Ontario.

Knowledge today is increasing at a rate that can best be described as following a curve defined by the equation $Y = a^x$. And we're just about reaching the steep slope of that curve.

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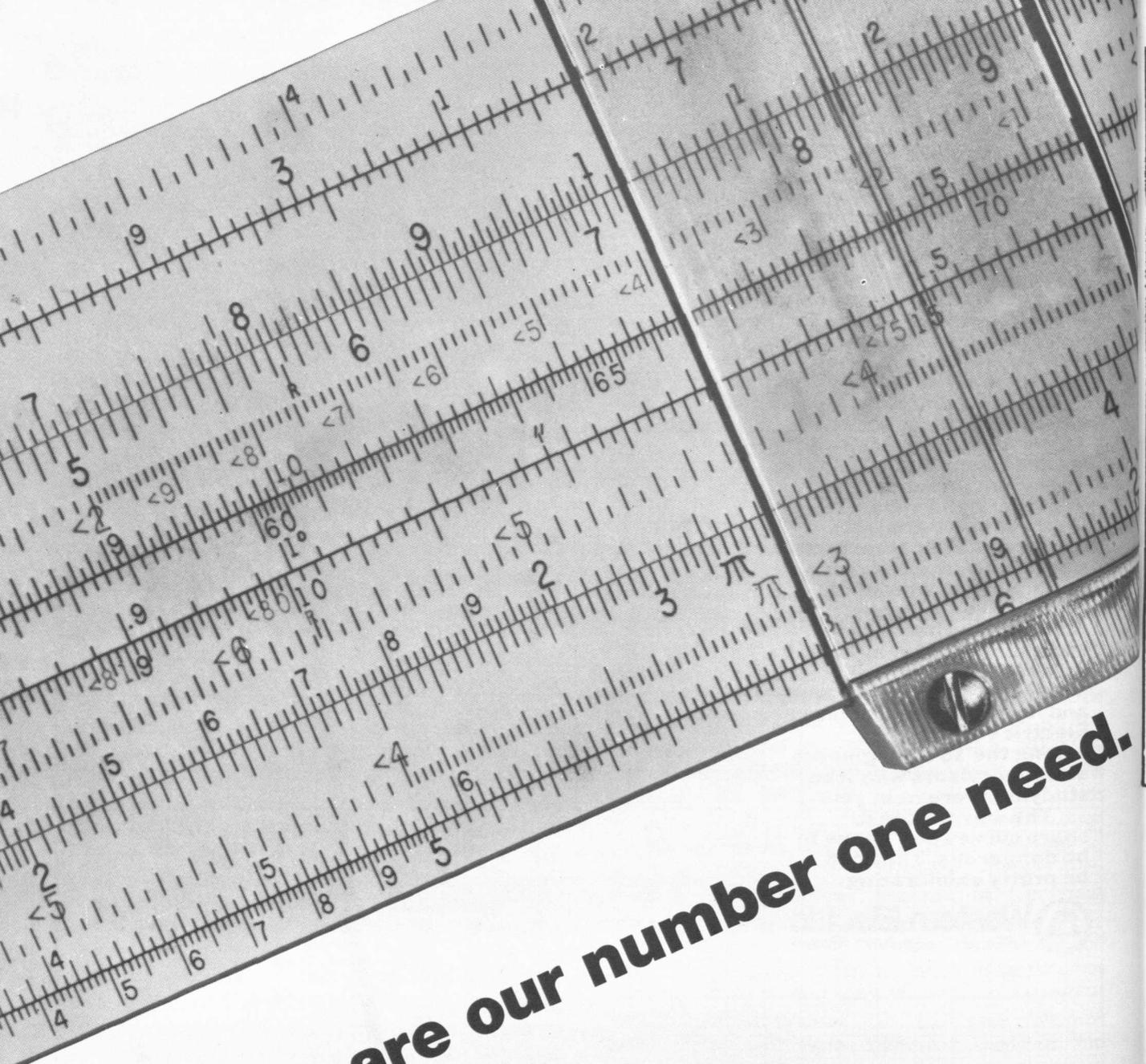
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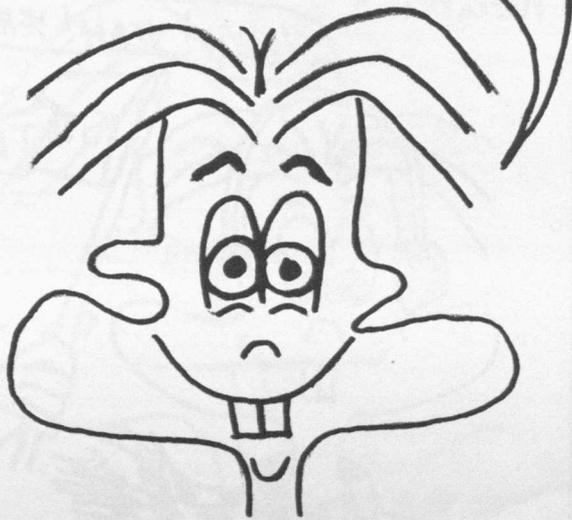
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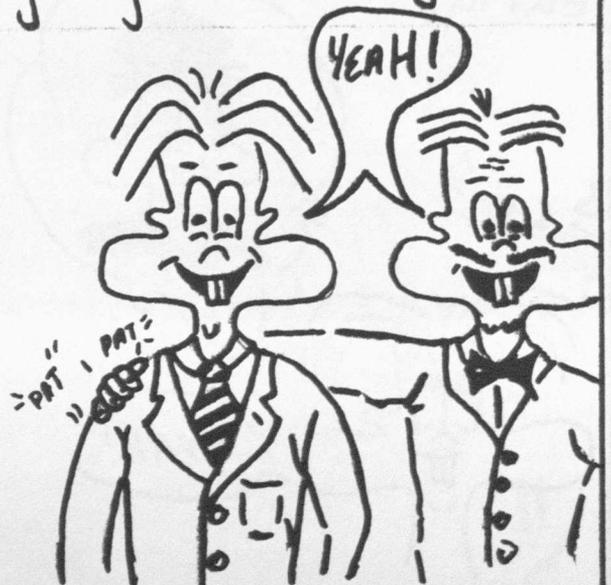
So, you're a first
term freshman?

YEAH!



You've just graduated
and now your parents
are real proud of your
going on to college?

YEAH!



You're really turned on about college and you probably won't cut a class all term?



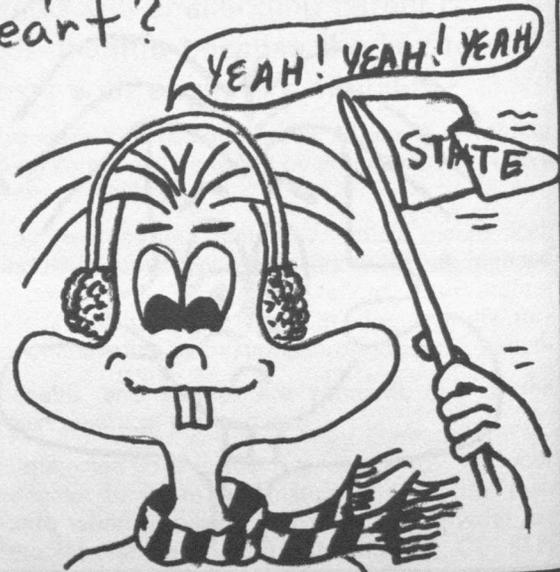
You've taken college prep courses in high school and you really know which end is up?



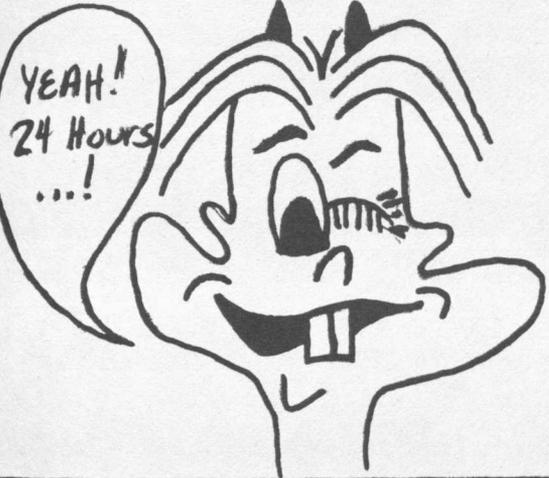
You've already got a schedule picked out and you plan to graduate early?



You're going to all the football games and you already know the players numbers by heart?



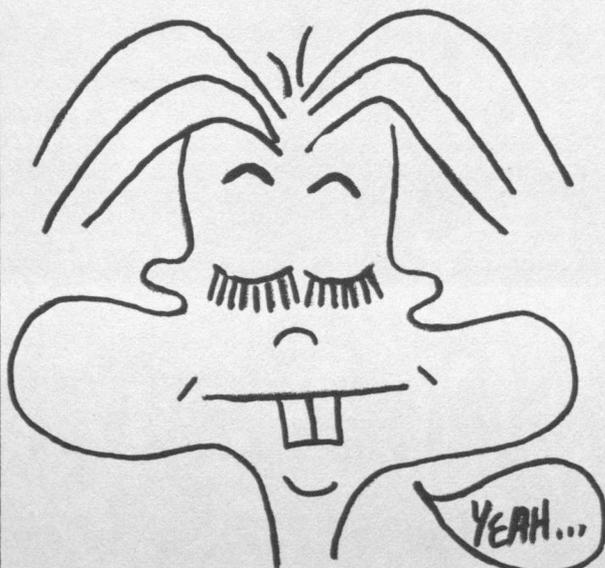
It's your first time away from home and you've already checked open house policy?



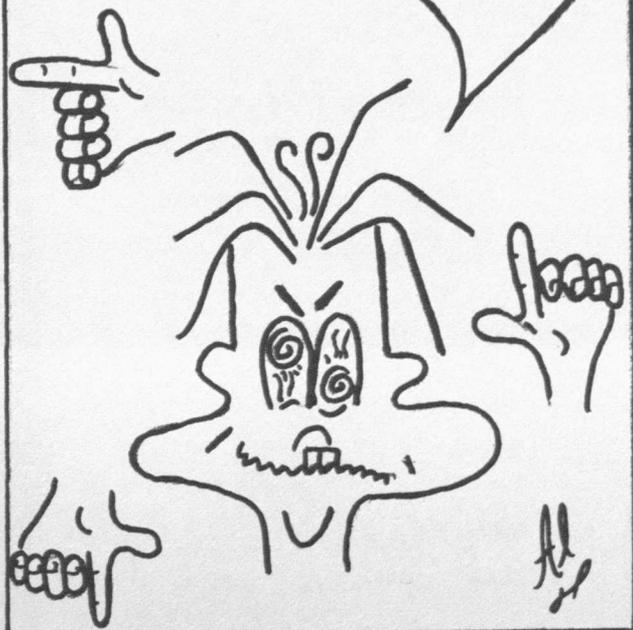
You've already cracked the system for getting co-ed phone numbers in the dorm?



I guess you are pretty well ready for the old college try?



...but tell me, which way is north?



Goodbye, lake.

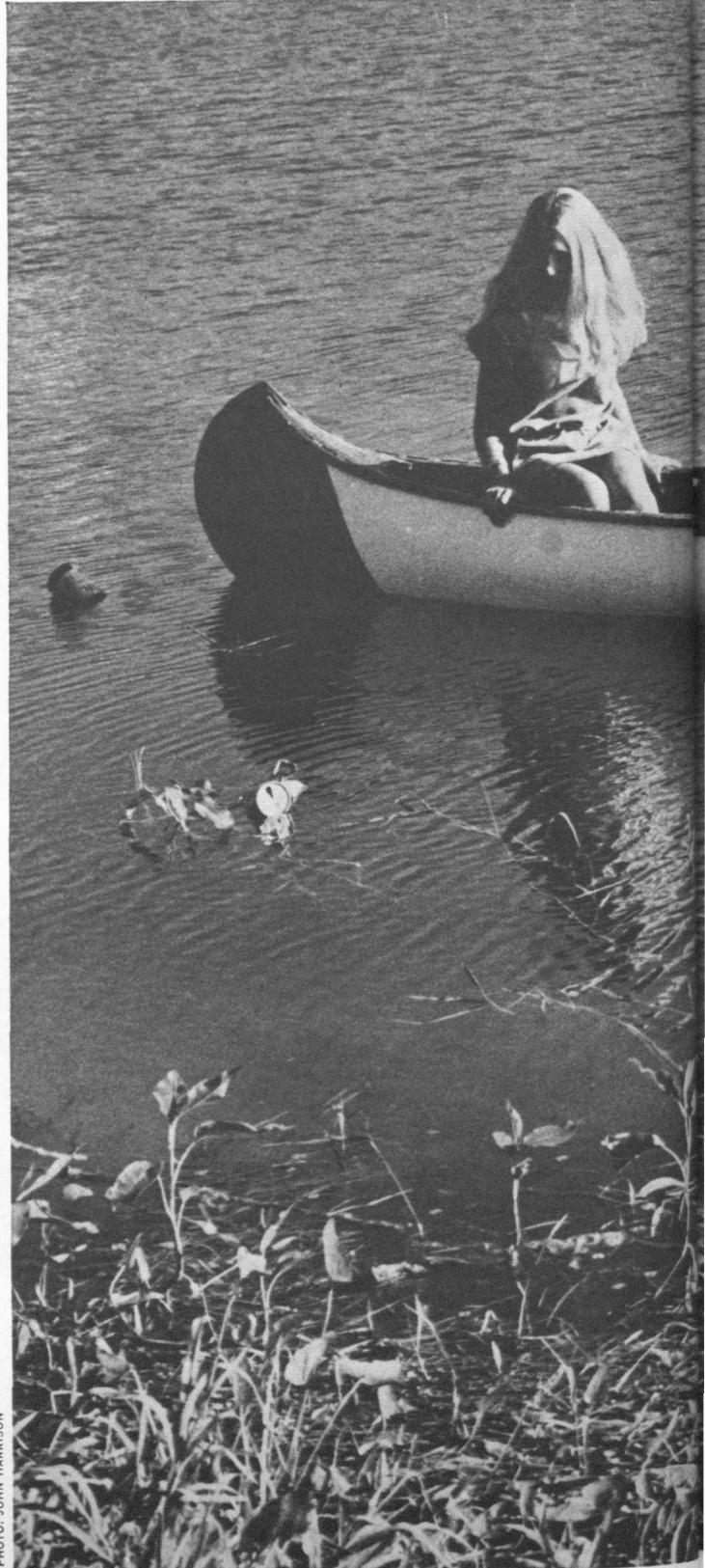


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FMC engineers also solve waste treatment problems for industrial plants. Some industries are doing a good job. But a lot still needs to be done.

Our environmental laboratory and our chemical research center are searching for more effective materials and working on new treatment concepts. We have some of the best systems available.

By pooling talents in our diversified company, we're giving rivers and lakes a new lease on life.

If you'd like to do something about things that need doing, write for our brochure, "Careers with FMC." Or pick up a copy from your placement office. FMC Corporation, Box 760, San Jose, California 95106.

We're an equal opportunity employer.



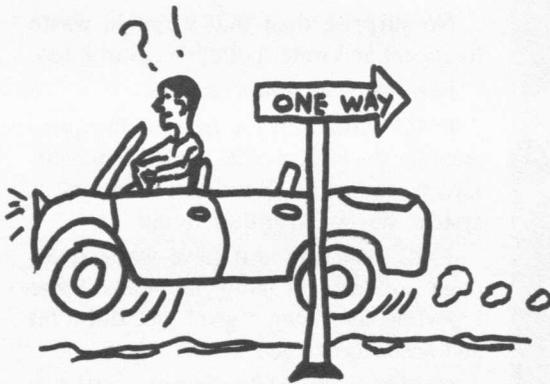
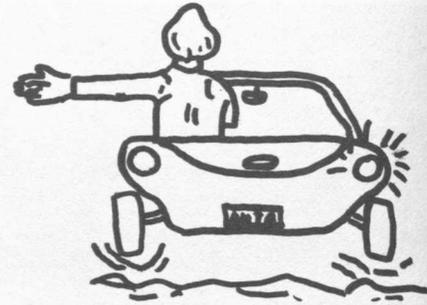
FMC CORPORATION
Putting ideas to work to make
water beautiful

STEPS

TO BECOMING a COURTEOUS DRIVER

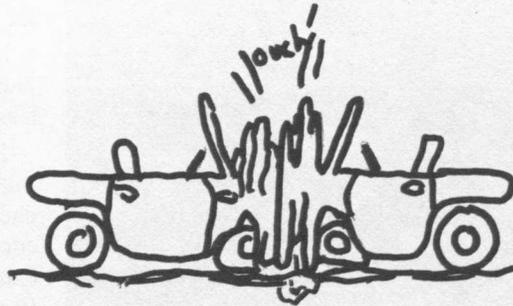
by Micheal E. Largo

1. Make all right turns from the leftmost lane.
2. When making a left from the right hand lane always drive half a block past your turn, stop, back up and wait until cars are coming, then make your turn; don't worry the other cars will stop.



3. Never use the turn signal; it diverts your attention. If it happens to be on, turn up the radio so that you won't hear it.
4. When parking, and traffic is behind you, drive very slowly. This will assure you that the people behind you won't take the last space. When you spot a place take your time about getting into it. Don't let the people behind you rush you. They have made allowances for you, and if they haven't they should learn.

5. If only two places remain in a parking lot and they happen to be adjacent places, take them both.



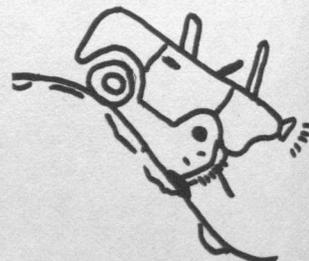
6. A *Merging Traffic* sign means three things.

- a. Stop and check for traffic
- b. Go when there are no cars within a mile radius, even parked cars.
- c. Drive with that white line directly under your car.

7. When the driver in the next lane is tailgating cut-in between him and the car in front of him. Make sure to maintain the proper distance at all times, and abide by rule number three.

8. Never pick up hitch-hikers unless:

- a. You are less than a block from your destination.
- b. You are driving in a no stopping zone.
- c. You are in heavy traffic.
- d. Your brake lights don't work.
- e. You intend to stop suddenly.
- f. The hitch-hikers have luggage that won't quite fit in your car without about five minutes of calculations.
- g. There is traffic in the next lane so that the guy behind you has to wait.





You're an engineer. You want to do things—big things. What kind of career could you choose at Bethlehem Steel?

Well, you could go into steel plant operations. Here you might supervise operations of one of our ultra-modern rolling mills, or basic oxygen furnace departments. You might design new mills, or direct their construction. You might be responsible for repair and maintenance of colossal, complex facilities.

What else? Plenty! You might

be deeply involved in metallurgy, electrical and electronic applications, power, coal chemicals, production engineering, or pollution abatement.

You could go into mining operations. Or shipbuilding and ship repair. Or ship design and engineering. Or fabricated steel construction. Or research and development. Or sales, as a technical representative or line salesman.

Diverse? You bet! We'd be hard-put to think of an industry

that can equal steel in the variety of opportunities for engineers and other technical graduates—or a steel company that can match the opportunities at Bethlehem Steel for moving up in management.

We could write a book about it. We have written a book about it. It's called, "Bethlehem Steel's Loop Course." You can pick up a copy in your placement office. Read it. If it interests you, plan on talking with our representative when he visits your campus.

BETHLEHEM STEEL

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When you can hardly hear yourself think, it's time to think about noise.

Noise won't kill you. But before it leaves you deaf, it may drive you crazy.

Noise is pollution. And noise pollution is approaching dangerous levels in our cities today.

People are tired of living in the din of car horns and jackhammers. They're starting to scream about noise.

Screaming won't help matters any. But technology will. Technology and the engineers who can make it work.

Engineers at General Electric are already working to take some of the noise out of our environment. One area where they're making real progress is jet-aircraft engines.

Until our engineers went to work on the problem, cutting down on engine noise always meant cutting down on power. But no more.

GE has built a jet engine for airliners that's quieter than any other you've ever heard. A high-bypass turbofan. It's quieter, even though it's twice as powerful as the engines on the passenger planes of the Sixties.

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.

GENERAL  ELECTRIC

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