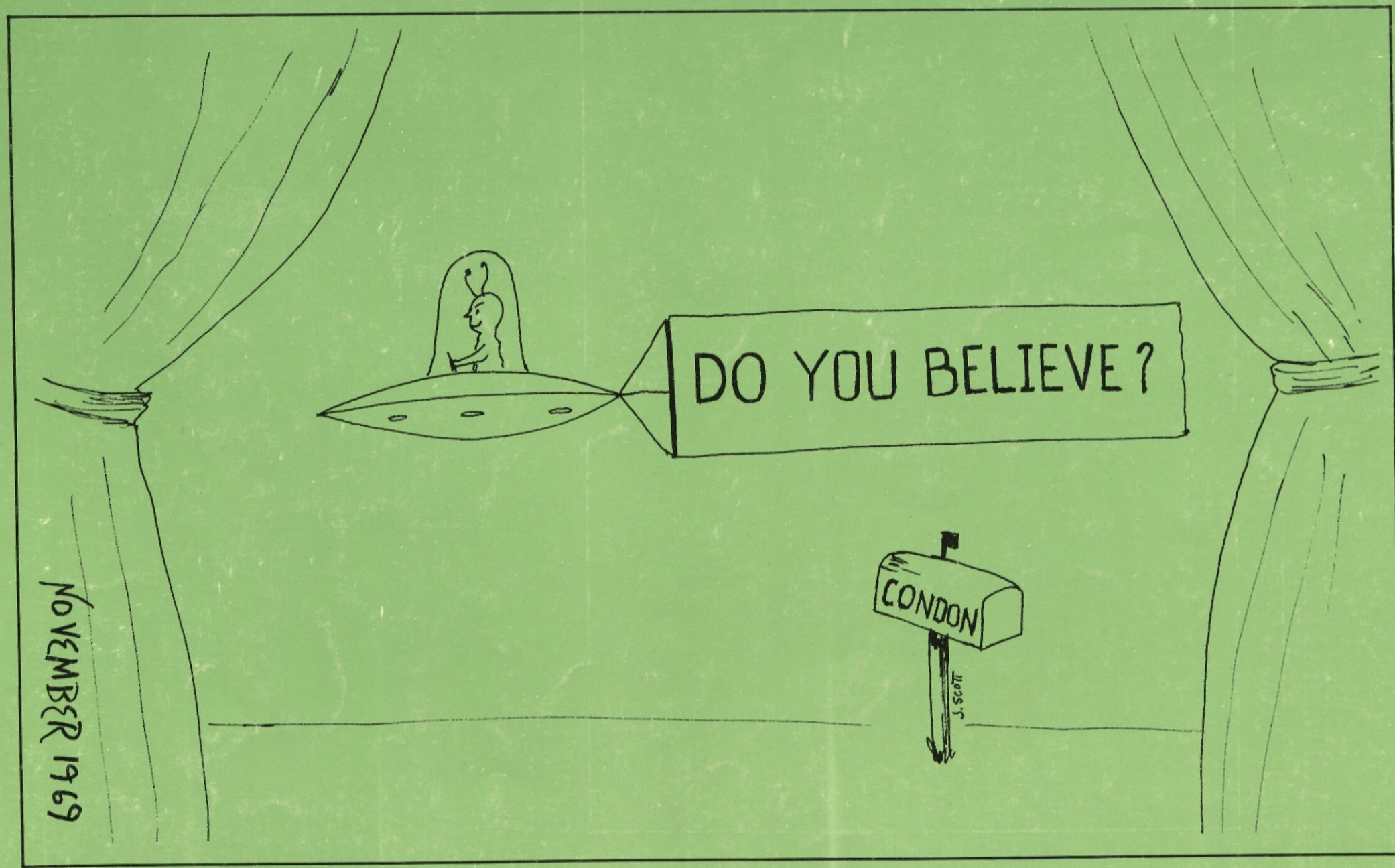
COLORADO ENGINEER



If you want to grow with a growth company...

go with Westinghouse.

In the past five years, our sales have gone up fifty percent and profits have nearly tripled. Our goal is continued growth. Much of this growth will come from our commitment to improve the world we live in.

When you're in everything from computers to urban development, to medical science, to mass transit, to oceanography—the opportunities are boundless.

We need help. We need engineers who want to grow and contribute to society at the same time. Westinghouse believes the two are not mutually exclusive.

Talk with our campus recruiter about starting a growth career with Westinghouse, or write Luke Noggle, Westinghouse Education Center, Pittsburgh, Pennsylvania 15221.

An equal opportunity employer.

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

Hit me.

Sooner or later, somewhere, sometime, some nice little old lady is going to tap bumpers with you in a parking lot.

Be prepared.

If you're buying a new car, make sure you get one with a color-coordinated rubber bumper (that's why you didn't notice it). Union Carbide research scientists sat down and puzzled out a good way to make a molded urethane rubber bumper. A bumper that won't chip, crack, rust. A bumper that's wrinkle-free. And quiet as can be.

Bumpers aren't our only automotive business. We make everything from plastics for padding and interiors, to chemicals for carpeting and tires, to solvents for paints, to hydraulic fluid for brakes, to PRESTONE antifreeze and summer coolant.

Back to bumpers. Drive carefully. Watch out for the other guy. And get a car with a bumper bumper to save your bumper bumps.

UNION CARBIDE

THE DISCOVERY COMPANY

1

For further information on our activities, write Union Carbide Corporation, 270 Park Avenue, New York, New York 10017. An equal opportunity employer.

there's much more to Collins than radios

The "Radio" in Collins Radio Company reflects only a portion of Collins' involvement in the areas of communication, computation, and control.

- Collins designs and manufactures computer systems for airlines and railroads and many other military and industrial organizations around the world. Collins recently introduced the first completely integrated communication/computation/control system with unlimited expansion capability.
- Collins supplies voice communication systems for all U.S. manned space flights.
- Collins serves as prime contractor on NASA's worldwide Apollo tracking network.
- Collins supplies avionic systems for more than 75% of the world's commercial airliners. (These systems enable a pilot to communicate with ground control centers, maintain proper course, avoid storms, and land safely when visibility is poor.)
- Collins ranks as the largest independent producer of microwave systems.
- Collins designs and installs complete earth stations for satellite communications.
- Collins ranks as one of the world's leading manufacturers of commercial broadcast equipment.
- Collins is recognized universally for the quality of its amateur radio equipment.

At each of Collins' four major facilities, opportunities exist in mechanical, electrical, and industrial engineering, and in computer science.

CAREER OPPORTUNITIES: • Product Design and Development • Field Support Engineering • Electronic Research • Data Operations • Programming and Systems Analysis • Accounting • Systems Design Engineering • Manufacturing • Technical Writing • Process Engineering • Integrated Circuitry Design • Microelectronic Thin Film Design • Reliability Engineering • Quality Engineering.

MARKETS AND PRODUCT AREAS: • Computer Systems • Avionics Systems • Broadcast • Specialized Military Systems • Telecommunications • Microwave • Space Communication • Amateur Radio.

Collins representatives will visit more than 100 campuses this year. Contact your College Placement Bureau for details. Or send your resume, in confidence, to Collins Radio Company, D. C. Peden, Dallas, Texas 75207; B. L. Bennett, Cedar Rapids, Iowa 52406; P. L. Chamberlin, Newport Beach, California 92663; or J. V. Scott, Toronto, Ontario.

an equal opportunity employer

COLLINS

editor-tena poljanec
business manager-steve heflin
advertising manager-john gammie
layout - conni james

staff-bill mccullough
stan harbaugh
jeanne gorrel
pam sedillo

FALCULTY ADVISORS

John Leahy

Lary Feeser

THE COLORADO ENGINEER

COLLEGE OF ENGINEERING • UNIVERSITY OF COLORADO

VOLUME SIXTY-SIX • NUMBER 1 • NOV. 1969

IN THIS ISSUE

FEATURES

SECTIONS

COVER

The view from Jim Scott (Aero '69)'s window.

Entered as second-class matter March 9, 1916, at the Post Office at Boulder, Colorado, under the Act of March 3, 1879.

General Offices: Engineering Center, OT 1-7, University of Colorado, Boulder, Colorado 80302.

MEMBER OF
ENGINEERING COLLEGE MAGAZINES ASSOCIATED
Professor Gordon Smith, Chairman
Department of Industrial Engineering
Oklahoma State University
Stillwater, Oklahoma 74074

Published four times per academic year in November, January, March and May.
Subscriptions: Controlled free distribution to undergraduate students in the College of Engineering: otherwise, $2.00 per year, $5.00 for three years.
Circulation: 2,200.
Publisher's Representative — Littell-Murray-Barnhill, Inc., 369 Lexington Avenue, New York 17, N.Y., and 737 North Michigan Avenue, Chicago 11, Illinois.

You'll flip over it!

Drop whatever you're doing and flip through the pages of our booklet, "Careers with Bethlehem Steel and the Loop Course." Pick up a copy at your placement office, or write: Manager of Personnel, Bethlehem Steel Corporation, Bethlehem, PA 18016.

BETHLEHEM STEEL

An Equal Opportunity Employer

BETHLEHEM STEEL

OFF THE EDITOR'S CUFF

As an engineer in this maze of towers and subterraneon of dungeons, you should feel an obligation to become involved in a manner beneficial to yourself as well as to those around you. Do you really know anything about this number-one organization in our big grain elevator? The Associated Engineering Students (AES) sponsor a tutoring service, functions, orientations, and other various activities. Of course if you think about all of the functions you somehow managed to pass up because there were just too many girls there, and you wouldn't get to enjoy the companionship of all your male engineering buddies, and the fact that your engineering courses just didn't prove tough enough to warrant the use of a tutor, don't despair. The highlight of your days in our distinctive building are E-DAYS. Well believe it or not, it involves looking at bodies clad in the skimpiest, flimsiest bikinis. It involves all sorts of elections, panel discussions, pretty girls, food, and beer. During the week prior to E-DAYS you get to vote on the Engineering Queen, the Most Perfectly Engineered Coed, and the next AES president. And what is really neat is the fact that you might not even have to think in voting for AES president because if it's like last year's, only one person ran (very tense election). In future years it might even be more difficult to find someone to run for the engineering president, and the engineers might be forced to turn to the Business School next door or the Arts and Parties group up on the hill. But besides the fact that no one in the engineering college wants to accept the responsibility of adopting this title, what about the ones who finally do give in and tie a little bit of glory onto their names? Do they in reality accept the responsibility endowed upon them? Can they stir up the fervor and excitement in their fellow students that would be the result of a successful campaign to fight the difficult courses and sometimes boring course material? Several have made statements that they were just plain ol' not interested in being active in AES. Attitudes of this sort generally do not occur in those organizations which are effectual and efficient. But the present officers are not to blame for present policies and attitudes. They can only make the best out of what they were handed, and work for changes in policies to affect next year's students and officers. THEY CANNOT DO THIS ALONE! Changes in policies and attitudes need to begin to change. It is YOUR responsibility, not strictly that of those elected, to do something about building the potential of AES into reality.

Lena Pojman
Editor

(I would like to acknowledge the help of Miss Deborah Wilcox in helping write this editorial.)

UNIVERSITY OF COLORADO
COLLEGE OF ENGINEERING

STATISTICAL INFORMATION

Engineering — Boulder Campus only

	Fall 1960	Fall 1966	Fall 1967	Fall 1968	Fall 1969
Undergraduate enrollments	1500	1595	1773	1970	1947
New freshman enrollments	376	377	466	540	454
Grad. student enrollments	120	267	281	261	268
Number of faculty	90	106	120	128	134
Avg. Engin. 9-month faculty salary	$7,526	$11,507	$12,514	$13,257	$13,886
Avg. Univ. 9-month faculty salary	$7,784	$11,396	$12,378	$13,098	$13,665
Number of techn. journal publications from College of Eng. w/ peer review prior to publication	15	84	109	110	109
Outside research support for College of Engineering — Total in effect	$0.5 M(*)	$1.6 M	$2.0 M	$1.3 M	$2.4 M
Annual value	$0.2 M	$0.62M	$0.8 M	$0.5 M	$0.95M
Number of projects	30	63	71	64	84
Outside support for instructional equipment, conferences and institutes, and spec. proj.					
Total in effect	-	$0.5 M	$0.9 M	$1.1 M	$1.0 M
Annual value	-	$0.2 M	$0.4 M	$0.45M	$0.4 M
Number of projects	-	21	28	36	25

Graduate student registration by Departments (Boulder Campus - most are full time but increase in number of part-time students and foreign students has been noted in 1968 & 1969)

	Fall 1967			Fall 1968			Fall 1969		
	M.S.	Ph.D.	Total	M.S.	Ph.D.	Total	M.S.	Ph.D.	Total
Aerospace Engr. Sciences	23	19	42	22	23	45	12	23	35
Chemical Engineering	30	19	49	16	26	42	24	20	44
Civil Engineering	18	24	42	6	19	25	15	16	31
Electrical Engineering	76	42	118	74	56	130	71	47	118
Mechanical Engineering	20	6	26	9	6	15	15	6	21
Mechanics	0	4	4	1	3	4	1	4	5
Eng. Des. & Econ. Eval.	-	-	-	-	-	-	14	0	14
	167	114	281	128	133	261	152	116	268

Denver and Colorado Springs Center (Engineering)

	Fall 1967	Fall 1968	Fall 1969
Denver Center total enrollments	813	775	735
Number of full-time faculty members at Denver Center	11	13	17
Colo. Springs Center total enrollments	152	173	150
Number of full-time fac. members at Colo. Sprgs. Ctr.	3	5	6

(*) M = Million

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.

Innovation—applying the known to discover the unknown, inventing new materials and putting them to work, using research and engineering to create the ideas and products of the future—this is the venture Du Pont people are engaged in.

You can become one of them, and advance professionally in your chosen field. See your Du Pont Recruiter. Or send us the coupon.

Venture: Use a love call to count bacteria.

Du Pont Company
Room 7890, Wilmington, DE 19898

I'd like your latest information on opportunities at Du Pont for graduates with degrees in_____

Name_____

University_____

Degree_____ Graduation Date_____

Address_____

City_____ State_____ Zip_____

An Equal Opportunity Employer (M/F)

DU PONT
REG. U.S. PAT. OFF.

Ventures for better living.

LETTERS TO THE EDITOR

SUSPENSION

Current suspension policies at the University of Colorado are, in my opinion, unfair and unrealistic. A beginning student has but one warning regarding the conditions under which he may be suspended—that being the brief explanation given in the *University of Colorado Bulletin*. A new student just starting school is not yet thinking in terms of failing and is very likely to overlook this warning. In this event he may be unaware of the gravity of his situation until after he has been suspended, and then the damage has already been done.

I feel that every year there are some good students who get off to a bad start and upon being suspended become discouraged and never go back to school, (even after the suspension has been lifted).

Upon graduation from high school I started taking night courses at the Denver Center, since I could not afford to go to college full time. To be perfectly honest, I was not yet ready for college and I was not aware of the importance of maintaining a high average. To put it bluntly I was just an inexperienced kid who had to learn the hard way that college was a lot different from high school. I maintained a C average with a minimum of effort and I thought that I was doing fine. Then, in a never-to-be-forgotten trigonometry class, (1962),. I received the only D of my college career.

The following month I received a letter from the university informing me that I was on probation and would have to make at least a 2.0 average the following semester or face suspension. That semester my average was slightly better than 2.0 but I got a letter of suspension anyway. The first letter had failed to mention that even though I maintained a 2.0 average for the semester I would be suspended if my cumulative average was less than 2.0 after four enrollment periods.

This seems unfair to me because a part-time student who is working a full-time job, as I was, can be suspended after taking only four classes if his cumulative average is 1.999, whereas, a full-time student, after taking more hours than this is allowed to remain in school with a 1.5 average. I understand that under present policy a student is no longer placed on probation as I was but directly suspended. I hope that one day these policies will be changed.

I have no idea how many students with a high potential have gone through the ordeal that I went through but, in my opinion, even one is too many. The fact that I have been nominated to Eta Kappa Nu proves to my own personal satisfaction that I am a capable student, but because I remained ignorant of the facts pertaining to suspension when I was a freshman, I have suffered irreparable damage. I think if I had been informed at the beginning of the damage I might do to my college career by starting school before I was ready to settle down and study, I would have waited an extra semester or so until I *was* ready. Then I would not have had to continually explain this blemish on my record which will, needlessly, stay with me forever.

I realize that the *University of Colorado Bulletin* clearly places upon the student the burden of knowing when he is about to be suspended. However, I think that the university should put forth a little more effort to see to it that all students are *personally* advised of the harm that can be done to their college careers by starting school before they are really ready.

Daniel J. Willard
Eta Kappa Nu Essay

CONCERN

Man's basic instincts are those of an animal. These instincts have been curbed and formed into a social structure by an evolutionary process of communication. This communication has guided peoples together through necessity and interdependence of productive capacities; therefore it is of necessity that as we near the twenty-first century, with our minds ever growing and grasping new ideas, that we do not let technology remove from us human concerns; that we do not allow man's base instincts to rise again from a milieu that has become cluttered with objects to which he cannot relate.

Eric Fromm in *The Art of Loving* states clearly that man is in need of affection. Through meaningful relationships he becomes a whole person being able to devote to himself, his work, and his society, more useful time, simple because this stability has given him self-confidence. Eric Frond in *Man's Search for Meaning* attacks the same problem, but form a different viewpoint. For man to be alive, he must have a "meaning" in his life; however, this meaning is not found and used beneficially without human coupling.

Technology and engineering wit have and can make the world a fine place for mankind; however, if they are to succeed, they must not only bring innovation into objects, but they must also innovate society and its members to feel secure in their new and ever-changing societies. I feel strongly that the dissident groups in this country are rebellious because they don't see where they belong; they are not recognized and their frustration leads to the mass mob unrest. It is brotherly concern as well as material growth that is needed to fill the bloated bellies, and frustrated minds. If man's mind is in turmoil, so will his society be. Certainly the intelligencia of a society cannot work and research into the future for man's benefit if mankind is rotting at its roots.

Gerhard H. Mundinger, Jr.
Outstanding Freshman Award Essay

A Celanese career is freedom, satisfaction, reward, & a little self-discipline.

We feel you should settle for nothing less than the professional opportunity that offers you the most satisfaction and reward. A career in which you can be yourself. Do your own thing.

Naturally, that takes a bit of planning and equipment on your part. Like a degree in chemistry, chemical, industrial or mechanical engineering. Or accounting. Plus a degree of imagination. Ambition. Responsibility. A little self-discipline.

With them, you'll find the professional climate excellent at Celanese. For some very good reasons.

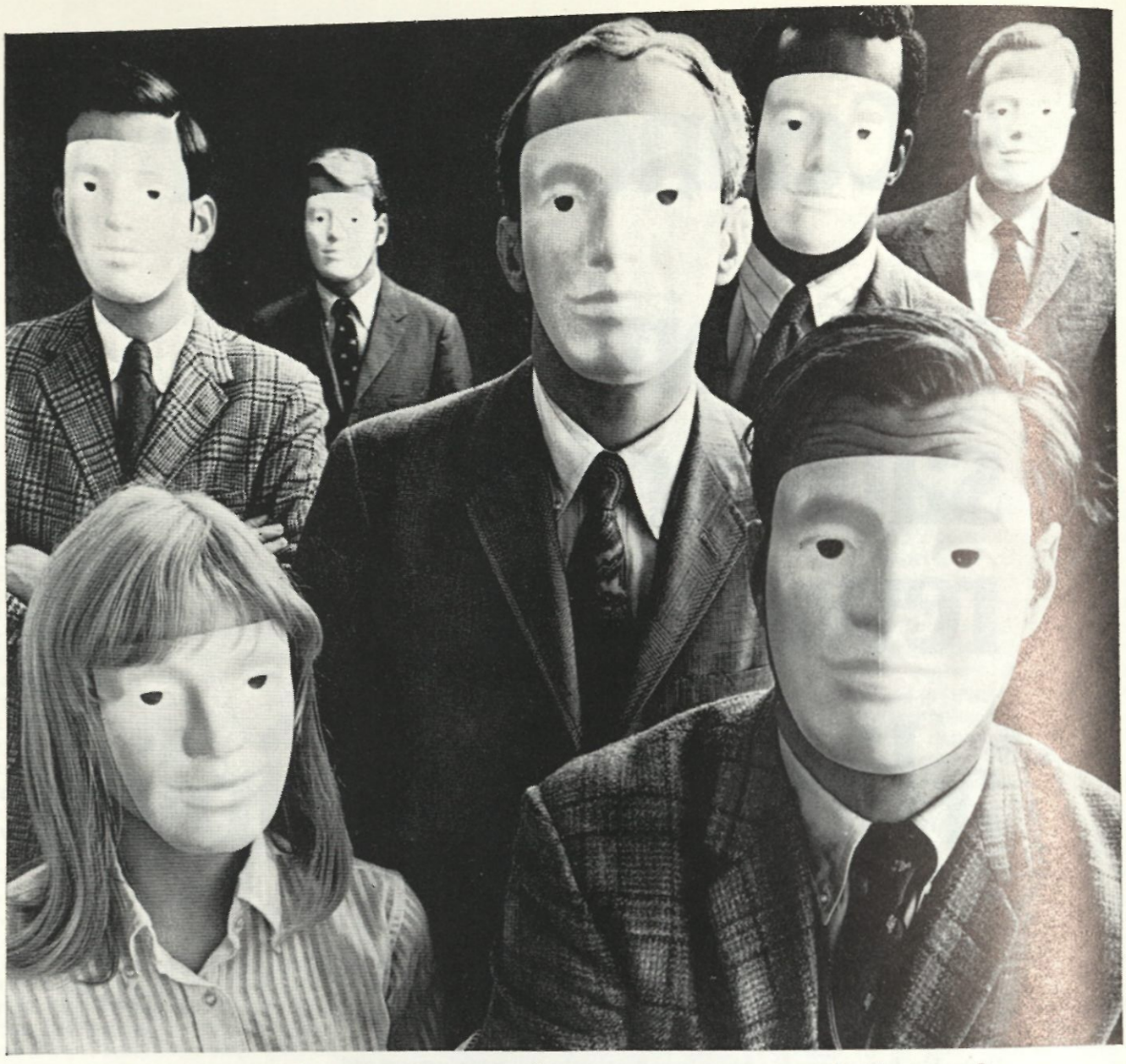
We're big. But not too big. More important, we're still actively young and growing. In the past ten years, or so, our sales have almost quadrupled.

And we won't tie you up with long, formal training programs. You'll learn as you practice your profession. Reap the rewards of performance—not on age, or how long you've been with us. Of course, you'll be working with experienced pros. So, when you need a hand you'll get it. Because it's to our mutual advantage to have you grow as fast as you can—and go as far as you can.

Your Placement Officer can tell you more about careers at Celanese. And about our developments in chemicals, fibers, plastics, coatings and petroleum products. Or write to: John B. Kuhn, Manager of University Relations, Celanese Corporation, 522 Fifth Avenue, New York, N.Y. 10036.

CELANESE®

An equal opportunity employer



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"?

Not this company.

We are not hung up on trivia like that.

The advances General Telephone & Electronics has made didn't come from people hiding behind organization charts and smiling at the right time.

They came from people who used their brains:

People who revolutionized picture-taking with the Sylvania flashcube, who developed the high-energy liquid laser, who came up with the sharpest color TV picture in the world, who pioneered instant electronic stock market quotations, and so on.

We are looking for more people like this—people who aren't afraid to stand up and try themselves out.

We are an equal opportunity employer:

All you need to make it with us is a good head on your shoulders.

General Telephone & Electronics

Sylvania Electric Products • Lenkurt Electric • Automatic Electric • Telephone Companies in 34 States • General Telephone Directory Company • General Telephone & Electronics Laboratories
General Telephone & Electronics International • GT&E Data Services • GT&E Communications

ANOTHER LETTER TO THE EDITOR

FOR WHAT IT'S WORTH

Did you know that about 60% of the girls in the C.U. dormitory system don't have a date on any given weekend? So when the guys frequently find themselves empty-handed (!) on weekends, the standard excuse of a female shortage just doesn't hold water. Of course, some girls just might not be interested, if that's possible, some may be waiting for Sir Lancelot to come winging back from the rice paddies, and a handful may even be studying. However, there's no way that a healthy percentage couldn't be somewhat wishful that the current situation would improve. Same for the guys, many of whom are equally idle on weekends.

Why, then, can't these people get together? Maybe they're just afraid to "let their hair down", to become open and honest with people. Take a typical example: not having a weekend date lined up by Friday, Harry tries his luck at F.A.C. The first thing he may notice is that there aren't enough girls for everybody. One possible reason: a good many of those dateless girls would rather die than they would admit to some strange guy that they're hard up. And besides, suppose some of Mary's friends see her at F.A.C.? Suppose the word gets around that she really *doesn't* have several guys wrapped around her little finger, scrambling for a chance to take her out?

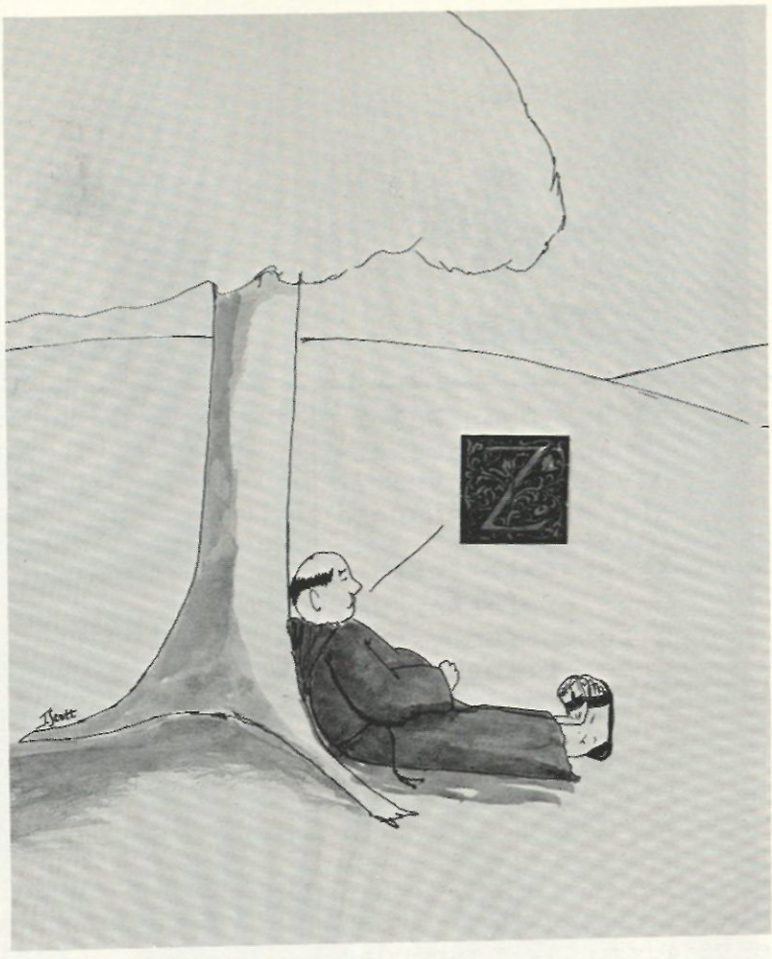
They guys are just as bad. Harry tries to hustle one of the best-looking girls in the crowd, mostly to lift his own ego and to show the other guys what a stud he is. Of course, the girl surmises (correctly or otherwise) that Harry is out to see how much he can get, and her opinion of guys in general is consequently lowered.

The whole ordeal, originally an opportunity for people to become genuinely acquainted, becomes one big snow job. Society's conventions have prevailed. And in a complex, technological age in which people need, move than ever, to know and understand one another, many are hiding behind masks. You can probably snow your friends for quite a while. But for how long can you prostitute yourself to somebody else's standards?

Clint Davis

Aero: "I've got a leak in my basement."
Plumber: "Well, go ahead; it's your basement."

* * * *



CHIPS

Typist: But Dean Maler, isn't this the same exam you used last year?
DM: Yes, but I changed the answers.
****

A guest professor was coming to CU to speak to three branches of engineering and discuss their fields in relation to some form of production. The first group were EE's and as the professor entered the room he immediately said good morning. The students promptly responded by saying good morning, whereupon the prof gave his talk. The Chem E's were next and the procedure was much the same as before. When the prof entered he said good morning and the students immediately replied with a good morning; however, when the Aeros' turn came and the prof said good morning, wouldn't you know that they all wrote it down.
****

Sorority girl: What makes me so popular with the boys? Is it my looks?
EE: No.
SG: Is it my personality?
EE: No.
SG: I give up.
EE: That's it!
****

Why did the Aero cross the road? (Mail or bring your answer to OT1-7.)

Sex Life of an Electron

One night when his charge was pretty high, Micro Farad decided to get himself a cute coil so that he could discharge. He picked up Milli Amp and took her for a ride on his mega cycle. They rode to the Sine Wave across Wheatstone Bridge, and thru a field by a flowing current.

He placed her at ground potential, raised her frequency, and lowered her resistance. Pulling out his high voltage probe, he inserted it into her socket, connecting them in series. He began to short-circuit her shunt. Fully excited, Milli Amp started to saturate.

With his exciter operating at maximun efficiency and her coil operating from his current flow, she soon got her shunt hot and released some electrons. They fluxed all night trying various connections and sockets until his bar magnet lost all its fluid strength and disintegrated into a soft iron core. Afterwards, Milli Amp tried self-induction and damaged her solenoid. With his battery fully discharged, Micro Farad was unable to excite her transformer so they ended the night by reversing polarity and blowing each others' fuses.
****

The mob was having financial problems expanding its number of houses of ill repute. They didn't want to spend the money to buy a truck to transport building material from the shipping dock to the building location. They figured that if they crossed a prostitute with an elephant, they'd get a two-ton pickup; instead, they got a whore that worked for peanuts and went broke.
****

Not only is it proper to hold an Aero's hand in the dark; it's usually necessary.
****

A cross-eyed woodpecker with a cork leg and synthetic rubber bill requires 4½ hours to peck ¾ of the distance through a cypress log 53 years old. Shingles cost 79¢/100 and weigh 8 oz. apiece. The log being pecked upon is 43 ft. long and weighs 46# per ft. Assuming that the friction coefficient is .097J between his bill and the log w/negligible resistance to diffusion Find: Amt. of Vitamin B1 used in pecking roof of $7500. barn w/6'X8' atrium.

The college you can't get into without a job.

The college is ours—Western Electric's Corporate Education Center in Hopewell, New Jersey.

Like your college, ours has a campus with dorms, dining halls, labs and a library. Unlike yours, you can't get into ours without a job. A job at Western Electric.

Our students—engineers, managers and other professionals—develop and expand their skills through a variety of courses, from corporate operations to computer electronics. To help bring better telephone service and equipment, through the Bell System.

For information contact your placement office. Or write: College Relations Manager, Western Electric Co., Room 2500, 222 Broadway, New York, New York 10038. An equal opportunity employer.

Western Electric
Manufacturing and Supply Unit of the Bell System


CAVU*

*CEILING AND VISIBILITY UNLIMITED

At Pratt & Whitney Aircraft "ceiling and visibility unlimited" is not just an expression. For example, the President of our parent corporation joined P&WA only two years after receiving an engineering degree. The preceding President, now Chairman, never worked for any other company. The current President of P&WA started in our engineering department as an experimental engineer and moved up to his present position. In fact, the majority of our senior officers all have one thing in common—degrees in an engineering or scientific field.

To insure CAVU*, we select our engineers and scientists carefully. Motivate them well. Give them the equipment and facilities only a leader can provide. Offer them company-paid, graduate education opportunities. Encourage them to push into fields that have not been explored before. Keep them reaching for a little bit more responsibility than they can manage. Reward them well when they **do** manage it.

Your degree can be a B.S., M.S., or Ph.D. in: **MECHANICAL • AERONAUTICAL • ELECTRICAL • CHEMICAL • CIVIL • MARINE • INDUSTRIAL ENGINEERING • PHYSICS • CHEMISTRY • METALLURGY • MATERIALS SCIENCE • CERAMICS • MATHEMATICS • STATISTICS • COMPUTER SCIENCE • ENGINEERING SCIENCE • ENGINEERING MECHANICS.**

Consult your college placement officer—or write Mr. William L. Stoner, Engineering Department, Pratt & Whitney Aircraft, East Hartford, Connecticut 06108.

CAVU* might also mean full utilization of your technical skills through a wide range of challenging programs which include jet engines for the newest military and commercial aircraft, gas turbines for industrial and marine use, rocket engines for space programs, fuel cells for space vehicles and terrestrial uses, and other advanced systems.

Pratt & Whitney Aircraft

EAST HARTFORD AND MIDDLETOWN, CONNECTICUT
WEST PALM BEACH, FLORIDA

DIVISION OF UNITED AIRCRAFT CORPORATION

An Equal Opportunity Employer

BOULDER'S RESPONSE TO FLOOD DANGER

From a paper by James J. Murray entitled "a Reasonalbe Response to a Flood Hazard."

Edited by John Leahy

About the Author,

John D. Meyer is a graduate student at the University of Colorado. He is studying Structural Engineering in the Civil Engineering Department. His article won an APWA Scholarship Contest.

"And the waters prevailed exceedingly upon the earth; and all the high hills that were under the whole heaven were covered." (Genesis)

The City of Boulder has had major and minor floods in its history, and certainly can expect to have more. But just now the expense of controlling prospective floods with special structures appears prohibitive; the alternatives still remaining are for the city to adapt itself to the existing flood-plains and water courses through flood-plain zoning, evacuation and warning procedures, flood insurance, and by not using land subject to flooding. Boulder has, in fact, studied several of these approaches – especially zoning laws. No regulations have yet been passed for zoning the flood plain, but when the Boulder officials do enact laws their legality when tested, should interest many cities across the nation. Such laws would also place Boulder among the few cities to have them in the arid West.

Most of the history of flooding in Boulder concerns Boulder Creek. The worst flood recorded for that stream happened in May, 1894, when all the bridges were swept away and the water rose to the window sills of the Colorado and Southern Railroad Depot, not the bus depot on Fourteenth Street. Many homes were also destroyed in that flood. Thirty years earlier there was an equally devastating rising of the waters, but no reliable data survives. Bad flooding occured in 1914, and nearly as bad in 1921. Lesser floods are recorded for 1919, 1923, 1938, 1941, and 1951. Recently, Boulder escaped serious

Increased land development in the upper reaches of a drainage area can create higher run off as shown by this small stream during the May 1969 Boulder Flood. DAILY CAMERA PHOTO

Flood damage to railroad tracks at Lyons, Colo. Damage resulted from the same May 1969 flood that hit Boulder, Colo. DAILY CAMERA PHOTO

We're not looking for ordinary people. Or satisfied people. We want people who question, who want to know why. We need them because they can help us grow. We'll give them as much challenge as they care to seek out.

At the same time, we offer something more than challenge. We offer opportunity. And in some unusual areas. The communications network is so vast and touches so many facets of life that you'd be surprised at the variety of jobs in the Bell System. Whatever your background, whatever your field of study, we probably have a pair of shoes for you to fill.

Why not ask a Bell System representative? Make an appointment when he comes to your campus.

An equal opportunity employer.

AT&T

flooding, in the spring of 1965, when Denver suffered destruction along the South Platt because the heavy rains did not reach Boulder. Nor have the smaller streams in the area behaved: Sunshine, Gregory, Two-Mile, Four Mile, Skunk, and Bear Creeks – all have flooded. Boulder, history shows, is decidedly vurnerable to flooding. This being so, the need for flood-protection programs seems apparent , indeed it seemed so to some people at the turn of the century. Precise engineering data is required, especially regarding rain-fall density patterns to calculate flooding potential.

Various hydrologic investigations have been made in Boulder; the first was by the Corps of Engineers in 1945, who recommended channel straightening for Boulder Creek, some revetment, removal of one bridge, and rebuilding several more, two new bridges, removal or relocating of fifty houses or commercial buildings, and construction of a levee. None of these was done, and by 1957 new buildings made these plans impossible. The U.S. Geological Survey has also made an extensive study of Boulder Creek, but in spite of a History of voluminous engineering and economic studies, encroachment on the Boulder flood plains and channel areas has continued. A few items: Colorado University built fifty-four quonset huts and eighteen barracks for "temporary" housing; the city built a municipal building, a library, a field house, and an annes to Boulder High – all hard by Boulder Creek. These and other buildings would raise the damage of another flood like 1894 to over two million dollars. There is, in short, no curb on flood-plain building; so matters are clearly growing more hazardous all the time. Some of the attitudes that seem to blind the facts given by the studies are interesting.

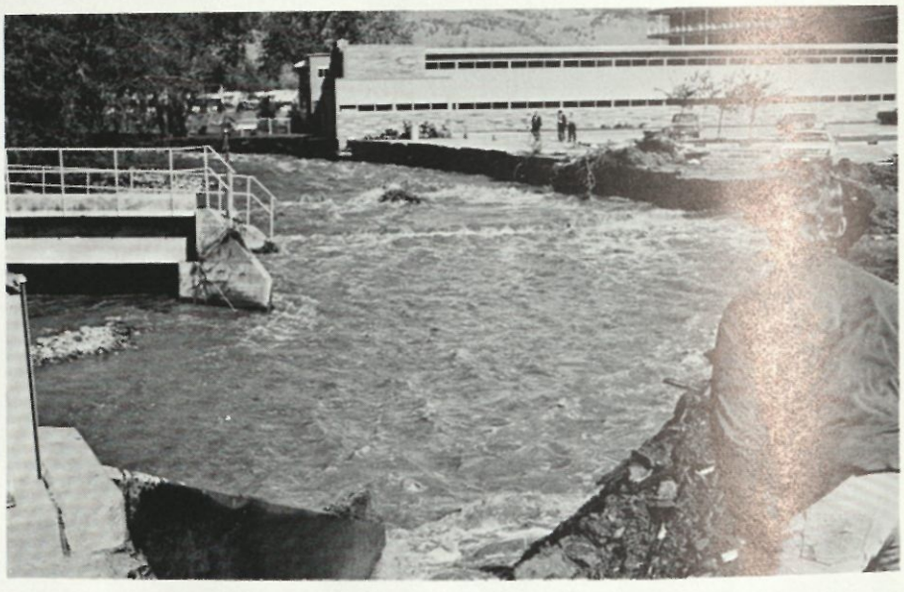
A canvass has shown two predominant attitudes about persistant development of the flood-plain: (1) that the hazard of flooding once existed but no longer does, and (2) the risk is economically feasible. Often the first view is simply uninformed. For example, many Boulder people feel that the Boulder Reservoir has removed any chance of another disaster like the 1894 flood. But those rains were concentrated below Barker dam. Another frequent opinion is that since almost all mining operations upstream have ended the run-off and debris reduction precludes another old style food. Wrong again: the building of homes, highways, and parking areas more than offests the mine closings.

Flood-plain zoning is logical for many reasons, not the least of which is the government's responsibility to protect the life and health of citizens. People have drowned in area floods, and with the rapid growth in population more people will drown. Another responsibility is to forbid land development that increases flood hazard such as the parking lots mentioned above. And the public needs to be made aware of many risks in simply occupying a flood-plain. The federal government in 1966 declared that federal agencies will not install or finance structures where there is flood hazard.

The Boulder Planning Board has outlined specific goals for the proposed flood-plain zoning laws, in brief: to avoid excessive flooding, damagj , or danger to people from major floods (the so-called one-hundred-year frequency), storm flood areas and to zone them; to make channel improvements through the City's Capital Improvement Program; and to make Boulder's programs meet the interests of the country. To begin doing these things, the Planning Board has proposed an amendment to the city's zoning ordinance. The many regulations proposed would have little effect on land use except in channel districts, and building in the flood plain districts would gradually conform to regulations as they are replaced or remodeled in the future.

If Boulder's proposed regulations for the flood plain become law, opposition

Debris piled under bridges was a major problem during the May 1969 Boulder Flood. Channel improvements required by Boulder's Flood-plain Zoning would help alleviate this type of damage. DAILY CAMERA PHOTO



Photograph looking west from 28th St. bridge in Boulder Colo. shows the extensive damage to a nearby bridge. The bridge was removed a few weeks later. Note that the corner of the building in the background was undercut by flood waters. Photograph was taken a few days after the may 1969 Boulder Flood. DAILY CAMERA PHOTO

Fellowships

For:
Masters, Engineer and Doctoral Degrees

In the fields of:
Electrical Engineering, Aerospace Engineering, Mechanical Engineering, Physics and Mathematics

Benefits include:
Educational stipend, dependent allowance, all academic expenses, professional salary, employee benefits and travel allowance. Value of these ranges from approximately $7,500 to $12,000 annually.

Be one of the more than a hundred students to win this outstanding opportunity. You will study at a prominent university through the Hughes Fellowship Program. Work-study and full-study academic year plans are offered. You will gain professional experience with full-time summer assignments in Hughes research and development laboratories. You may take advantage of a variety of assignments through planned rotation.

Requirements: B.S. degree (or equivalent) for Masters Fellowships; M.S. degree (or equivalent) for Engineer and Doctoral Fellowships; U.S. citizenship; grade point average of 3.0 or better out of a possible 4.0; selection by Hughes Fellowship Committee.

Hughes plans to substantially increase the number of fellowship awards leading to the degree of Engineer.

For additional information, complete and air-mail form to: Hughes Aircraft Company, Scientific Education Office, P.O. Box 90515, Los Angeles, California 90009.

HUGHES
HUGHES AIRCRAFT COMPANY

An equal opportunity employer—M & F

Hughes Aircraft Company, Scientific Education Office, World Way, P.O. Box 90515, Los Angeles, Calif. 90009
Please send me information about Hughes Fellowships.

Name (printed): _____

Address _____

City _____ State _____ Zip _____

I am interested in obtaining: ☐ Masters ☐ Engineer ☐ Doctoral

fellowship in the field of _____

I have (or expect) a Bachelor's degree in _____ (Field)

by _____ (Mo., Yr.)

from _____ (Institution)

GPA is _____ out of possible _____

Also have (or expect) Master's degree in _____ (Field)

by _____ (Mo., Yr.)

from _____ (Institution)

GPA is _____ out of possible _____

U.S. CITIZENSHIP IS REQUIRED

DO YOU THINK A BRIGHT ENGINEER-TO-BE SHOULD SPEND HIS MOST IMAGINATIVE YEARS UNIMAGINATIVELY?

NEITHER DO WE!
THAT'S WHY WE ASK YOU
TO JOIN THE
COLORADO ENGINEER
STAFF.
APPLY AT OT 1-7

NEW STANDARDS FOR EVALUATION
GUIDE TO EMPLOYEE PERFORMANCE APPRAISAL
PERFORMACE DEGREES

Performance Factors	*Far Exceeds Job Requirements*	*Exceeds Job Requirements*	*Meets Job Requirements*	*Needs Some Improvement*	*Does Not Meet Minimum Requirements*
Quality	Leaps tall buildings with a single bound	Must take running start to leap over tall buildings	Can leap over short buildings only	Crashes into buildings when attempting to jump over them	Cannot recognize buildings at all
Timeliness	Is faster than a speeding bullet	Is as fast as a speeding bullet	Not quite as fast as a speeding bullet	Would you believe a slow bullet?	Wounds self with bullet when attempting to shoot
Initiative	Is stronger than a locomotive	Is stronger than a bull elephant	Is stronger than a bull	Shoots the bull	Smells like a bull
Adaptability	Walks on water consistently	Walks on water in emergencies	Washes with water in emergencies	Drinks water in emergencies	Passes water in emergencies
Communications	Talks with God	Talks with the angels	Talks to himself	Argues with himself	Loses these arguments

will have to come through the courts. At present the state favors a gradual elimination policy similar to Boulder's proposals for the food plain, over any abrupt change of land use – such as Boulder's proposed regulations for channel regulations. (One obvious problem is that owners cannot summarily be deprived of their land.) But Boulder, is a home-rule city, and could supersede state statutes. Moreover, precedent is lacking, for Colorado has had no court cases concerning flood-plain zoning and would have to look to other kinds of zoning problems for direction.

Flood-plain zoning will never aim to remove all people from the danger area, so one obvious problem is to devise a good warning and evacuation procedure. Such a plan exists, thanks to the Boulder Civil Denfense Unit, and it outlines methods for warning the public, rescuing and evacuating victums, providing shelter and care, and establishing headquarters and communications. Still anothher method of dealing with the prospects of flooding is flood insurance, but it is only a prospect – Theory is more like it. The Department of Housing and Urban Development is one agency now investigating the possibilities for insurance against flood.

Too many proposals have been made to list them here, but one more interesting one appears in a Washington report: to place workers about the city shich show how high the waters rose in earlier floods. That, presumably, would help counter normal human euphoria and lower the risk, over the years, of another Johnstown, Pa.

Many a year ago there were warning voices that Boulder would some day have enroachment on city water courses, and it would be too late to act. Now the city, too late in a sense, is trying the only means possible in attempting flood-plain zoning. No other just means is available. Boulder's record is a familiar story: Some people foresaw the problems, and prohibitive expense of "some day" trying to cure them, and those people were ignored. The situation is now that nothing dramatic can be done, nor done quickly; and the city plans to avoid seeing conditions worsen and to hope for gradual elimination of the obvious hazards in the flood plain. It is not altogether too late, but it is late.

The article was written during the summer of 1968. On August 19, 1969, floodplain zoning regulations were adopted by the Boulder City Council. In the final form there are several changes from the proposed regulations described in the article. The Channel Districts are now referred to as Floodway Districts and Floodplain Districts are referred to as Flood Storage Districts. The legal problem of the very restrictive land use in Floodway Districts was unraveled in the following manner. The allowable land uses are still just as restrictive but one exception is made. Existing uses (buildings, etc.) may remain unaltered so long as they conform to the land use laws that were in effect prior to August 19, 1969, and that they contain no buoyant, flammable, poisonous, or explosive materials or any other materials that would be harmful to human beings during a flood. Repairs may be made to structures due to normal wear and tear. However, repairs necessitated by explosions, fires, or acts of God must meet certain floodproofing requirements. If the building is to be completely rebuilt, it must be moved so as to cause the least damage during a flood. It must also be floodproofed. After eighteen months of nonuse, the land must conform to all Floodway District Regulations. Other regulations are generally the same as they were described in the article.

Violation of these regulations may result in a fine of three hundred dollars or ninety days in jail or both. Each day of violation constitutes a separate offense.

Boulder endured a flood resulting from between a 10 to 25 year storm during May of 1969. It vividly revealed the need for decisive action. In Boulder County the total damage costs were 1.2 million dollars. Conclusion: The author now believes his article to be conservative.

Boulder, Coloardo, Sept. 19, 1969

Olin

ORGANIZATION	LOCATIONS HAVING CURRENT OPENINGS	MAJOR PRODUCTS PRODUCED	DISCIPLINE REQUIREMENTS	TYPE OF WORK PERFORMED
CHEMICALS GROUP —Chemicals Division —Agricultural Division —Plastics Operation	Assonet, Mass. Augusta, Ga. Brandenburg, Ky. Carrollton, Ohio Canton, Ohio Charleston, Tenn. Joliet, Ill. Lake Charles, La. Little Rock, Ark. McIntosh, Ala. New Haven, Conn. Niagara Falls, N.Y. Pasadena, Texas Rochester, N.Y. Saltville, Va. Stamford, Conn.	Polyvinyl Plastics Plastic Piping Chlor-Alkali Products Ammonia Phosphates Urea Nitrogen Acids Hydrazine Petrochemicals Insecticides Pesticides Polyurethane Carbon Dioxide Animal Health Products Automotive Chemicals	ChE ME IE Chemistry Accounting Business Adm. Transportation Marketing	Process Development Design, Maintenance Planning, Scheduling Production, Sales Accounting Marketing Financial Analysis Distribution Project Engineering (Plant Startup & Construction) Research Engineering Technical Service
ALUMINUM DIVISION	Chattanooga, Tenn. Gulfport, Miss. Hannibal, Ohio New Haven, Conn. Sedalia, Mo.	Architectural Products Aluminum Extrusions Aluminum Sheet, Plate, Coils Aluminum Wire & Cable Primary Aluminum	ChE IE ME Met. Eng. Accounting Business Adm. Ind. Tech. & Mgmt.	Manufacturing Production Sales Maintenance Finance Metals R&D
BRASS DIVISION	East Alton, Ill. New Haven, Conn.	Brass Fabricated Parts Sheet & Strip—Brass ROLL-BOND Panels Stampings	ChE IE & O.R. ME Met. Eng. Accounting Business Adm. Ind. Tech. & Mgmt.	Manufacturing Production Sales Maintenance Finance Operations Research
FINE PAPER & FILM GROUP —Ecusta Paper Division —Film Division	Covington, Ind. Pisgah Forest, N.C.	Carbonizing Paper Fine Printing Papers Specialty Paper Products Cigarette Paper & Filters Cellophane	ChE Chemistry Pulp & Paper Tech. IE ME Math Business Adm. Accounting	Marketing Process Engineering Plant Engineering R&D, Design Development Statistician Systems Engineering Production Mgmt. General IE Accounting
OLINKRAFT, INC.	West Monroe, La.	Kraft Paper Kraft Bags Corrugated Containers Lumber Plywood Industrial Cartons Multiple Cartons	ChE Chemistry Pulp & Paper Tech. IE ME EE	Process Engineering Plant Engineering R&D, Design Systems Engineering Production Mgmt. General IE
WINCHESTER GROUP —Winchester-Western Division —Energy Systems Division —Ramset Operations —Weaver Co.	East Alton, Ill. El Paso, Texas La Porte, Ind. New Haven, Conn. Marion, Ill. Tallahassee, Fla.	Sporting Arms Ammunition Powder Actuated Tools Smokeless Powder Solid Propellants Safety Flares Franchised Clubs Safaris Telescopic Sights	Accounting Finance Business Adm. ME IE Math, Physics Ind. Mgmt. Computer Opt. Marketing ChE, Chemistry Personnel Mgt.	Finance, Accounting Manufacturing Programming R&D, Design Production Control Purchasing Marketing, Sales Plant Engineering Operations Research
ORMET CORP.	Burnside, La. Hannibal, Ohio	Alumina Aluminum	ChE IE ME Metallurgy Accounting Business Adm. Ind. Tech. & Mgmt.	Manufacturing Production Maintenance Finance

If you find this chart interesting, we're interested.

For additional information about Olin,
please contact your Placement Office or write Mr. Monte H. Jacoby, College Relations Officer,
Olin, 120 Long Ridge Road, Stamford, Conn. 06904. Olin is an Equal Opportunity Employer (M & F) and a Plans for Progress Company.

ECMA Comments

Quite possibly true . . .

Engineers are a distinct group, being extremely dedicated students. They are characterized in the main by the ability to offer criticism on most any topic, many times with no facts or explanation for a fasis. Also they are too often disdainful of involving themselves personally in finding a reason for this criticism or in solving the problem.

THE MIAMI ENGINEER, October 1969

Try as they do . . .

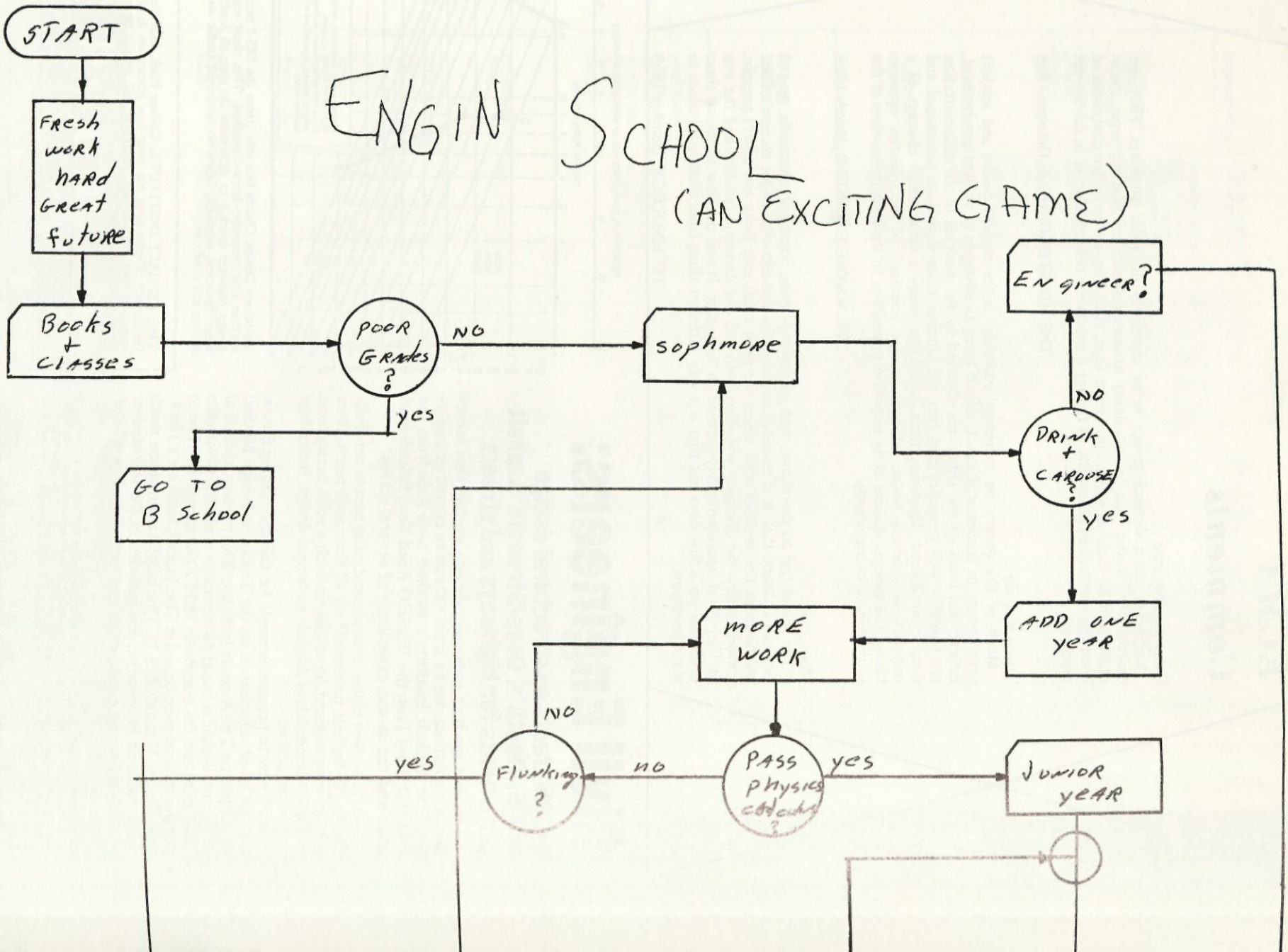
Much of the outcry on univeristy campuses is for student power and student involvement in academic affairs. I, myself being an advocate of student involvement, believe that many of the arguments afforded by the students to the administration are basically well grounded and that the student voice should be recognized and deeply considered. However, there seemingly exists a detrimental element of a minority of students which infringes on the relevanc3 of the majority opinion. Hence the general student body may find opposition to its ideas irregardless of the soundness of its arguments.

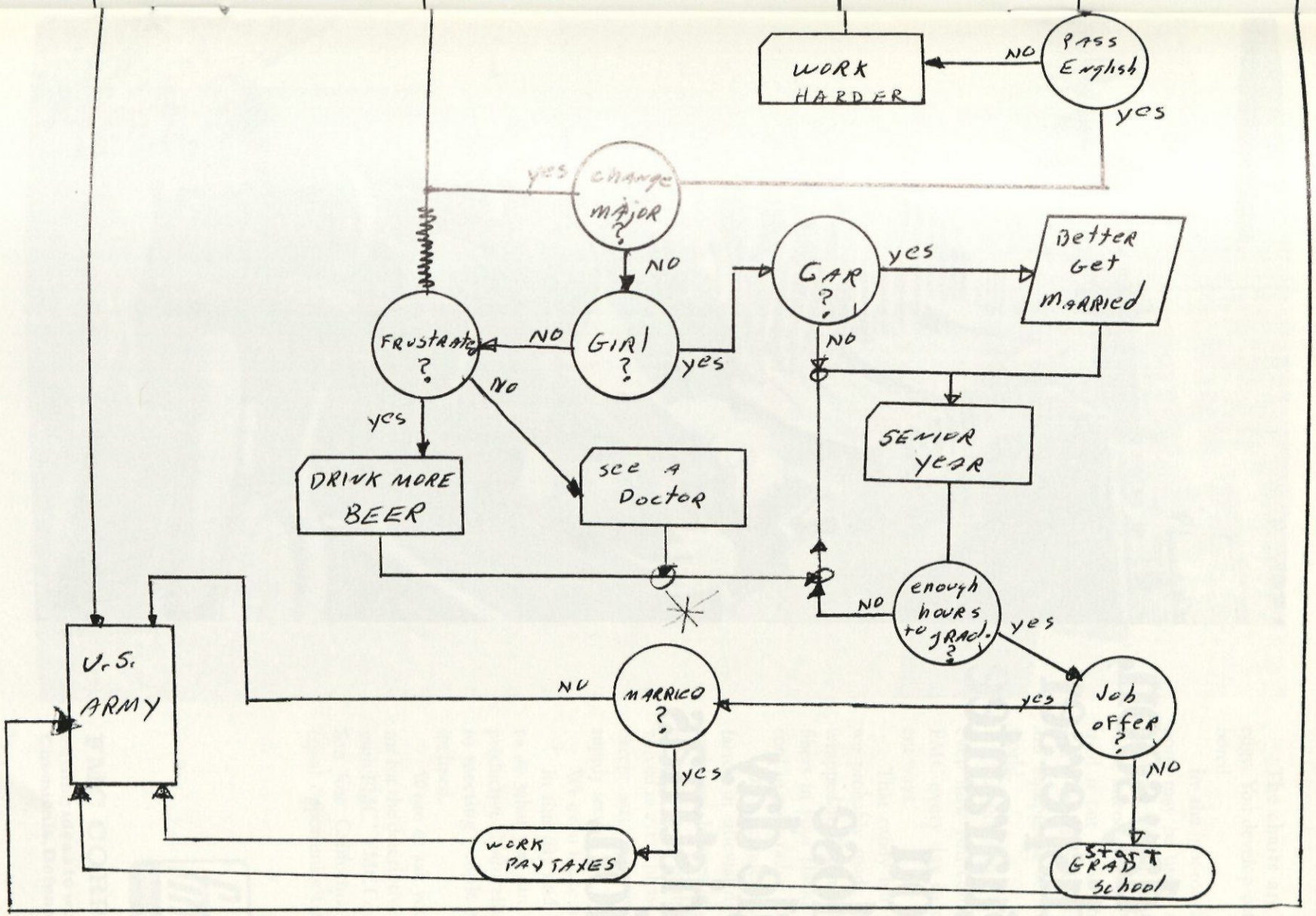
THE WAYNE ENGINEER, March 1969

Moon talk . . .

The round trip to the moon, with its accompanying circus paraphernailia, 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. Unfortunatley the diversion was short-lived and our domestic troubles and the war in Viet Nam uncooperatively refused 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.

TECHNOLOGY, October 1969


ENGIN SCHOOL
(AN EXCITING GAME)
START
Fresh work hard Great future
Books + classes
poor GRades ?
NO
yes
GO TO B School
sophmore
ENGINEER?
NO
DRINK + CAROUSE ?
yes
ADD ONE YEAR
MORE WORK
NO
yes
Flunking ?
no
PASS physics calculus ?
yes
JUNIOR YEAR


WORK HARDER
NO
Pass English
yes
yes
change MAJOR ?
NO
GAR ?
yes
Better Get MARRIED
FRUSTRATED ?
NO
GIRL ?
yes
NO
yes
DRINK MORE BEER
see A Doctor
NO
SENIOR YEAR
enough hours to GRAD. ?
NO
yes
U.S. ARMY
NO
MARRIED ?
yes
Job offer ?
yes
NO
WORK PAY TAXES
Start GRAD School

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

PHOTO: JOHN HARRISON

The chairs are lumpy. You get edgy. You develop coffee mouth. You're bored.

In the not-too-distant future, airports may be using an FMC Corporation machine to disperse fog and all those attendant miseries. We've already tried it out in Sacramento, California, and it works. Someday, it may be standard equipment at airports around the world.

Actually, you don't know it, but even now you come in contact with FMC every day in a hundred different ways.

That candy bar you ate at noon—we probably made the machinery that wrapped it. We made the Avril® rayon fibers in your slacks and the Dynacor® cord in your radial tires.

On a grander scale we are a major factor in alleviating the world's food problems. Harvesting machines, fertilizers, packaging equipment—FMC is involved in every phase of food production except actually growing it—but we do supply seeds.

We even make fire engines.

In this day and age, it's important to do what you can to make life more productive. Naturally, we look forward to meeting people who are similarly inclined.

Write or ask your placement director for the descriptive brochure, "Careers with FMC." FMC Corporation, Box 760, San Jose, California 95106. We are an equal opportunity employer.

fmc CORPORATION ®

FMC CORPORATION

Putting ideas to work in Machinery, Chemicals, Defense, Fibers & Films

Dan Schmidt, Missouri '64, met the challenge in mining at St. Joe

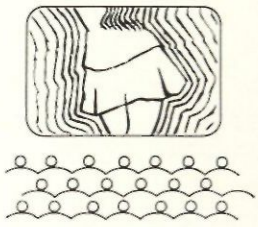
Since he graduated from the University of Missouri at Rolla, Dan found opportunity for progress at St. Joe. He's Plant Engineer at St. Joe's ultra-modern Fletcher mine. There he's responsible for some of the most sophisticated equipment to be found in any mine-mill complex on earth. He works with a young, aggressive team in a company that's tops in the industry. ☐ Dan and his wife Carole and their two sons find life pleasant in Southeast Missouri. He hunts, fishes and competes in softball and tennis. They live in the country but they are only 90 minutes drive from big city attractions such as major league baseball in St. Louis. ☐ St. Joe has challenging opportunities for people with the ability and the drive to meet them. They are located in Southeast Missouri, Pennsylvania, Upper New York State and New York City. ☐ You may find your challenge and your future with St. Joe.

ST. JOE

Producers and Marketers of Lead, Zinc, Zinc Oxide, Iron Ore Pellets, Iron Oxide, Agricultural Limestone, Cadmium, Copper Concentrates, Silver and Sulphuric Acid.

ST. JOSEPH LEAD CO., 250 Park Avenue, New York, New York 10017

SJ-389



Catch a flick tonight.

They can be very interesting.

The color film running through the projector is composed of numerous layers. We put them down in the State of New York on a base we build there from materials we create in the State of Tennessee.

Those layers constitute chemical reactors as thin as 1/10,000 inch. Perhaps seven critical diffusion and reaction steps are run in them. Somebody has to find and maintain an optimum balance for those steps.

Nice work for chemical engineers.

In addition, our involvement in many matters remote from color film opens other choices:

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; liaison with customers.

In case you're interested, keep us in mind.

EASTMAN KODAK COMPANY
Business and Technical Personnel Department
Rochester, N. Y. 14650

An equal-opportunity employer. The opportunities are in Rochester, N. Y., Kingsport, Tenn., Longview, Tex., and Columbia, S. C.

Kodak

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