SPARTAN ENGINEER

NOVEMBER, 1966

Go Westinghouse, Young Man!

A modern fable with technical overtones

Once there was a young college senior named Jack who wanted desperately to climb the beanstalk of success, facing the kind of challenges his forefathers faced on the frontiers of early America.

But Jack wasn't sure which kind of beanstalk he wanted to climb.

His mother wanted him to take a job at the local store so he'd be close to home.

His friends urged him to join a protest movement.

His professors wanted him to go on to graduate school.

Then Jack met a Mr. Greeley from Westinghouse. Mr. Greeley was a recruiter of college students. He was a kindly man with a warm smile, and he explained how Jack could get an advanced tuition-free degree while working at Westinghouse.

Mr. Greeley also explained that Westinghouse, being a giant organization, was in a much better position than most to undertake projects that would benefit the less fortunate peoples of the world.

Mr. Greeley's advice was:

"Go Westinghouse, young man!"

And Jack did.

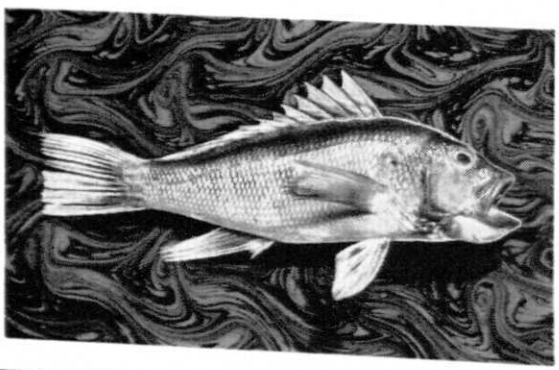
Given a choice of six large operating groups* within Westinghouse, Jack elected to join the Atomic, Defense and Space Group and was promptly assigned to work on an oceanographic project.

A fast learner, Jack took root quickly, reassuring his graying but still pleasant-faced mother, "Don't worry, Mom, I'm on my way to the top."

Though officially a trainee, Jack was a big help in the development of *Deepstar*—a Jules Verne-like underseas vehicle designed to explore the ocean depths. One of *Deepstar's* many missions was to search for food sources to meet the growing needs of a hungry world.

The project was an enormous success; Jack's management was delighted.

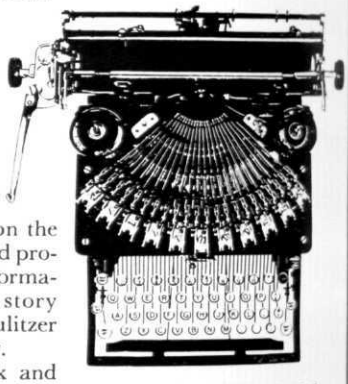
But before a grateful UNESCO could honor him publicly, Jack obtained a transfer to one of the many space projects Westinghouse coordinates.



Jack's assignment: help develop a rendezvous system for Gemini capsules.

To the news publications of the nation, this was the story of the year. In fact, one of the big syndicates assigned their most beautiful, technically oriented woman reporter to get an exclusive story from Jack . . . at any cost.

One night while returning from work . . . Jack was accosted by the beautiful young newswoman, who suggested that Jack give her an exclusive bylined story describing the project in detail.



Though taken aback by her beauty, Jack never lost sight of his duty. He pleaded with the reporter to hold her story until after the launching. She agreed on the condition that Jack would provide her with enough information for a subsequent story that would win her a Pulitzer Prize for news reporting.

The pressure on Jack and his closely knit engineering team tightened. By day, they'd work on the space guidance system; by night, Jack would feed background information to the beautiful, technically oriented reporter. It was hard work, but it was important work.

Finally the day arrived for which the world had long waited. America's two capsules rendezvoused successfully. Mankind was now assured of a stairway to the stars.

While television-viewing millions rejoiced, Jack was as good as his word, offering the beautiful lady reporter the story she wanted so badly.

However, the girl, now smitten with Jack, turned her back on the Pulitzer Prize, preferring instead to join Westinghouse, attend its Advanced Education School and obtain a degree in engineering. (Women are welcome at Westinghouse, an equal opportunity employer.)

Now they both work at Westinghouse —while Jack designs atomic reactors for America's newest missile-firing submarines, his beautiful ex-reporter wife, an education specialist, helps train Peace Corps volunteers for overseas duty—and they're only a bean's throw from the neat white cottage they share with his mother.

And they all lived happily ever after.

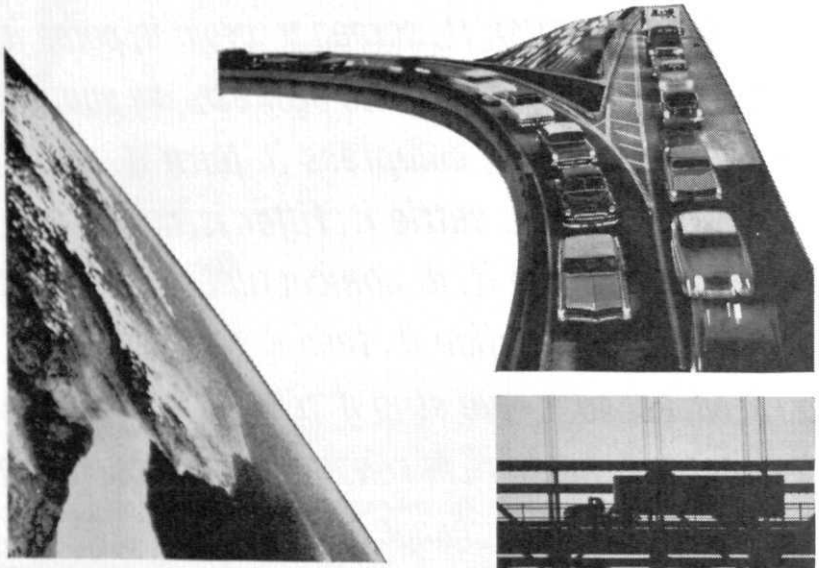
Moral: By planting your career seeds with Westinghouse, you, too, can climb the beanstalk of success, overcoming giant obstacles and earning a lot of golden rewards.

You can be sure if it's Westinghouse

For further information, contact the Mr. Greeley from Westinghouse who will be visiting your campus during the next few weeks or write: L. H. Noggle, Westinghouse Educational Center, Pittsburgh, Pennsylvania 15221.

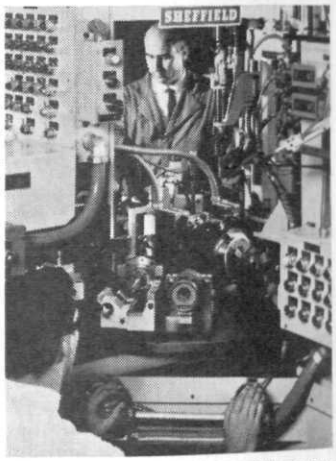
*The Westinghouse Operating Groups: Consumer Products; Industrial; Construction; Electronic Components & Specialty Products; Atomic, Defense & Space; Electric Utility.

These are some exciting things Bendix® is doing. You could be doing them, too!



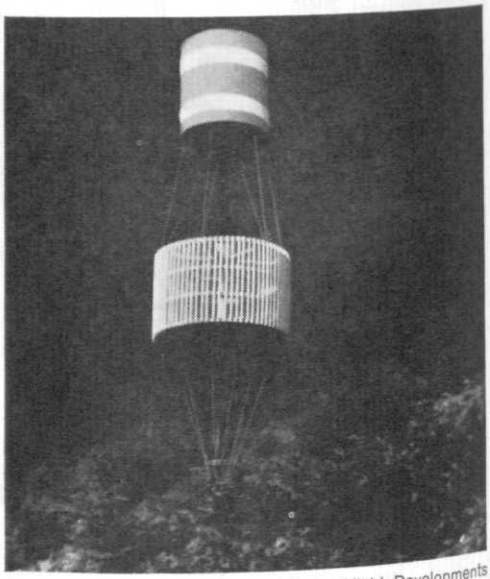
Space and missiles. Bendix activities span many phases of the U.S. space program—from producing guidance and control systems to studying the nature of the moon's surface.

Automotive. Brakes, steering, carburetion and other related components are continually being improved by Bendix engineers.



Automation. Bendix is providing manufacturers with many types of cost-cutting equipment—including numerical control systems and automatic gaging and monitoring systems.

Aviation. Results of Bendix research include the first commercial all-electronic autopilot and, just recently, the first FAA-approved all-weather landing system.



Oceanics. Bendix is a leader in this new field. Developments include navigation devices to withstand pressures at 3 miles deep, underwater telemetry, guidance/control systems for anti-submarine torpedoes and submarine steering systems.

Picture yourself a Bendix engineer working in one of these areas: space, missiles, aviation, automotive, oceanics or automation. Whichever field you choose, Bendix offers you the challenges and opportunities that come with working on projects and programs ranking among today's most important.

Why not look further into all the diversified activities Bendix has to offer? Materials are available from our representatives when they visit your campus. Or write directly to J. M. LaRue, Director of University and Scientific Relations, The Bendix Corporation, 1104 Fisher Building, Detroit, Michigan 48202.

Bendix has 31 divisions and 13 subsidiaries throughout the United States, and 21 subsidiaries and affiliates in Canada and overseas. An equal opportunity employer.

THE Bendix CORPORATION

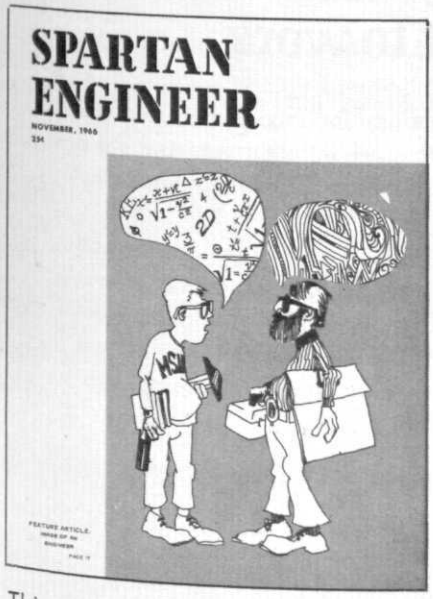
FISHER BUILDING, DETROIT, MICH. 48202

WHERE IDEAS UNLOCK THE FUTURE

Bendix divisions are in California, Florida, Missouri, Iowa, Ohio, Indiana, Michigan, Pennsylvania, New York, New Jersey, Maryland.

SPARTAN engineer

VOLUME 20 NUMBER 1 NOVEMBER, 1966



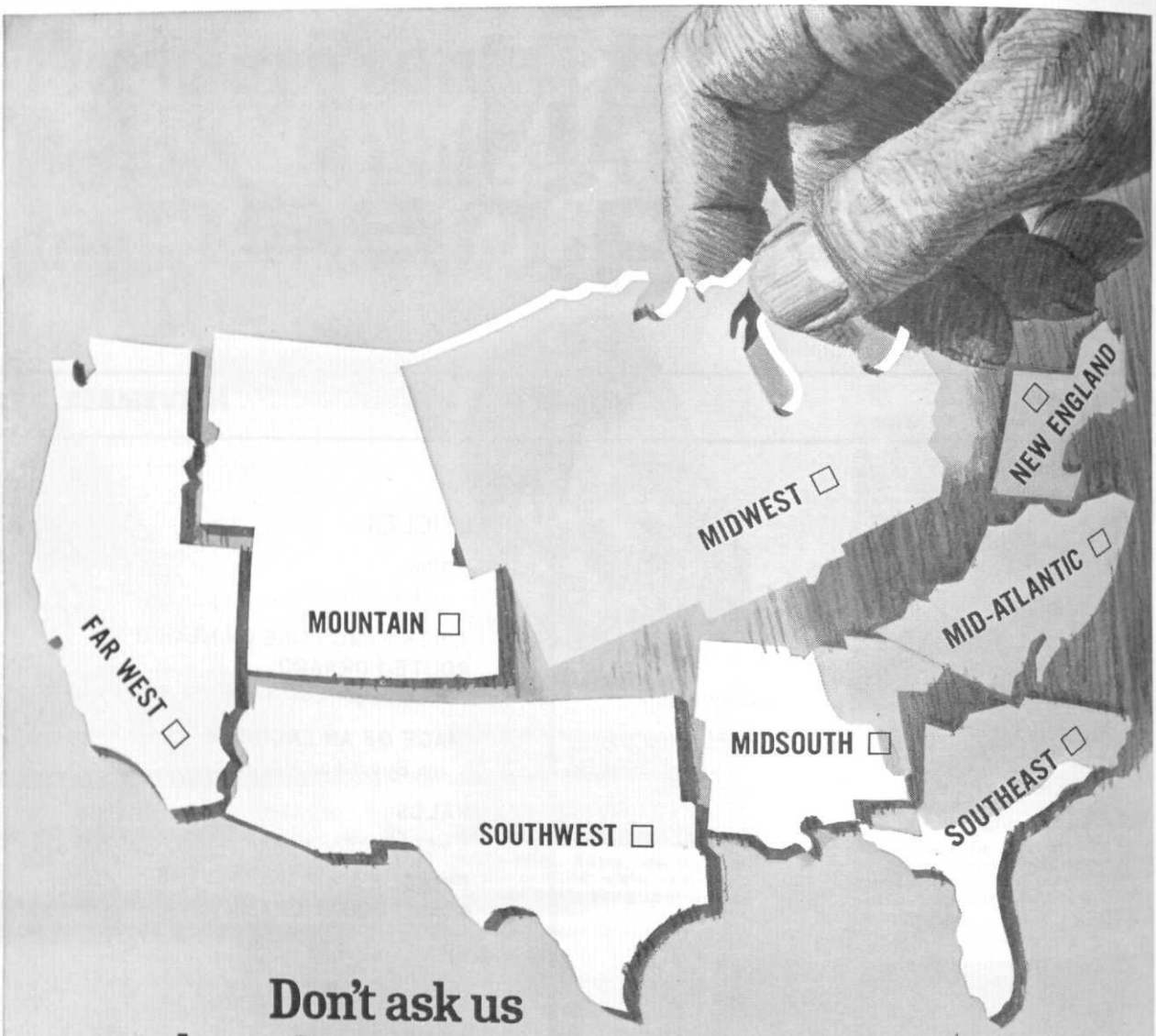
This month's cover is done by Tom Price and depicts his idea of the difference between engineering and art students.

ARTICLES

DEPARTMENTS

Member, Engineering College Magazine Associated
Chairman: Howard K. Schwebke
University of Wisconsin, Madison, Wisconsin
Publisher's Rep.: Littell-Murray-Barnhill, 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 Bldg., Phone 517 355-3520.
Subscription rate by mail $1.00 per year. Single copies 25¢.



Don't ask us where the opportunities are... just check where you want to work

This year Monsanto will have well over 1,000 professional openings for engineers, scientists and college graduates of all degree levels. That means the chances are excellent you can get a job you'll like in a location you want. As the map above shows, Monsanto Company has many good jobs available all over the country.

Find out about the many career opportunities available at Monsanto, one of the largest and fastest-growing chemical companies in the world. Our products range from plasticizers to farm chemicals; from nuclear sources to chemical fibers (Chemstrand Division). We even make electronic instruments. And we're growing. Sales have quadrupled in 10 years. Make an appointment at your placement office to talk to the Man from Monsanto. Or write: Monsanto Company, Professional Recruiting, St. Louis, Missouri 63166.

Monsanto®

An equal opportunity employer

Editorial..

A STATEMENT OF POLICY

Those of you who have seen the Spartan Engineer in past years will notice a change starting with this issue. While in the past the magazine has consisted mainly of technical articles on the various phases of engineering, this year those articles will be hard to find. Poetry, science fiction, and essays, such as the one in this issue showing how an English major views an engineer, will be much more common than anything containing an equation. These articles are intended to help the engineer look at himself and decide whether he is happy with the "Image of an Engineer." Through the Spartan Engineer you, as engineers, will be able to see yourself as others see you, and this has long been known to be the best way of realizing your faults and seeing how to correct them. As a magazine written for and by engineers, the Spartan Engineer is in the position of being able to concentrate on the problems of being an engineer.

At the recent Engineering College Magazine Association convention in Philadelphia, I discussed with many other editors of engineering magazines whether articles of this nature are proper in a college engineering magazine. My argument was that while you could read reactionary and controversial articles in "The Paper," poetry and fiction in "Zeitgeist," and technical articles in "The IEEE Journal," only in a college engineering magazine such as the Spartan Engineer can you combine the three together.

It is my hope that the Spartan Engineer can start a new trend among college engineering magazines. Never before, to my knowledge, has a college engineering magazine tried to become as diversified as the Spartan Engineer will be this year. It is a new idea and one that will be tested this year. Your comments on this policy, or on any article in the magazine, are more than welcome. If you disagree with any idea expressed in the magazine your rebuttal will always find an open space in the next issue. With your help and support, I'm sure the Spartan Engineer will be a most different and most entertaining magazine.

Gary Romano

what's so special about Collins?

Unusual career opportunities? Fringe benefits? Ideal locations? Exciting work? Advancement potential?

Well, almost every industrial concern can offer those.

We can show you dozens of photographs of career people working at Collins, using the finest facilities and tools available. But that isn't the whole Collins story.

You see, one of our biggest specialities is you. Your speciality is special at Collins. Every major engineering breakthrough at Collins can be traced to an individual specialist or team of specialists.

Which leads to another speciality: state-of-the-art communication systems. Collins' record of "firsts" over the years is an enviable one: single sideband development, space communication systems, aircraft all-weather landing systems, high-speed data communication and message switching networks—to name a few.

We suggest you contact Collins' representative when he's on campus. And contact your college placement officer for details.

The rest of the Collins story? We frankly can't tell you at this moment.

You'll be writing it.

COMMUNICATION / COMPUTATION / CONTROL

COLLINS

COLLINS RADIO COMPANY / DALLAS, TEXAS • CEDAR RAPIDS, IOWA • NEWPORT BEACH, CALIFORNIA • TORONTO, ONTARIO

Bangkok • Beirut • Frankfurt • Hong Kong • Kuala Lumpur • Los Angeles • London • Melbourne • Mexico City • New York • Paris • Rome • Washington • Wellington

At DuPont your "accomplibility" is rewarded

Handsomely.

What's "accomplibility"?

It's our special word for a technical man's capacity for individual accomplishment, for getting things done—well. It may be a breakthrough in fiber technology, a series of professional lectures, or the development of a new process machine.

As a technical man*, you should be thinking about your opportunities for achievement in the field of your choice.

Du Pont offers a climate of freedom and innovation, plus the means to accomplishment. You have at your disposal the equipment and materials you need for exploring ideas . . . proving out theories. You have specialists for information, trained technicians to assist you.

The rewards are impressive: recognition . . . leadership . . . reputation . . . challenge.

And a well-satisfied "accomplibility."

Learn more about Du Pont. Send this coupon for a subscription to the Du Pont magazine.

E. I. du Pont de Nemours & Co. (Inc.)
3656 Nemours Building
Wilmington, Delaware 19898
Please send me the Du Pont magazine.

Name_____

Class_____ Major_____ Degree expected_____

College_____

My address_____

City_____ State_____ Zip Code_____

*This year, our recruiters will be at your school looking mainly for Ch.E., M.E., I.E., E.E., C.E., chemistry, physics and mathematics graduates. Du Pont is an equal opportunity employer.

DU PONT

REG. U.S. PAT. OFF.

Better Things for Better Living . . . *through Chemistry*

Dean's Letter

The traditional Engineering Curricula in the College of Engineering at Michigan State University are about to be supplemented by a new and very exciting curriculum offering. The new offering, to be known as the Engineering Science Program, offers the student great flexibility and allows him the possibility of creating a program which will meet his specific objectives.

The basic outline of the program is as follows:

I. American Thought and Language (111, 112, 113)
Social Science (231, 232, 233)
Humanities (241, 242, 243) 33 credits

II. Mathematics (111, 112, 113, 214, 215)
Chemistry (111, 112, 113)
Physics (287, 288, 289)
Computer Programming 51 credits

III. Major Area A. This work must be taken in the College of Engineering. Minimum of 42 credits

IV. Minor Area B. This work may be in any College. Minimum of 24 credits

V. minor Area C. This work must be outside of the College of Engineering if Minor Area B is in Engineering. Minimum of 16 credits

VI. Electives to be taken in any area of the University to give an overall total of 180 credits, exclusive of Natural Science and HPR.

The 42 credits minimum in the major area A, the 24 credits minimum in the minor area B and the 16 credits minimum in the minor area C must each go toward the attainment of a clear capability in a single area of study. In addition, the work of A, B and C must be complementary and lead toward a unified educational objective.

Typical areas for the major work A would include the following:

Thermodynamics and Heat Transfer - Mechanics - Systems Science - Computer Science - Material Science

The minor work B and C might be drawn from the following areas:

Mathematics - Statistics - Physics - Chemistry - Business - Biological Science - Any area of A - Any other Engineering discipline.

The faculty committees in the Computer Science and Systems Science areas have supplied considerable detail with respect to possible programs in their areas and some of these will be used as examples of the flexibility and power inherent in the Engineering Science Program.

Major Area A - Systems Science
Minor Area B - Computer Science

This combination would provide the student with a strong background in engineering systems with emphasis on all phases of computers and their application to analysis, design, control and optimization. The second minor could be in Mathematics or Electronics.

Major Area A - Systems Science
Minor Area B - Chemical Processes

Here the student would be specifically oriented toward the operational analysis and control of large-scale process systems. Second minor work could be in Mathematics and Statistics, Biochemistry or Microbiology.

Major Area A - Systems Science
Minor Area B & C - Mathematics - Statistics, Transportation, Production or Economics

Such a program would be most appropriate for students desiring a broad program in engineering systems and anticipating either graduate study in the College of Business or employment with an engineering firm with management responsibility.

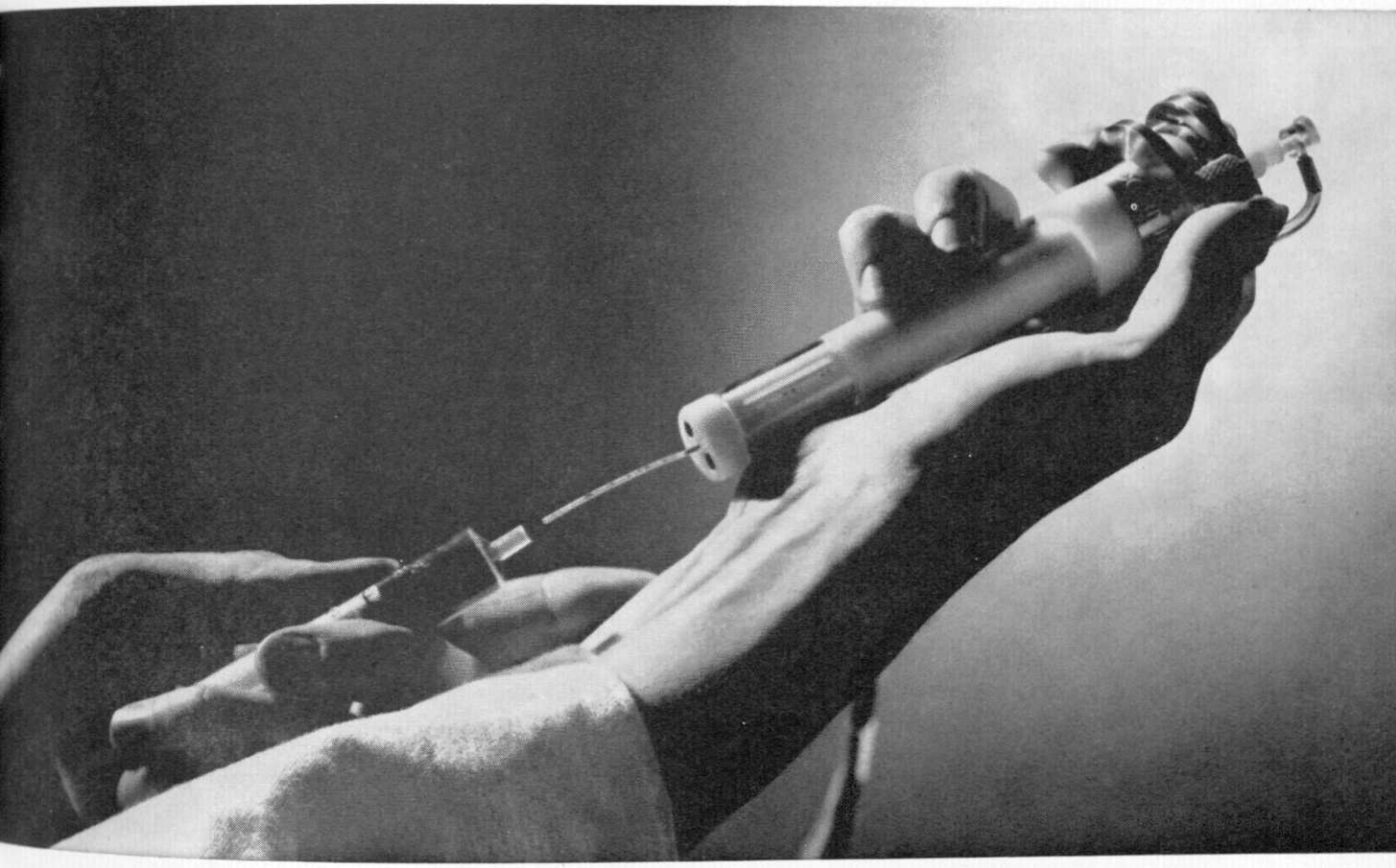
Major Area A - Computer Science
Minor Area B - Mathematics - Statistics

By proper choice of the mathematics preparation, such a program could lead to work in the theory and design of computers, or for mathematical or statistical computer applications. The second minor could be taken in Systems Analysis, in Electronics or in many areas of Business such as in the example above.

The advisers in the Student Affairs Office, College of Engineering can provide detailed answers to questions arising for the Engineering Science Program.

Dr. L. Von Tersch
Associate Dean

If you still think glass is just glass,



ask a clinical chemist.

Determining the pH, or relative acidity, of a patient's blood is a routine part of many physical examinations. Until recently, this was a time-consuming process. It involved the use of a cumbersome water bath to maintain the blood sample at body temperature. Now all it takes is 15 seconds. Ask a clinical chemist.

The difference is a new blood pH system designed and engineered by Corning research. Heart of the system is an electrode with a glass element that senses the difference in acidity between the sample and a liquid of standardized pH. A proportional electronic heater holds the temperature of the sample to within $\pm 0.01°C$ of any preselected temperature. Warm-up time from plug-in is only 3 minutes. An aspirator provides for quick flushing of the electrode after each use.

Sophisticated instrumentation like this is just one more example of the new glitter in glass. Today, glass can be made six times stronger than steel. Or as soft as silk. It can bend or not bend. Break or not break. Melt or not melt. It can be molded, cast, machined, drawn and pressed. In short, it possesses more useful capabilities than any other known material.

For solutions to their materials problems, industry and government are coming to Corning. Because Corning is *the* glassmaster. It's a broad, international company, with one of the most daring, expert and imaginative research and engineering staffs in the world. Plus a marketing principle that commits them to developing products only in areas where a need exists and no product does.

Young engineers seeking challenge, opportunity and advancement are invited to write to Career Development Manager, Corning Glass Works, Corning, N.Y. 14830.

CORNING
CORNING GLASS WORKS
AN EQUAL-OPPORTUNITY EMPLOYER

POEM

by EMIL SANPAKU

Hoddy Toddy
Oh by golly
Who the hell are we!

Engineers, engineers,
Professors screw it in our ears.
We are the smartest,
Are the best,
Yet are not millionaires.

Who cares?

Ding Dong Dell
The engineer's in hell.
He is dead,
And it is said
We'll make out just as well.

Think not only of the public's eyes,
For they are not the force that drives,

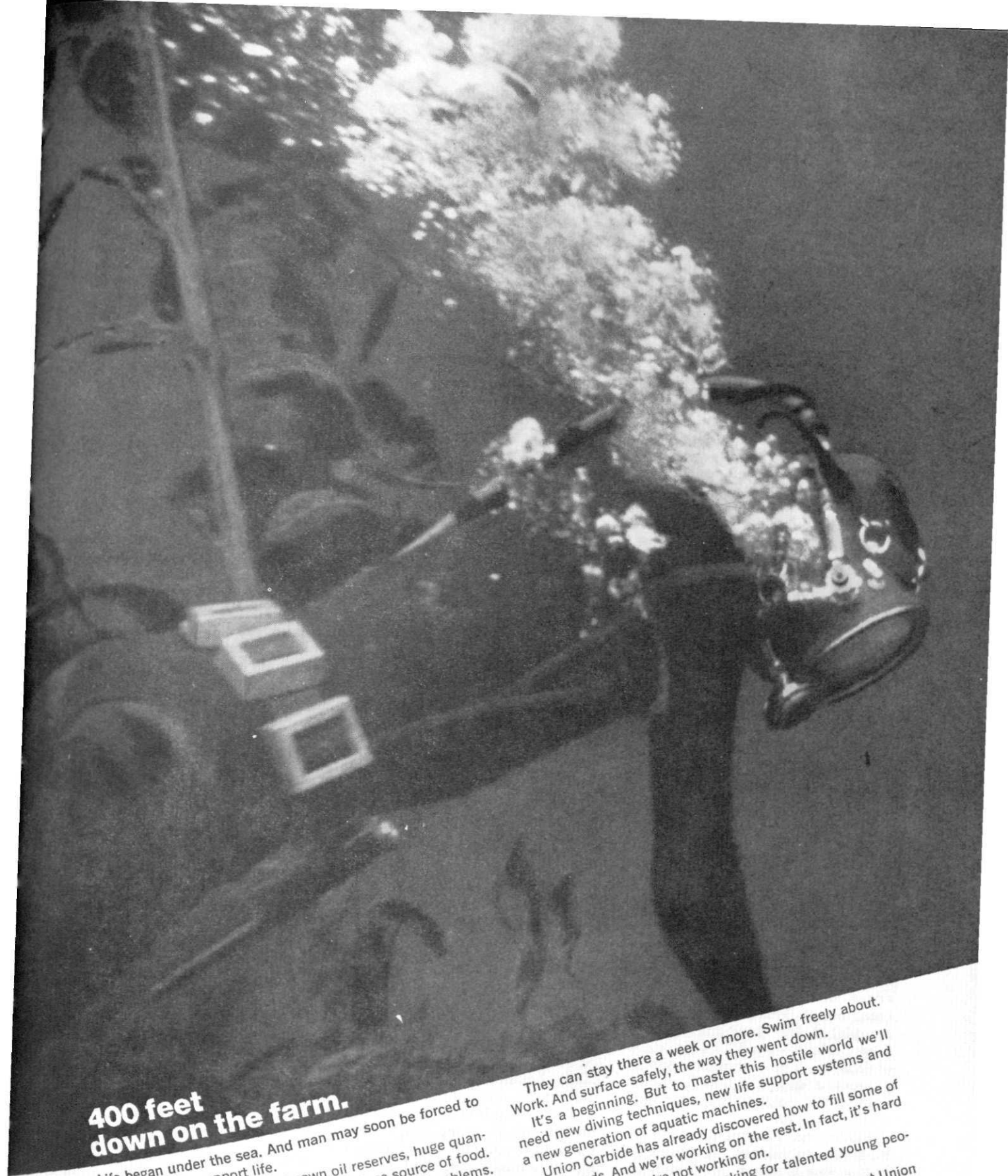
The Engineer

Star Light,
Star Bright,
First star I see tonight.
The engineer with all his might,
Will reach you and put out your light.

Goodnight

Our IBM, who is so great,
Long may your coils glow.
Thy answers come,
Thy will be done,
On tape,
as well as paper.
Give us this day, your knowledge great;
And forgive us our errors,
As tomorrow we will program correctly,
For we have much to learn.

IBM.



400 feet down on the farm.

Life began under the sea. And man may soon be forced to return there to support life.

There lie half the world's known oil reserves, huge quantities of other raw materials and a limitless source of food.

But at 400 feet, working creates enormous problems. Pressures are 13 times greater than at the surface. Normal air mixtures transform man into a senseless drunk. If he surfaces too quickly, he dies in agony.

Yet men are at work there now. Union Carbide's Ocean Systems Inc. brings them down in a new kind of diving bell; supplies them with "air" that is 80% helium, special breathing gear and a pressurized cabin to live in.

They can stay there a week or more. Swim freely about. Work. And surface safely, the way they went down.

It's a beginning. But to master this hostile world we'll need new diving techniques, new life support systems and a new generation of aquatic machines.

Union Carbide has already discovered how to fill some of these needs. And we're working on the rest. In fact, it's hard to find anything we're not working on.

That's why we're always looking for talented young people to help us.

Your placement office has more information about Union Carbide. An equal opportunity employer.

UNION CARBIDE

THE DISCOVERY COMPANY

Dear Editor:

Some time ago you were kind enough to publish some of my articles on what Mexico is doing about agricultural development, (Editor's note -- Mr. Castillo's article on the Raudales Dam appeared in the November 1962 issue of Spartan Engineer.) and I am again hoping you will accept the enclosed one for publication in your magazine.

You will probably find typographic errors but this is happening to me because of my poor sight. I have already completed my 81st birthday, and am full of other ailments, but still working.

Thanking you for your kind attention to this matter, I wish to remain,

Sincerely yours,
Felipe Jauregui
Castillo
Soto 109-4-B
Mexico 3, D.F.

A NEW FLAG POLE ON

MEXICO'S ROUTE FORWARD

by F. Jauregui Castillo

As a part of a sustained nation-wide effort of the Mexican Government Departments to reduce the extent of poverty that persists principally in rural areas of the country, the Secretariate of Hydraulic Resources completed last year the "Adolfo Lopez Mateos Dam" in the state of Sinaloa. The completion of this project added 375,000 acres of new fertile land to this bountiful western region.

Since the allotment of these newly reclaimed agricultural lands was made in parcels of 25 acres to each peasant, 15,000 peasants and their families have received a release from the helpless conditions under which they formerly existed. The actual number of people helped by this project would prcbably number approximately 75,000, since Mexican families rarely consist of less than four of five members.

The significance of the ALM dam lies not exclusively in the allotment of land to farmers, but in that it also had incorporated and enlarged the cycle of early vegetable produce Sinaloa exports yearly to the United States, from which the state and the country at large derives considerable income. Right now the extensive concrete-lined network of irrigation canals built in connection with the dams is distributing and saving large volumes of water which were formerly lost through evaporation and seepage.

Futhermore, the existence of farm mechanization and modern means of plant defense introduced in Sinaloa several years ago when two other dams, the "Sanalona" and the "Miguel Hidalgo" were completed by the SHR will, in the opinion of reliable statisticians, cause a profound social and economic change in favor of the highly populated state.

The hydroelectric plant installed at the foot of the ALM dam is also a feature of prime importance, since the Federal Government feels that industrial development must accompany agricultural development, especially because a variety of raw materials abounds in the area.

As a complement to the utility of the ALM dam, national and foreign tourists, particularly North Americans, find tremendous appeal in the recreation facilities offered by the dam's 30,000 acre foot reservoir. The paved road leading to the artificial lake starts at kilometer 1450 of the Guadalajara-Nogales highway, and is only 12 miles long. The shortness of this route makes the journey an alluring prospect for visitors eagerly seeking southern latitudes to leave behind the severity of Northern winters. Here, in this ideal summer resort, they can relax or devote themselves to fishing and boating. Unfortunately, bathing is not to be recommended since the water is somewhat muddy due to continuous inflows from rains around the basin, but one can hunt not far from the lake where deer and other minor fauna such as rabbits, squirrels, and the like abound.

If, however, the visitor happens to be an engineer curious enough to combine pleasure with professional interest, he will probably be inclined to inquire into the particulars of the ALM dam to satisfy his occupational curiousity.

The massive structure, standing across the torrential Humaya river, is 107 meters high, 800 meters long, 10 meters at the crown, and 475 meters at the base. To insure a good foundation, a thorough cleaning of the contact area was effected, and all loose material was removed. The trench resulting from this dredging was 9 meters deep and 60 meters wide at the bottom, with slopes at a ratio of 1.5:1, and was filled with copund clay to filter the river carryings.

In the center of this trench and all along its axis a concrete dentil was built to variable depths, penetrating to sound rock and into the impervious core of the dam. Close to and supported by the dentil, deep injections of 1,780 cubic meters of grouting were made through 16,000 meters of drillings.

The watershed and its main sources of water supply extend through the states of Durange, Chihuahua, and Sinaloa proper, covering an area of 11,570 kilometers or 75% of the Culiacan river flow. Of the 3,500 million cubic meters of water confined in; the reservoir of the ALM dam, 130 million cubic meters are silt deposits, 2,810 million cubic meters are used for irrigation and electric power production, and 650 million cubic meters are reserved for flood control.

The outlet of the dam was excavated into a natural formation of compacted and impervious cal-

ciferous tufa known in the region as Boucarit's formation. The bottom of the outlet trench was covered with a layer of fluvial carryings 9 meters thick.

There are three zones of chosen materials in this dam. The middle section constitutes the impervious zone and consists of compacted clay, with slopes 0.5:1 on both sides. The filtering zones between the impervious and the pervious materials were built of gravel and river sand, with slopes 1:1.5. The pervious zones are formed by rock, having variable slopes of 1.75:1 from the dam's crown to elevation 175 meters, continuing, on the upstream side with slopes 2.2:1 till elevation 112.25 meters, and 3:1 down to natural ground. Both faces of the dam are protected by layers of selected rock 3 meters thick, placed by dumpings.

The spillway was built at a port called "La Cutama" located about 4 kilometers north of the outlet. It discharges into the Humaya river bed through "El Potrere" creek. This spillway is of the fan type; has two free symmetrical and circular centers at the base, with depressed Creager's profiles. It converges into a discharging canal which carries the water to the Humaya river. Built of concrete, this spillway has a length of 160 meters at the crest, and the designed flow is estimated at only 15,000 cubic meter/s, already regularized in the reservoir at only 5,600 cubic meter/s to pass with a load of 7.47 meters, leaving a free edge of 3.02 meters.

The discharging canal is 35 meters wide at the bottom, and 650 meters long; its whole length has been lined with reinforced concrete. In order to lodge the structure it was necessary to excavate 1,200,000 cubic meters of soil, and its construction required 26,000 cubic meters of simple and reinforced concrete. The steel for reinforcement amounted to 545 tons.

The intake works were built on the right-hand side declivity of the dam. This structure consists mainly of two tunnels 7 meters in diameter and about 600 meters long. On some sections of these tunnels reinforced concrete lining was not necessary because of the Boucarit nature of the formation. These tunnels feed the turbines of the hydroelectric plant and at the same time provide water for irrigation.

Within the area presently covered by the reservoir there formerly existed 72 small settlements occupied by 545 families, an aggregate of 3,400 people, who lived on dry farming and a few head of cattle. To each family, besides the 25 acres of agricultural land, 525 square meters of extra ground was given to their headman on which, with material and technical assistance from the SHR's engineers decent houses were built, a procedure which has been followed throughout the country.

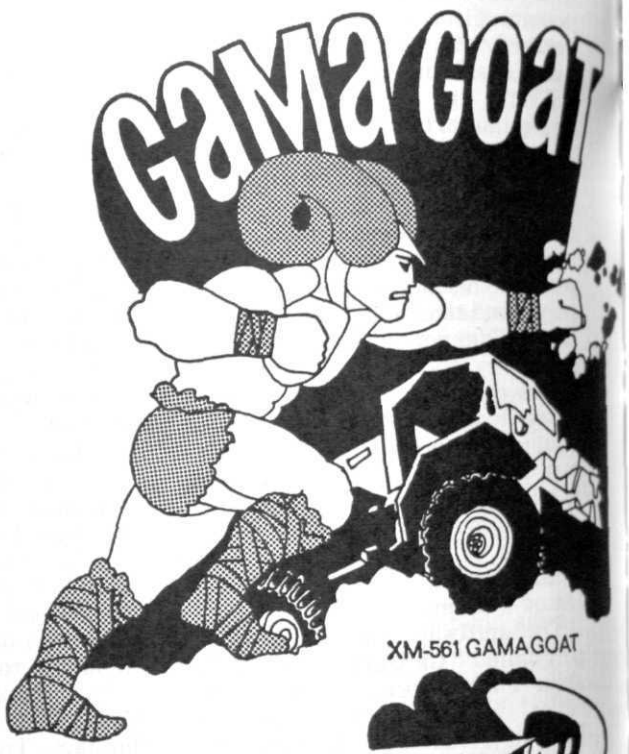
All of the foregoing refers only to the outstanding achievements of the SHR in the state of Sinaloa, although at the present time the organization has completed 88

CONTINUED TO PAGE 29

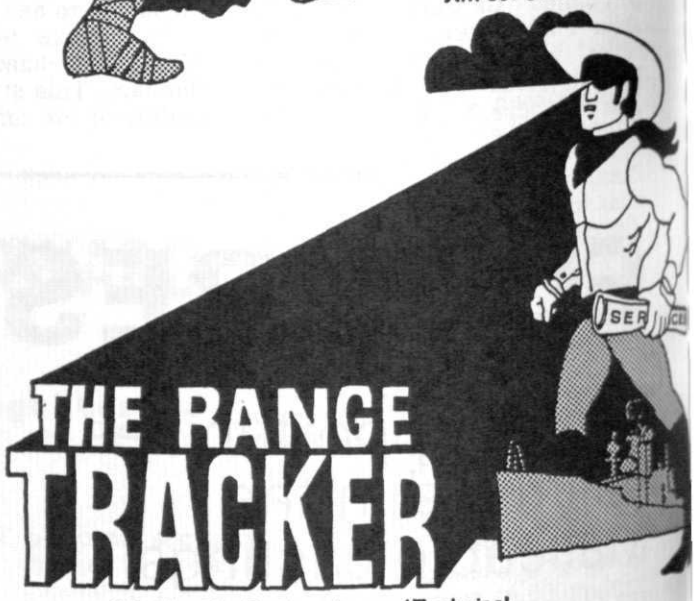
be a Hero . . .

or "How to practice your one-upmanship on industry". We do it all the time at LTV Aerospace Corporation—dreaming up big shiny things like a plane's plane or a missile's muscle. In fact, our Hero engineers have come up with some of the nation's superest Super Stars. The word is out that there are some great star gazer spots open now (some earthy ones, too). So whether you're a circles, waves or angles engineer, you, too, can be a Hero in such areas as aerodynamics ☐ avionics and instrumentation ☐ airframes design ☐ systems analysis ☐ reliability ☐ dynamics ☐ systems design ☐ propulsion ☐ stress analysis ☐ industrial engineering ☐ technical administration . . . and others.

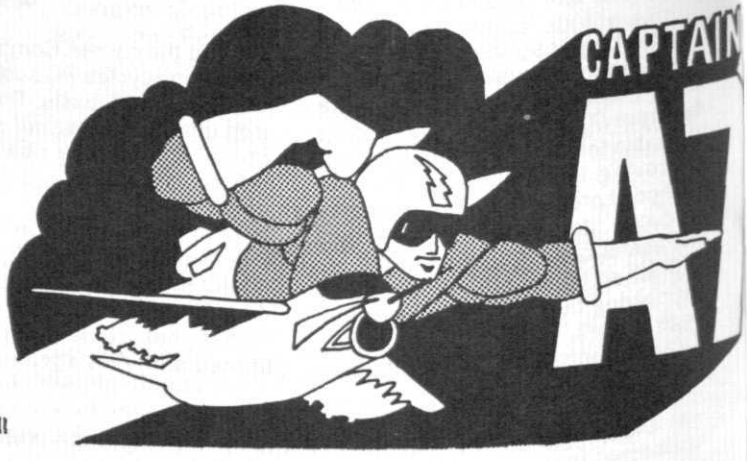
Get the whole story. Ask your Placement Office, then write College Relations Office, LTV Aerospace Corporation, P.O. Box 5907, Dallas, Texas 75222. And when you write, be sure to ask, "how's your LTV bird" . LTV is an equal opportunity employer.



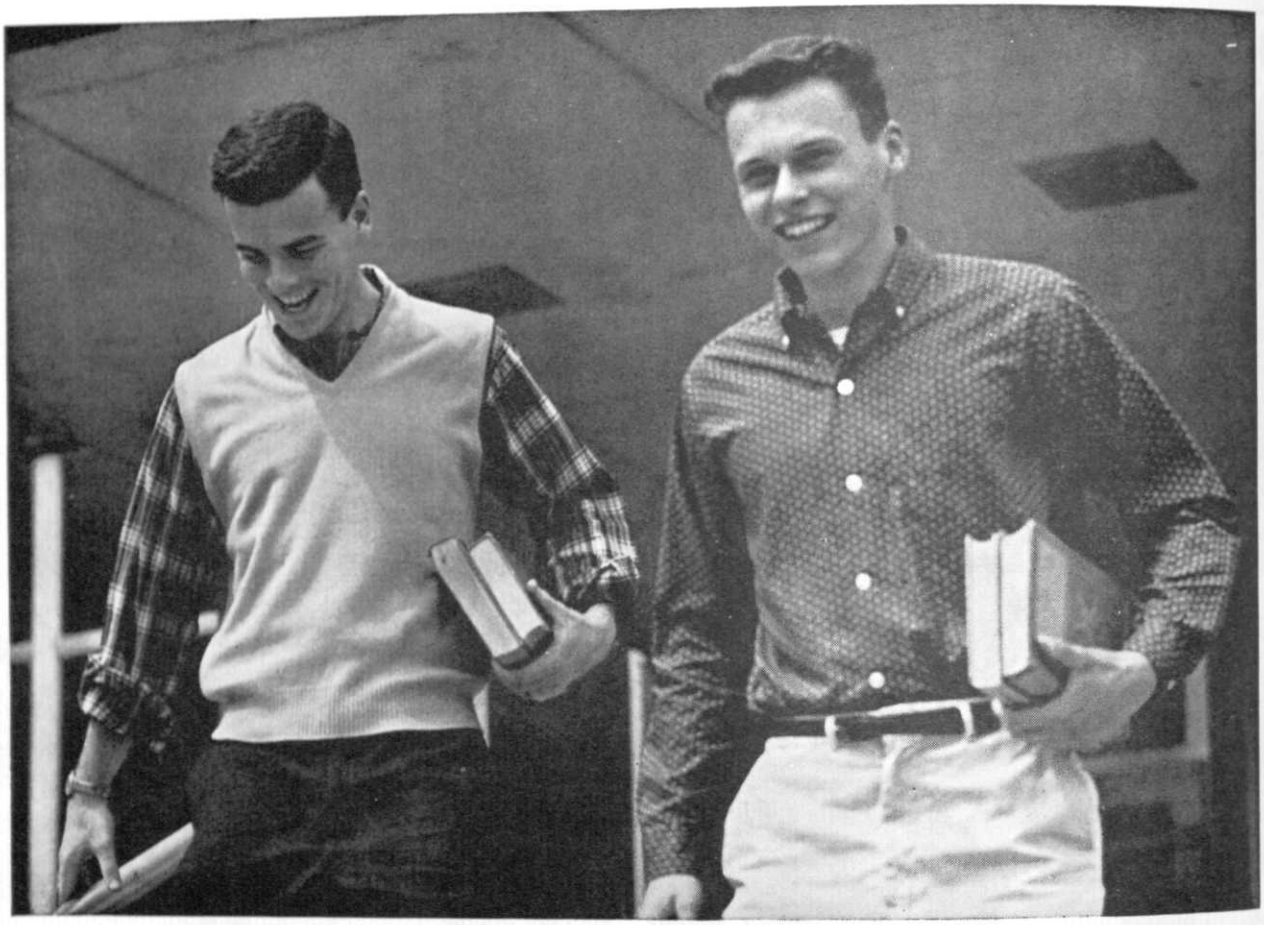
XM-561 GAMA GOAT



World-wide Engineering and Technical Services/Ships Instrumentation



A-7 Corsair II



What turns you on?

Responsibility? Professional Recognition? Financial Reward? We know of no company better able, or more disposed, to satisfy these goals than Celanese Corporation.

Why Celanese? You'll be working for a young company that's growing fast—and "plans" to keep growing. 1965 sales rose 23% to over $860 million. Our future planned growth depends on our ability to attract top-notch people who can grow with us.

Sound good? If you feel you can perform in our fast-moving, intellectually demanding environment, it should.

If you're ambitious, flexible and imaginative, well trained in chemistry, physics, chemical, electrical or mechanical engineering, marketing, finance, accounting or industrial relations, we'd like to talk to you—regardless of your military commitments. And you'll like what you see at Celanese.

Discuss us with your faculty and Placement Officer and see our representative when he is on your campus. Or write to: John B. Kuhn, Manager of University Recruitment, Celanese Corporation, 522 Fifth Ave., New York, N. Y. 10036.

CELANESE

AN EQUAL OPPORTUNITY EMPLOYER

IMAGE OF AN ENGINEER

by Jim Buschman

It began much the same as any conversation. I sat absentmindedly gazing through the windows of the Crossroads Cafeteria, watching the construction workers put the finishing touches on the new Math-Languages Building, as I sipped my morning cup of coffee. As usual, I was contemplating what it would be like to work construction. Several of my friends had managed to squeeze in a few weeks of hard labor between college and the army, but so far I had avoided both Uncle Sam and the Construction Worker's Union with equal agility. I knew a little about it, though. When I was a kid in the suburbs, we stole enough lumber, shingles, and roofing tar to build a three-story treehouse, and I had once put my initials on the second tower of the Mackinac Bridge.

"Mind if I join you?" My train of thought was interrupted, and I looked up.

"No--go right ahead," I answered. My guest was tall and thin. His levis and socks were white, his shirt was the same fluorescent orange color of the cafeteria tray he had balanced on his forearm, and his sleeves were rolled to three-quarter length. He wore black-rimmed glasses and carried an untidy notebook, a T-square, six very thick books, and a rumpled Barracuda jacket under his right arm.

"Some building," I commented, indicating the giant structure outside.

"Yes it is," answered my friend. "It's eight stories high, or a total of 185 feet. Its width is 156 feet, and it is 963 feet long. Each of the steel girders in its frame has a tensile strength of 120,000 pounds per square inch. It employs a complex concept of design created by Enrico Piazzi and later developed by George Donlevy. Of course it costs more to construct that way, but the overall value of the building will be greatly enhanced."

"You wouldn't be in engineering, would you?" I asked him.

A look of dismay came over his face. "I didn't think it showed," he murmured. "We students in engineering are trying to get away from this old image of us that everyone seems to have."

"It really was just a lucky guess," I replied, not wanting to hurt his feelings. "What image are you referring to?"

"Aw, you know--the idea that an engineering major is a funny-looking guy who talks in mathematical formulas and wears a slide rule on his belt. It isn't true anymore. We want to broaden our interests. Just look at these books."

He spread them out on the table, knocking his coffee over in the process. Besides a calculus book and something called Thermodynamics -- Principles and Properties, there were volumes on the life of Beethoven, Stanislavskyan acting methods, the complete works of Shakespeare, and Tolkien's Trilogy of the Ring.

"Very impressive," I said, and his face lit up. Encouraged, he went on proudly: "And I've also had courses in Art and Philosophy."

"Philosophy of what?" I queried.

"Philosophy of Electrical Engineering."

"I see. I notice you're still wearing your slide rule. Isn't that a part of the old image?"

"Yes, it is," he admitted, "but there are some things you just can't part with."

"I suppose."

"For my art project last year I made a new case for it. Would you like to see it?"

I said I would. I could tell by the skill with which he unbuckled his belt and slid off the slide rule that he had done this before.

"Notice the leather engraving," he pointed out.

I did. Boyle's Law in Gothic script. It was beautiful.

"Actually, this isn't my only slide rule," he went on. I have a larger one, and one slightly smaller, and then an itty-bitty white one only an inch long." (I could tell that was his favorite.) "Let me show you," he said as he flipped out his wallet. "There's my baby. And here's a shot of the four of them together. That was taken last summer."

"You have a nice family."

Suddenly he seemed to come back to earth. "I'm sorry," he said, "I'm getting carried away with engineering again. My advisor warned me not to do that. Watch the image, he told me. He suggested that I write some poetry, so I tried it. He said it was good for the soul, and it is. I call my poem 'Engineer' ".

"May I hear it?"

"Of course." He giggled. "Now don't laugh. I never recited poetry before."

He cleared his throat and began to read:

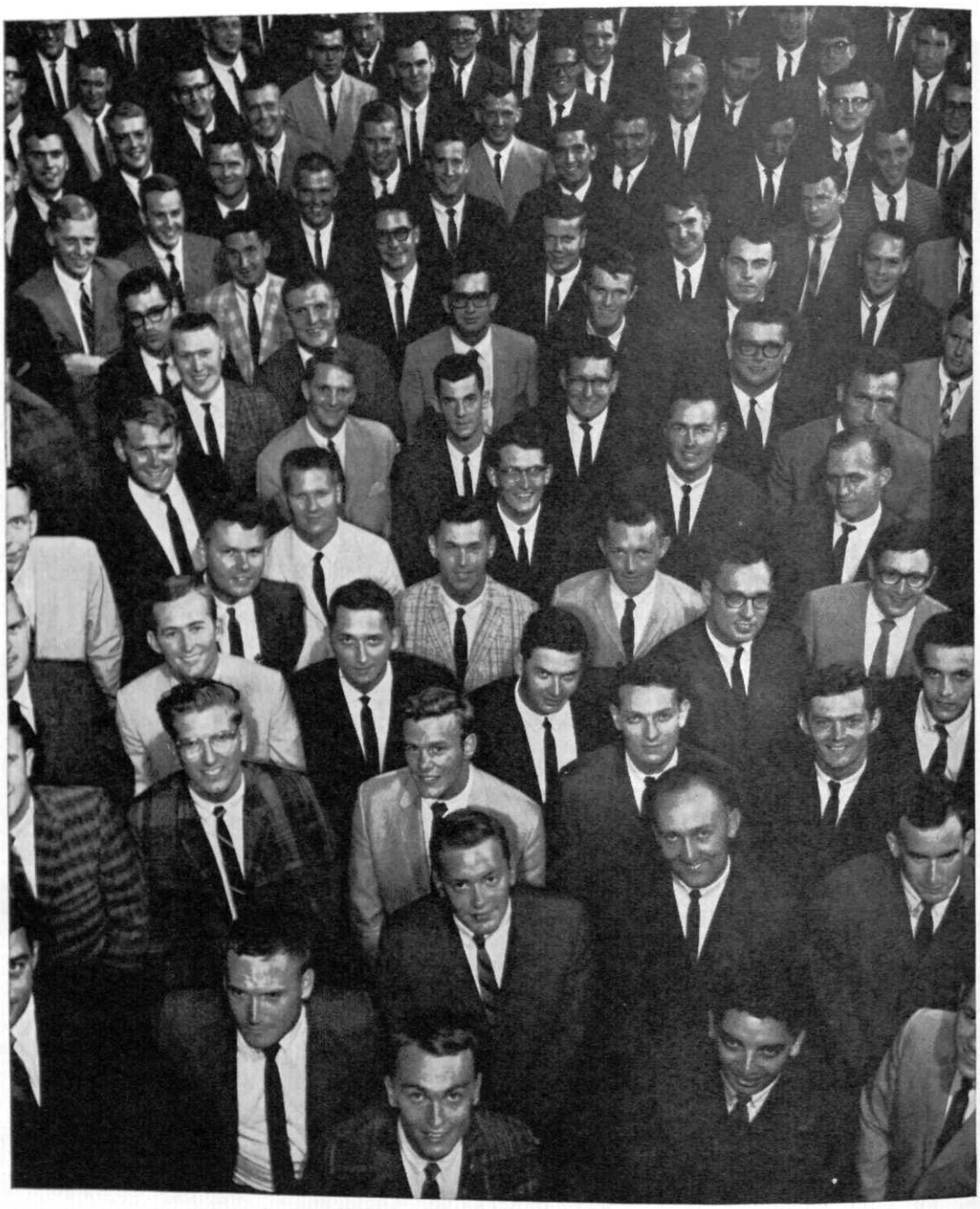
"En-gi-neer! En-gi-neer!
On your brawny back you bear
The weight of a nation,
En-gi-neer!

"Build me a highway, engineer!
Make it six lanes wide from
Detroit
To Houston, or
maybe
Topeka, if the money runs out.

"Build me an Astro-dome,
engineer!
But watch out for the unions,
boy,
'Cause if you don't they'll take
you
For everything they can get
Twenty-hour work weeks
Compensation
Coffee-breaks and
Tea-breaks and
Dr. Pepper-breaks
Damn unions, anyway.

"Build me a parking ramp,
engineer!
Only don't build many more cars
Or else I won't find a place to
park
Unless I drive a Honda
Build more Hondas, engineer!

CONTINUED ON PAGE 38



MEET THE CLASS OF '66

They're members of Bethlehem Steel's 1966 Loop Course —graduates of colleges and universities from coast to coast.

What is the Loop Course? Since 1922, we have conducted this course to train college graduates for management careers at Bethlehem Steel. Hundreds of men at all levels of management, including our Chairman, started as loopers.

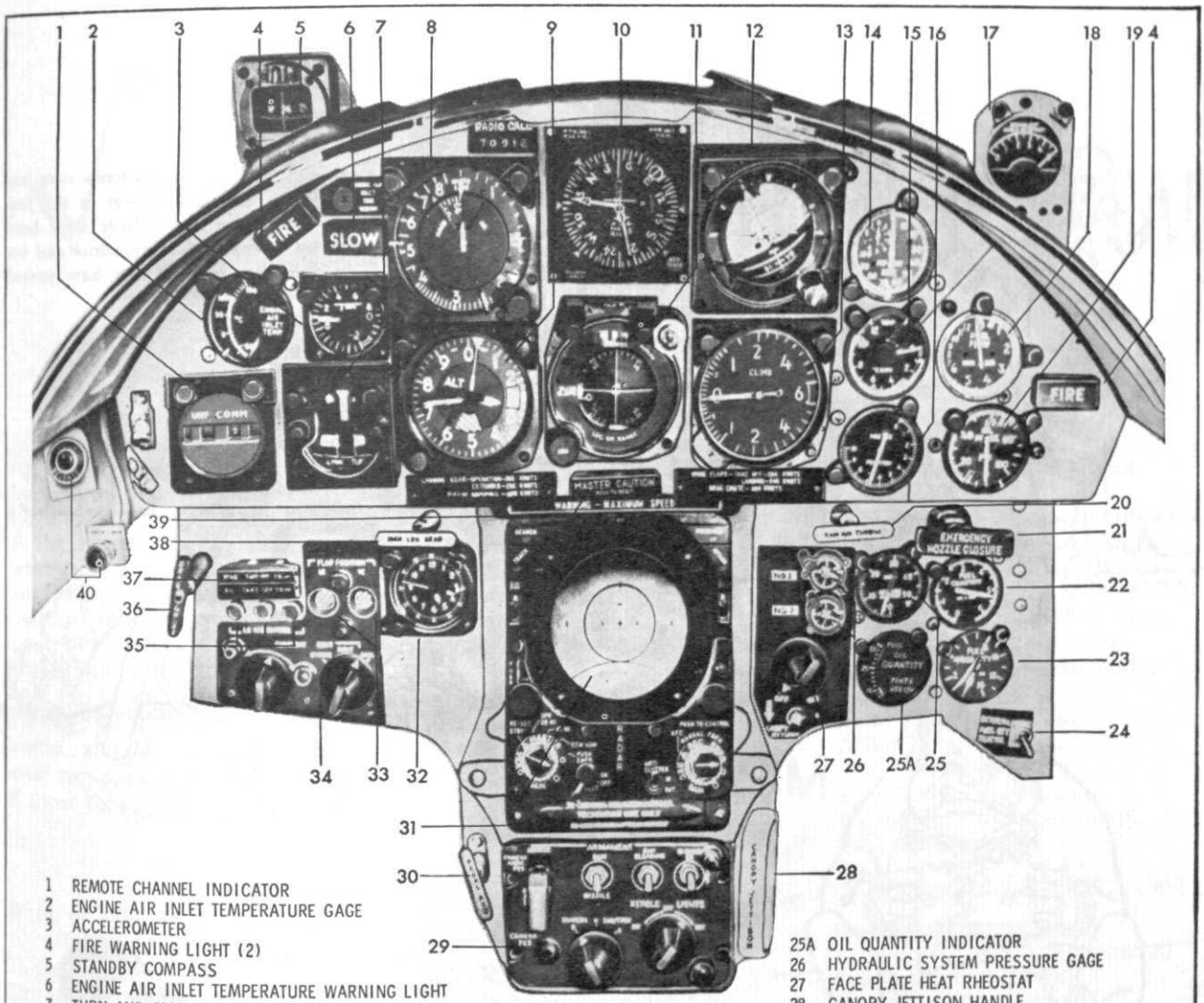
The '66 Loop convened at our general offices in Bethlehem, Pa., early in July. After five weeks of indoctrination, many of these men were assigned to facilities throughout the country for further brief training at the operations before undertaking their first job assignments. Others, such as sales and accounting trainees, remain at the general offices for longer periods before being assigned.

Although our primary need is for engineering and other technical graduates—such men have many fine opportunities in all phases of steelmaking, as well as in research, sales, mining, fabricated steel construction, and shipbuilding—both technical and non-technical graduates are needed for most of those activities as well as accounting, purchasing, traffic, finance and law, industrial and public relations, and general services.

You'll find a great deal more information in our booklet, "Careers with Bethlehem Steel and the Loop Course." You can obtain a copy at your Placement Office, or drop a postcard to Personnel Division, Industrial and Public Relations Department, Bethlehem, Pa. 18016.

BETHLEHEM STEEL

An equal opportunity employer in the Plans for Progress Program

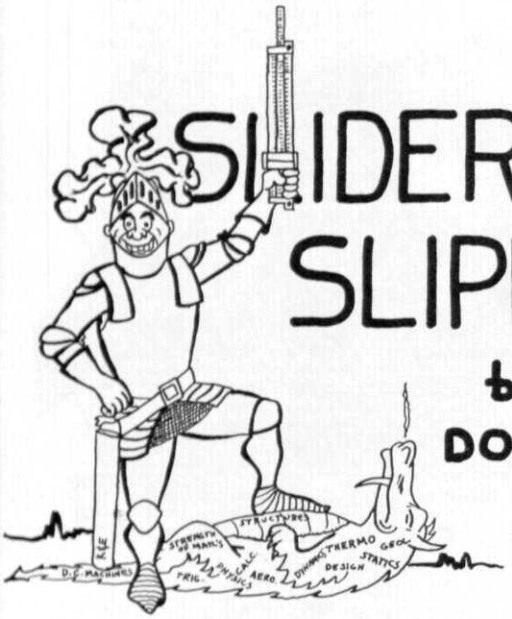


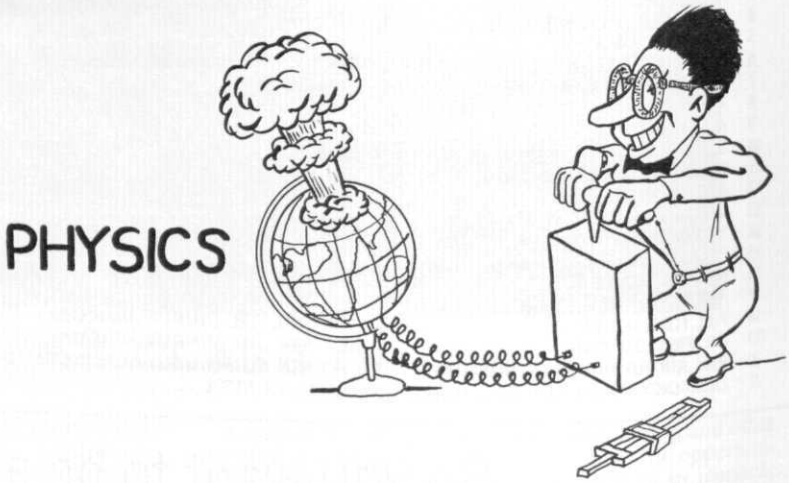
1 REMOTE CHANNEL INDICATOR
2 ENGINE AIR INLET TEMPERATURE GAGE
3 ACCELEROMETER
4 FIRE WARNING LIGHT (2)
5 STANDBY COMPASS
6 ENGINE AIR INLET TEMPERATURE WARNING LIGHT
7 TURN-AND-SLIP INDICATOR
8 AIRSPEED AND MACH NUMBER INDICATOR
9 ALTIMETER
10 BEARING DISTANCE HEADING INDICATOR ID-526 BDHI
11 COURSE INDICATOR (ID-249)
12 ATTITUDE INDICATOR
13 VERTICAL VELOCITY INDICATOR
14 TACHOMETER
15 EXHAUST GAS TEMPERATURE GAGE
16 EXHAUST NOZZLE POSITION INDICATOR
17 AUTOMATIC PITCH CONTROL INDICATOR
18 FUEL FLOW INDICATOR
19 OIL PRESSURE GAGE
20 RAM AIR TURBINE EXTENSION HANDLE
21 EMERGENCY NOZZLE CLOSURE HANDLE
22 INTERNAL FUEL QUANTITY INDICATOR
23 EXTERNAL FUEL QUANTITY INDICATOR
24 EXTERNAL FUEL QUANTITY SELECTOR SWITCH
25 CABIN ALTIMETER
25A OIL QUANTITY INDICATOR
26 HYDRAULIC SYSTEM PRESSURE GAGE
27 FACE PLATE HEAT RHEOSTAT
28 CANOPY JETTISON HANDLE
29 ARMAMENT CONTROL PANEL
30 RUDDER PEDAL ADJUSTMENT HANDLE
31 RADAR SCOPE AND CONTROL PANEL
32 CLOCK
33 WING FLAP POSITION INDICATORS
34 GUNSIGHT CONTROL SWITCH
35 LANDING GEAR POSITION INDICATOR LIGHTS
36 DRAG CHUTE HANDLE
37 STABILIZER AND AILERON TAKEOFF TRIM INDICATOR LIGHTS
38 MANUAL LANDING GEAR RELEASE HANDLE
39 MASTER CAUTION LIGHT AND RESET BAR
40 ARRESTING HOOK RELEASE BUTTON AND ARRESTING HOOK DOWN WARNING LIGHT

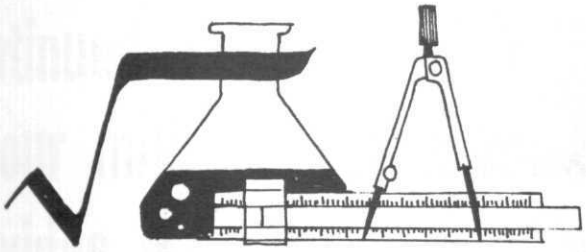
SLIDERULE SLIPPERS

by DON GATES

Editors Note: These cartoons were first run in the *Kansas Engineer* in the January, 1956 issue. They have since been used by several other magazines and are reprinted here because they have proved to be so popular.







PLACEMENT BUREAU

The following is a tentative listing of companies interviewing Engineering majors during the months of December, 1966 and January 1967. Each Monday of the regular term the Placement bureau publishes a bulletin containing the companies interviewing and majors and degree levels sought for the following week. This bulletin is the most reliable source of Placement Bureau information. Appointments should be arranged at least two days prior to the time of interview.

Week of Nov. 28-Dec. 2, 1966

Riegel Paper Co.
City of Ann Arbor, Mich.
McGill Manufacturing Co.
Goddard Space Flight Center
Johns-Manville Co.
Green Giant Co.
General Electric Co.
Standard Brands Corp.
Western Union
Factory Mutual Engineering Corp.
Wheelabrator Corp.

Week of Dec. 5-9, 1966

United Aircraft Corp.
U.S. Navy Development Center
Marbon Chemical Division of Borg-Warner
Illinois Dept. of Public Health
Central Soya Co.
Ingersoll-Rand
Pennsylvania Power and Light Co.
Kaydon Engineering Corp.
Aberdeen Proving Ground (U.S. Army)
H.K. Ferguson Co.
Atlas Chemical Industries
V.A. Hospital-Battle Creek
Gerber Products
New York Dept. of Health
National Security Agency
U.S. Navy Avionics Facility
Ebasco Service Inc.
Marathon Oil Co.
Rapids-Standard Co.
Warner-Chilcott Div. of Warner-Lambert
Department of Defense-Detroit

No interviews from Dec. 10, 1966 until Jan. 10, 1967 due to final examinations and term break.

Week of Jan. 11-13, 1967

Pennsalt Chemicals
AVCO-New Idea Farm Equipment
Packaging Corp. of America
Goss Co.
P.R. Mallory
Modine Manufacturing Co.
W.R. Grace-Cryovac Div.
American-Enka
Chas. Pfizer Co.
Rohm and Haas
Carbon Production Div. Union Carbide
Sealed Power
Morse Chain Co.
Keeler Brass Co.
Air Reduction Co.
Federal-Mogul Corp.
Westinghouse Corp.
National Aeronautics and Space Administration (NASA)
Kellog Co.
Symington-Wayne
General Electric Co.
Inland Steel Container Div. of, Inland Steel
McClouth Steel Co.
Mechanical Handling Systems Co.
Anchor-Hocking Glass Co.
U.S. Navy Propellant Plant
Massey-Ferguson

Week of Jan. 17-21, 1967

U.S. Army Corps of Engineers
Addressograph-Multigraph Corp.
Raytheon Corp.
Excello Corp.
Minnesota Ore Operations Div. U.S. Steel
U.S. Atomic Energy Commission
Aeroneutronic Div. Philco Corp.
National Castings Div., Midland-Ross Corp.
American Bosch Arma Corp.
Carrier Air Conditioning
Airborne Instruments Corp.
Hamilton Standard
Esso-Humble Oil Co.
Allied Chemical Co.
Whirlpool Corp.
Sperry Gyroscope Co.
Wynadotte Chemical Corp.
Bell Aerosystems

Week of Jan. 23-27, 1967

General Electric Co.
Applied Physics Laboratories
Pacific Missle Range
General Radio Corp.
General Motors Corp.
Newport News Shipbuilding and Dry Dock Co.
Sealright Corp.
Swift and Co. -- R&D
Anaconda Wire and Copper Co.
Perfect Circle
Corning Glass Works
Dupont
Boeing Co.
Linde Div., Union Carbide
International Telephone and Telegraph Co. (ITT)
Reynolds Metals Co.
Republic Steel
Honeywell
Industrial Nucleonics Co.
Bunker Ramo Corp.

Week of Jan. 30-31, 1967

North American Aviation
Eastman Kodak
Minnesota Mining and Manufacturing Co. (3M)
Lockheed-California Co.
Univac
Avis Industrial Corp.
Brunswick Co.
Hercules Powder Co.

NEWS for 1966 1967 ENGINEERING GRADUATES

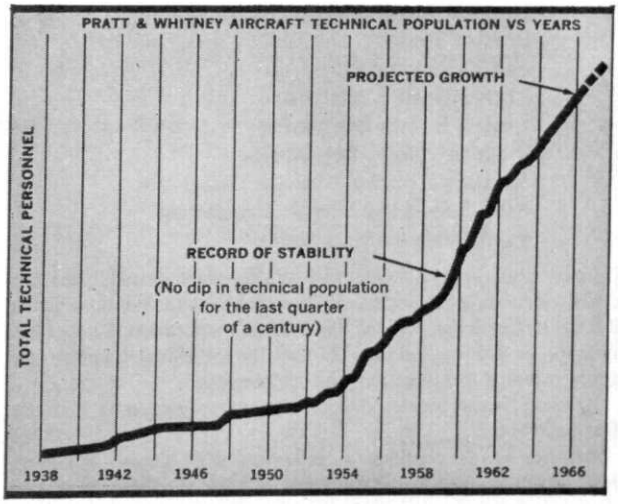
Continued expansion of our military and commercial business provides openings for virtually every technical talent.

As you contemplate one of the most important decisions of your life, we suggest you consider career opportunities at Pratt & Whitney Aircraft. Like most everyone else, we offer all of the usual "fringe" benefits, including our Corporation-financed Graduate Education Program. But, far more important to you and your future, is the wide-open opportunity for professional growth with a company that enjoys an enviable record of stability in the dynamic atmosphere of aerospace technology.

And make no mistake about it . . . you'll get a solid feeling of satisfaction from your contribution to our nation's economic growth and to its national defense as well.

Your degree can be a B.S., M.S. or Ph.D. in: **MECHANICAL, AERONAUTICAL, CHEMICAL, CIVIL (structures oriented), ELECTRICAL, MARINE, and METALLURGICAL ENGINEERING • ENGINEERING MECHANICS, APPLIED MATHEMATICS, CERAMICS, PHYSICS and ENGINEERING PHYSICS.**

For further information concerning a career with Pratt & Whitney Aircraft, consult your college placement officer—or write Mr. William L. Stoner, Engineering Department, Pratt & Whitney Aircraft, East Hartford, Connecticut 06108.



Take a look at the above chart; then a good long look at Pratt & Whitney Aircraft—where technical careers offer exciting growth, continuing challenge, and lasting stability—where engineers and scientists are recognized as the major reason for the Company's continued success.

SPECIALISTS IN POWER . . . POWER FOR PROPULSION—POWER FOR AUXILIARY SYSTEMS. CURRENT UTILIZATIONS INCLUDE MILITARY AND COMMERCIAL AIRCRAFT, MISSILES, SPACE VEHICLES, MARINE AND INDUSTRIAL APPLICATIONS.

Pratt & Whitney Aircraft

CONNECTICUT OPERATIONS EAST HARTFORD, CONNECTICUT
FLORIDA OPERATIONS WEST PALM BEACH, FLORIDA

DIVISION OF UNITED AIRCRAFT CORP.

An Equal Opportunity Employer

ENGINEERS...

HAVE YOU CONSIDERED SUNDSTRAND AVIATION?

Sundstrand Aviation, a leader in research, design, development, and production of high-performance, shaft-power conversion systems, now has over 100 active applications in aircraft secondary power, underwater propulsion, missile and space vehicle secondary power, and land vehicle propulsion.

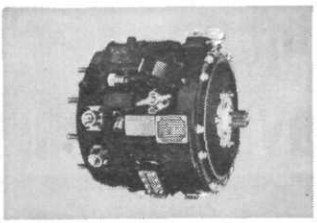
A continuing rise in sales to both the commercial and military markets has brought about a long-range expansion program that is providing new engineering facilities and many excellent job openings. There are challenging engineering positions open in many areas including:

Project Engineering
Electronic Circuit Design
Hydraulic Pump and Motor Development
Dynamic Analysis
Product Testing
Facility Automation
Thermodynamic Analysis
Control System Engineering
Turbo-machinery Development
Rotating Electrical Machine Design
Metallurgy and Materials Engineering
Instrumentation Engineering

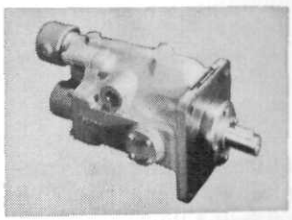
Current expansion and extensive new product development are rapidly increasing the opportunities at Sundstrand Aviation. While it is the largest division of the Sundstrand Corporation, Sundstrand Aviation is still small enough so that the individual engineer can attain personal identification with his projects.

Excellent fringe benefits include a company-sponsored Master's Degree Program.

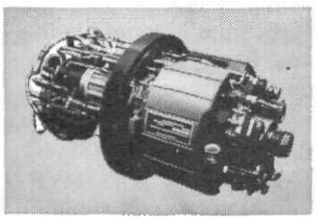
Arrange for a confidential interview with Duane Rohlfing, Manager of Professional Placement . . .



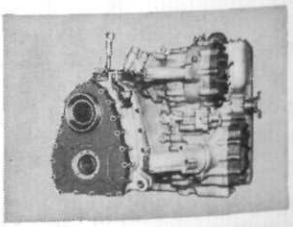
Constant speed drive similar to those installed on F-111, C-5A, DC-9, F-4, and 737 aircraft.



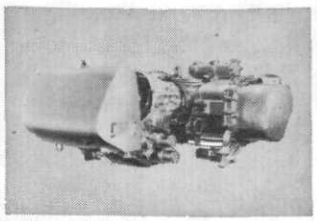
Hydraulic pump for aircraft applications.



Underwater propulsion system for the Mark-48 torpedo.



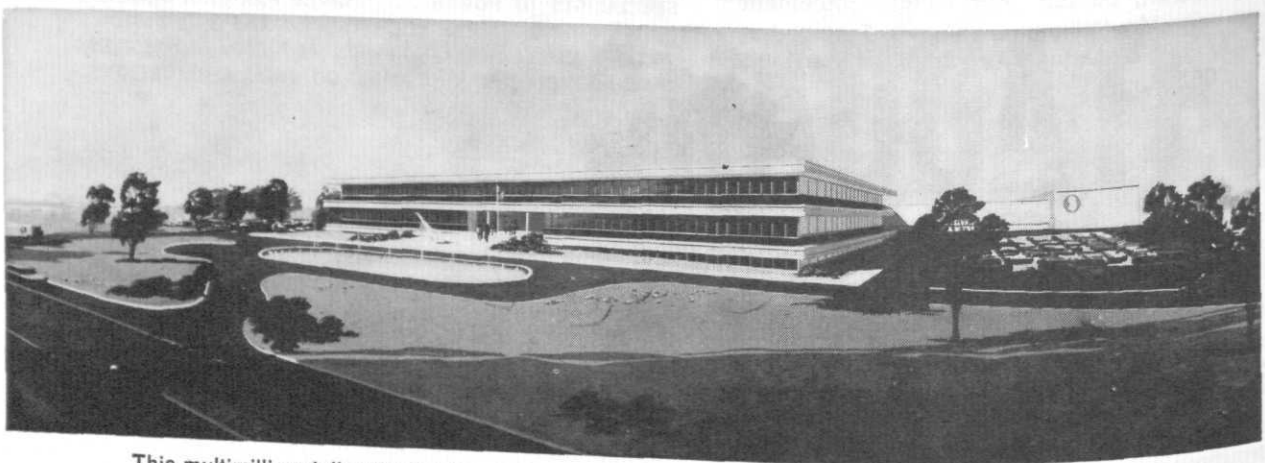
Hydrostatic transmission for military vehicles.



Accessory drive system for high-temperature operation.

SUNDSTRAND

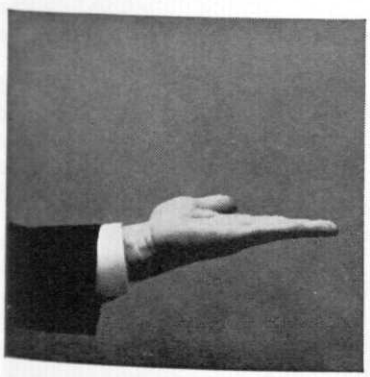
SUNDSTRAND PERSONNEL CENTER
1403 23rd Avenue
Rockford, Illinois 61101



This multimillion dollar R & D Center scheduled for completion in 1967 will add 400,000 square feet to Sundstrand Aviation's specialized facilities.

The Rain in Maine is Plainly

$$D = \frac{SNR}{SNR_o} = \frac{t/T_{SYS}}{t_o/T_{SYS_o}} = t_x \frac{T_{SYS_o}}{T_{SYS}} = \frac{\Delta - 1}{\Delta_o - 1}^{*}$$



Attention to detail is an old Bell System habit. Or maybe you call it thoroughness. Or follow-through.

Anyway, we attended to an interesting detail recently—the effect of rain on the microwave link between a communications satellite and our pioneer ground station antenna at Andover, Maine.

If we could but measure the rain's effect, we could improve the design of satellite ground stations. The question was how.

Well, you often have to take your laboratory tools where you find them, and in this case we found ours in Cassiopeia A, a strong and stable radio star that is always visible from Andover. We measured the noise power from Cassiopeia A during dry periods, and then measured the reduction during rainy periods. The result could be expressed as a formula and employed accurately in designing future ground stations.

The initial success of our Telstar® satellites proved the feasibility of communicating via space.

But it also opened the door—or the heavens—to a whole new technology which we are now busily exploring in every detail.

In space, on land or beneath the sea—wherever we operate—we go into things thoroughly.

Sometimes we know when not to come in out of the rain.

* * *

You may well find a rewarding career in the Bell System, where people find solutions to unusual problems. Bell System Companies are equal opportunity employers. Arrange for an on-campus interview through your Placement Office, or talk to a local Bell System Company.

*The definitions and derivation, plus further information on satellite transmission degradation due to rainfall, may be found in the Bell System Technical Journal, Vol. XLIV, No. 7, Sept., 1965, p. 1528, which is available in most scientific and engineering libraries.

AT&T Bell System
American Telephone & Telegraph and Associated Companies

WALLS

by Lee Carson

The alien glared morosely at the walls of his confinement. They were about the color and consistency of mayonnaise on rye bread. The alien knew that it was some form of plastic, but he had not attempted to taste it. The cell was not a ballroom, by any means, but comfortable enough for its three inmates. The alien wondered if the other two were as unjustly imprisoned as he.

"Let's be practical about this," whined one of the others -- the funny misshapen one about his own size. The third occupant appeared to be some kind of midget.

"Let's not be ridiculous," said the alien.

The midget apparently took this as a cue, and began running around the cell, alternately laughing and crying. The misshapened one just rolled her eyes and groaned.

"Why, oh why, can't we just be logical?" The female stared down her sunken chin into her absurb bosom. The male wondered if she perhaps had a broken neck.

"Shut up." Instead of being logical, he tried to concentrate on being just rational. He stood on the spongy floor, bouncing a little, and considering the problem of escape. He was irritated slightly by the sight of the female lying on the soft surface face down and muttering.

The midget, it seemed, was finally running low on whatever fueled him, but suddenly, bursting from his deceptive slowness, he knocked over the chair, the only piece of furniture in the whole cell. The place might be pretty small, thought the male, but it was big enough to run around in without having to knock things over. If you had to run around in the first place, which was debatable.

"Whaddya have to knock things over for?" In reply to this demand, the midget shreiked piercingly and fell to the floor.

"Well?" But the midget was having more to do with him.

The male righted the chair and sat in it. The others were both prone. The female was sleeping. The midget was pretending to be. The alien stared at the walls.

"We are in here," he said, "and we wish to be out. I don't know about either of you, but I've got things to do, and things that have to be done. I assume we are still on the same planet." He looked sharply at the midget, who was squirming.

"You!" He aimed a finger at the cowering form. "I know your kind. You wouldn't be happy or satisfied any place. But I certainly have better ways of wasting my time than sitting here waiting for the red tape to strangle whoever stuck us here." The midget opened one eye and made a supersonic cheering noise. The female turned over and woke up, leaving her eyes closed.

"They couldn't have anything on me. They just couldn't. They couldn't. Why don't they tell us?" The female babbled on to herself, twisting her fingers nervously.

"They obviously don't pick up kids and stupid women. So shut up! If anybody has to worry, it's me." And with that, the male tried to relax. The chair was uncomfortable, but he certainly would not lie upon the floor. Gradually his tenseness dissipated, leaving behind only headache.

Being philosophical, thought the male, was hardly helpful. The walls were not stone but a very sturdy plastic.

"Four walls," said the alien, "do not a prison make," But he spotted the error in this the minute he said it. He started counting the walls. The midget was covertly watching him.

He discovered that he had forgotten to make the one he had started on. There were a lot of them. He pushed the chair over against one facet.

There were thirty-three walls.

This was somewhat interesting but not informative. The midget began crawling around the circumference of the cell, pretending to count. The male moved the chair away from the wall and sat down again.

"Walls do not a prison make," he told himself, conceding that did constitute a strong factor in the composition.

"Homer!" exclaimed the midget.

"Whaddya mean, 'Homer'?" The male bitterly picked some grime out of a fingernail.

"Homer, homer, homer, homer," said the midget, paddling around the periphery of the cell.

"What?" Finally the midget condescended to point to a spot on the wall. There was a little imprint there, like a manufacturer's, that said, in block letters, HOMER.

The male looked at the next panel, and the next, and the next. They all said "Homer" on them, near the bottom.

The frustrated alien began researching the walls, poring over every square inch. This was all getting to be too much of a bother. You'd think there'd be a door or something someplace.

So the male kept on, in his way. On the floor, the female was using her own unimitable methods to survive happily, snoring occasionally. Flashes and songs ran on and on through the head of the midget.

Eventually the male destroyed the chair against the wall and fell asleep, spreadeagled in the center of the cell. The female babbled in her sleep. The midget laughed and cried.

When they were sure that the gas had taken effect, the two watching entities entered the room. One stood and hummed pleasantly while the other examined the drugged aliens.

"A good range of specimens," repeated the one who was not a doctor.

The other grunted. "Look here, E, I don't like this approach at all. I don't think that we can gauge the level of sophistication accurately enough to test these creatures."

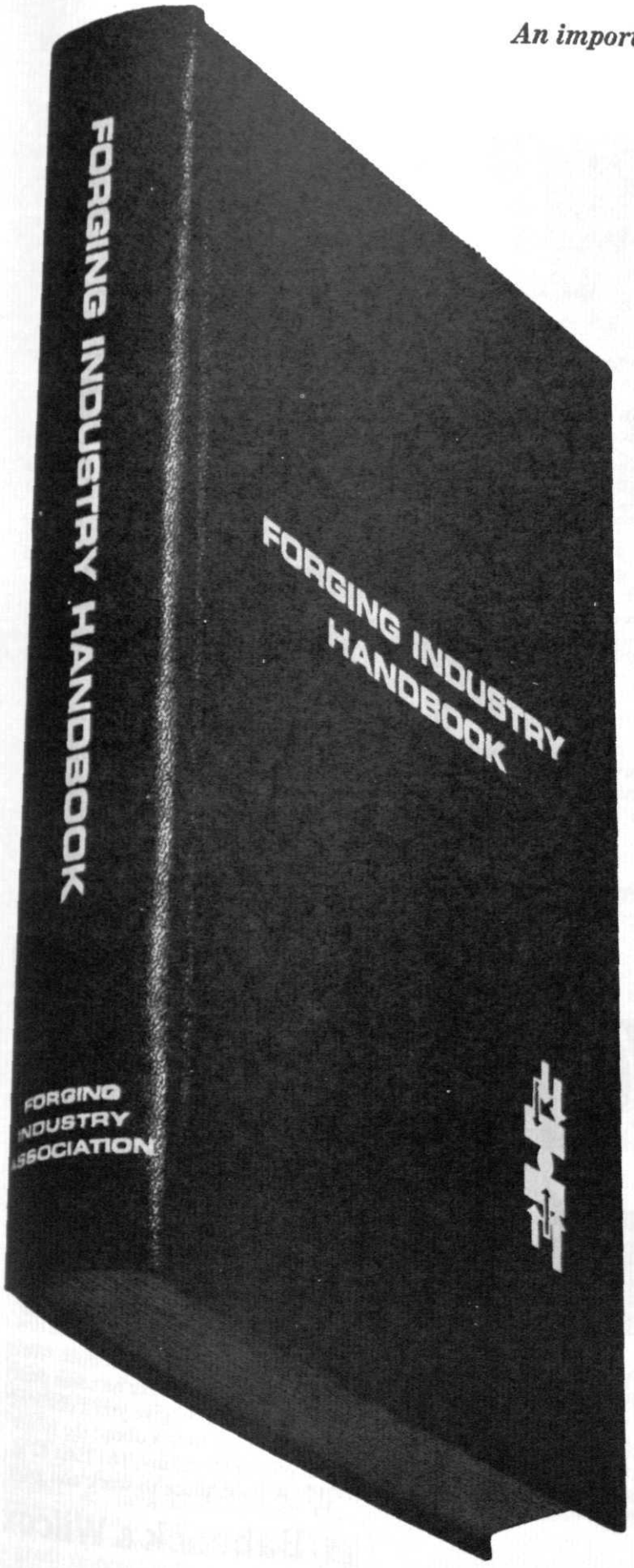
"A-ball, old fellow," said the other. "We're only testing them on their own bases. Surely that's fair."

"Individuals vary. You do not allow enough for aberrations."

"Now, A, give me a chance to complete my case. I say that even if they are unable to solve any of the chamber, we can still determine their level by observing their reactions to the puzzle."

CONTINUED ON PAGE 29

An important addition to your technical library!



A brand-new, complete guide to forging design and specification

If *you* design, specify or buy forged parts, you need this new Forging Industry Handbook—the first such complete work in years.

The following list of chapter headings indicates the comprehensive manner in which this new volume discusses modern forgings and forging technology: Introduction to Forgings/Advantages of Forgings/Applications of Forgings/Metallurgical Characteristics of Forgings/Forging Processes and Methods/Forging Design Principles and Practices/Forging Materials/Heat Treatment of Forgings/Manufacture of Forgings/Forging Facilities/Controlled Quality Forging/Purchasing of Forgings.

Whatever your interest in forgings may be, you are bound to benefit from the data and other useful information contained in this handbook.

Mail this coupon (along with your check or money order*) to the Forging Industry Association, 1121 Illuminating Building, 55 Public Square, Cleveland, Ohio 44113.

Send check or money order to:
FORGING INDUSTRY ASSOCIATION
1121 Illuminating Building
55 Public Square
Cleveland, Ohio 44113

Send me_____copies of the Forging Industry Handbook.

Name_____

Title_____

Company_____

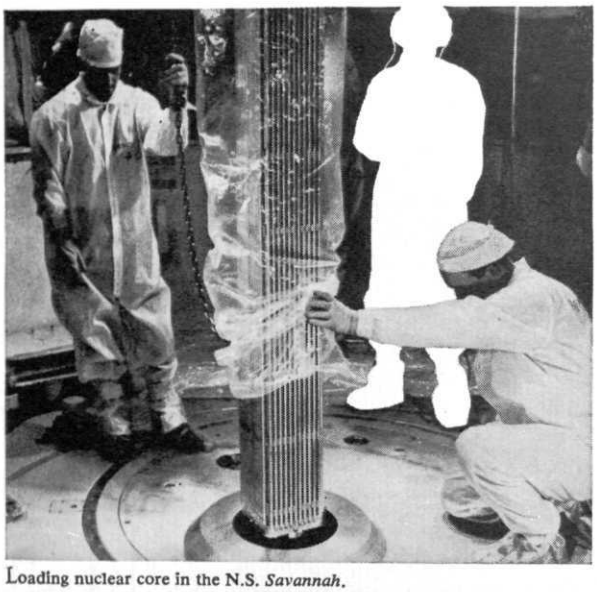
Address_____

City_____ State_____ Zip Code_____

*$15 per copy in USA and Canada. All others: $25 per copy. Plus 50¢ for postage and handling charges.

Student Price $2.50

(This advertisement on behalf of the Forging Industry is published by United States Steel, a supplier of quality forging steels.)



Loading nuclear core in the N.S. *Savannah*.

Put yourself in our place.

Come grow with us. We started in boilers and steam generation, then moved on to atomic power stations, nuclear marine propulsion, computers and control systems, closed circuit TV and specialty machine tools. (We still make the best boiler in America.)

Tomorrow, who knows? You could be on the B&W team that launches an entirely new product. We're big enough ($480 million last year) to take on some pretty exciting projects. But small enough to give you a challenging job, not just desk space. Want to talk about the future? Write to The Babcock & Wilcox Company, 161 East 42 St., New York, N.Y. 10017. A good place to work and grow.

Babcock & Wilcox

Walls. . .

CONTINUED FROM PAGE 26

"Granted. However, we should not drop in on the smallest since it is apparently a gelatinous and unformed member of the race. And that one," he pointed to the misshapen one, "we have noted as not belonging to the dominent caste. Hence we must take the remaining one, who may be deranged or defective."

"We can ascertain that for ourselves," said E. "Shall we drop in on him?"

"After you," said A.

(. . .the essence of rest. . . the pressing of unaccustomed solidity. . .the faint taint of ozone and oil. . .the unconscious awareness of position as reported by word of ear. . .the tiny breath of ventilating air. . .an indistinct rumbling faraway, hovering above the brightstar (would I were steadfast as thou art) outlet as glimpsed from dark depths. . .sensory twinges. . . all the impressions of the physical self transmuted into the leaping gloriousness of fantasy unsublimated from the Id on a sweeping background of remembered spangled stars and *SP*A*C*E*. . .utterly convincing as magnificently staged for the benefit of none in an enclosed bone amphitheater. . . on the stage, in halflight, is the tundra. . .and the Owl in his tree. . .and the multiplyingly stultifying Redundants. . .and the sad muted disk of the sun. . . the familiar landscape of marshgrass barrenness. . .but suddenly the darkness moves a notch: BLOCK! a wall. . .a discordant note intrudes and swells in a strident cacophony of animal fear . . .and the overtones and undercurrents invade, pervade, undermine, and overwhelm. . .BLoCK! another wall. . .BLOCK!. . . BLOCK! BLOCK! BLOCK! . . the walls closing in. . .squeezing. . .the Walls. . .BLOCK! the walls! the walls! the WALLS!!! . . .)

The entities disengaged themselves forcibly, shuddering a bit. At their feet, the alien groaned, still locked in mortal combat with himself.

Old A-ball sighed. "I'm afraid I see what you mean. The depth is there, but the mental narrowness, the limitations, the inability to see beyond conditioning. They didn't even get the one about Homer."

"Ah, yes," said E. "The Duplication, the depth, but no horizons in these ones. There are other races, A."

"Perhaps. . .perhaps you haven't given them chance enough."

"No," said E firmly. "Their depth isn't extended that 'high' either; not consistently, anyway. Remember the old Latin -- no word for 'up'? It would seem they haven't progressed far beyond that stage. There will be other races and other places."

"You may be correct. . ."

"Yes. Let's straighten up here, and get back to the control room. As Civil Service Recruiters, we don't even rank the space loonies, and I'm sure the topper would like to pop these back and get going again. Other races, A-ball."

"Hmm? Yes." A shrugged tiredly. "You may be correct."

"Right," said E. "As Pope, I believe, once remarked: 'the proper study of mankind is man.'"

His comrade and colleague snorted and they both levitated through the roof opening.

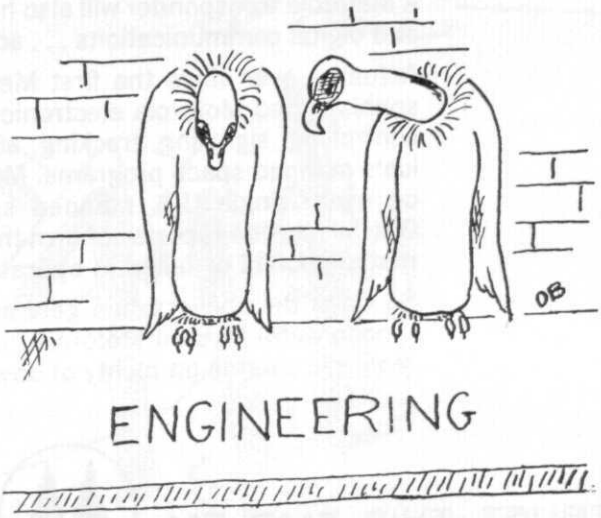
Flag Pole . . .

CONTINUED FROM PAGE 13

major dams and 620 minor ones. The largest dam in Latin America, the "Netzahualcoyotl," built in the south east, was erected by SHR. It has 5 tunnels 14 meters in diameter and an impounding capacity of 12,500 million cubic meters of water.

In addition to building dams the SHR is entrusted with the construction and management of works to provide potable water and to dispose of sewage in small towns and cities all over the republic. These two additional services have greatly improved sanitation, and in many tropical areas eliminated ailments as malaria and a host of other plagues that formerly ravaged the population.

The SHR's technical and scientific personnel have demonstrated an invariable sense of responsibility, self-determination, and patriotic zeal, providing a great impetus to Mexico's route forward.



Stick around—the fatality rate is real high.

CONSUMER PRODUCTS ★ COMMUNICATIONS ★ SEMICONDUCTOR PRODUCTS ★ GOVERNMENT ELECTRONICS ★ AUTOMOTIVE PRODUCTS ★ CONTROL SYSTEMS

moon man? moon talk!

Imagine hearing from the Man on the Moon!

You will. And the first American voice that speaks to earth from moon will arrive by the help of a Motorola transceiver.

Each of the 8 major phases of the historic Apollo space mission which will carry the first American astronauts to the surface of the moon—from pre-launch checkout... through moon landing and exploration . . . to earth return—will receive the critically important support of Motorola electronics equipment.

But back to moon talk. Enroute to the moon—a Motorola Up Data Link on board the Command Service Module will receive mission data from earth. When the Apollo astronaut speaks to earth from the moon, a Motorola transceiver will help send his voice to us. A small Motorola-designed backpack antenna associated with the communication system will relay his words to LM (the Lunar Module that lands the astronauts on the moon), where the transceiver assists in relaying them on to earth.

A Motorola transponder will also help provide television, voice, and digital communications . . . across 238,857 miles.

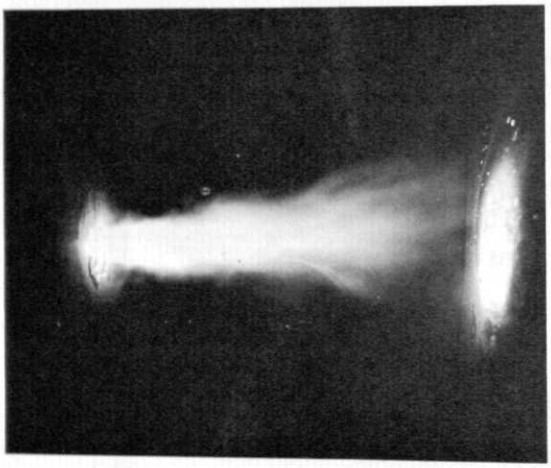
Actually—ever since the first Mercury space flight in 1961, sophisticated Motorola electronics have played a vital role in controlling, signaling, tracking, and communicating in America's manned space programs. Motorola equipment has been on every single U.S. manned spacecraft mission. *Reliably*. Official mission reports confirm that a Motorola unit has never malfunctioned or failed to operate on any of these flights.

So when the conversation gets around to "moon talks" and "moon walks," count Motorola in. And, by the way, you'll find Motorola's name on plenty of down-to-earth products, too!

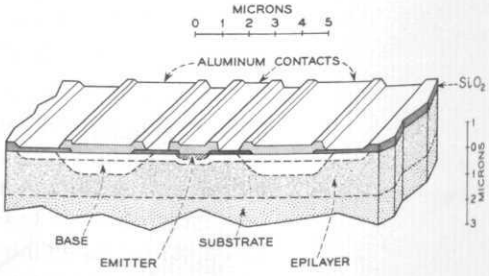
TRUST THIS EMBLEM WHEREVER YOU FIND IT

MOTOROLA

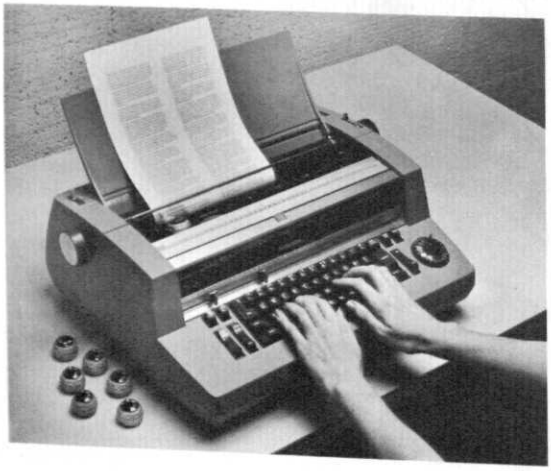
Industrial News



Experimental unit for the plasma arc reduction of ores uses intense heat of a plasma of reducing gas to reduce fine particles of iron ore to pure iron. The reducing gas is electrically heated to a high temperature as it passes through an electric arc. A reaction between the high temperature gas and the iron oxide injected into it removes the oxygen, leaving fine particles of pure iron. The process is representative of some of the exciting new fields now being studied at Bethlehem Steel Corporation's Homer Research Laboratories, situated near Bethlehem, Pennsylvania.



Improved silicon transistors fabricated by Rudolph Schmidt at Bell Telephone Laboratories have a base layer of boron-diffused silicon that is about one-half the thickness of those previously attained. The thin base layer contributes to a cut-off frequency of more than 7 GHz, the highest reported thus far. The epilayer of arsenic-doped silicon forms the collector of the transistor. The emitter strip, only one micron wide, is phosphorus-diffused silicon.



ast, economical method of setting cold type, with ity approaching that of hot type, was introduced y by IBM's Office Products Division. The new IBM lectric" Composer prepares camera-ready copy for :s, catalogs, brochures and newspapers.

new "Composer" features semi-automatic justifi- on. As shown above, the operator draft-types the ', ending just inside the desired margin. The ma- e then automatically measures how much space ains between the last word typed and the margin. ng the second and final typing, the "Composer" matically adds the necessary units of space between words to end the copy exactly on the margin.

Industrial News

A new advance in fermentation equipment has been developed by New Brunswick Scientific Company, New Brunswick, N. J., that allows steam-sterilizable pilot plant fermentators to be operated with pushbutton convenience.

Set the dials, throw the switches, and a series of sequential operations controls steam sterilization and environmental growth conditions.

The new development is an important safety factor. In previous designs every phase of the operation had to be performed manually or electrically, with a relatively high risk of human error entering the experiment. The semi-automated fermentors greatly minimize the risk of sequence mistakes that might cause contamination.

The new fermentor employs electrically operated process valves in a special control circuit that provides automatic operation without expensive laboratory supervision. By energizing only a few switches, the fermentors initiate medium sterilization; air inlet and exhaust sterilization; agitation and aeration; as well as electronic control of temperature, foam and pH. The valves are electrically interlocked to perform in perfect sequence, minimizing operating errors.

The NBS Fermacell, a semi-automated pilot plant fermentor, is suitable for microbiological and biochemical research, including laboratory, pilot-plant, and small-scale industrial fermentations, is available in three sizes for working volumes up to 40, 100, or 200 liters.

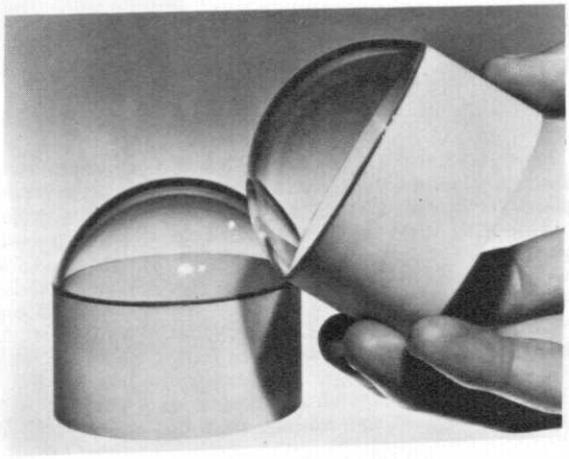
Mass cultivation of microbial cells and yield of their metabolites can be achieved in batch production or continuous culture, with wide latitude in the control of agitation, aeration, temperature, pressure, pH, and other process variables.

Optimum conditions are easily maintained for the cultivation of a broad range of organisms, including aerobic and anerobic bacteria, streptomycetes, molds and yeast, and mammalian and plant tissue cultures.

Culture samples are removed through a sampling tube near the bottom of the vessel or through a bottom drain. Ports for sampling, harvesting, addition of inoculum, nutrient, antifoam, and pH reagent may be steamed individually during sterilization and during operation, since each port has its own steam supply and a steam cap for sterilization of its hose fitting.

Air and other gas mixtures are bubbled through the broth by means of a ring-type or single-orifice sparger, and the flow, adjustable at the control panel.

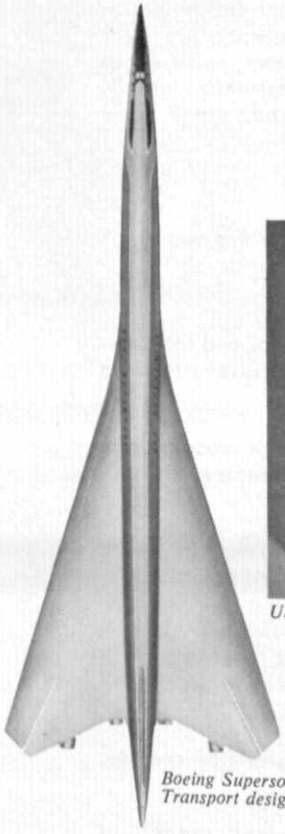
Accessory equipment includes a mobile hydraulic lift for raising or lowering the Fermacell vessel, an automatic pH controller for continuous monitoring, recording, and control of pH, steam-sterilizable pH electrode assemblies, a steam-injection humidifying system to compensate for normal evaporation losses, and an air incinerator for added safety in the sterilization of the fermentor air supply and exhaust gases. Other accessories include a submersible ultraviolet light for immersion in the medium to achieve maximum irradiation, and a mobile refrigerated harvest cart for rapid cooling and storage of harvested cells.



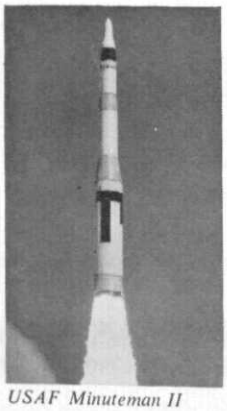
A new glass composition with extended infrared transmission serves as part of the "eye" of Redeye – the shoulder-fired surface-to-air missile. The new material, trademarked Cortran, is used in the 2½-inch-diameter nose dome on the heat-seeking Redeye. The glass, Corning Code 9753, transmits 82 per cent of infrared energy at 4 microns (40,000 Angstroms). The extended range of transmission is equivalent to extending sensing ability from about 1,200° F to 800° F – thus allowing greater sensitivity to heat sources. The Redeye domes are shown in a ceramic mounting collar.

Fifty years ago we only made 'aeroplanes'.
(See what's happening now!)

New Boeing 747



Boeing Supersonic Transport design

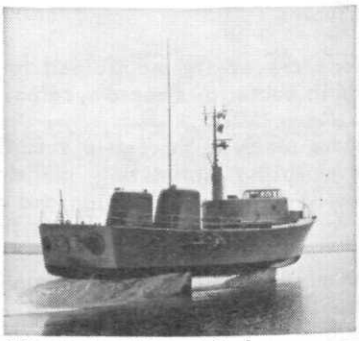


USAF Minuteman II

NASA Lunar Orbiter

NASA Saturn V

Boeing-Vertol Helicopter



USN Hydrofoil Patrol Craft

Boeing 727 Trijet

Boeing 737 Twinjet

In 1916 The Boeing Company's career was launched on the wings of a small seaplane. Its top speed was 75 mph.

Now, half a century later, we can help you launch your career in the dynamic environment of jet airplanes, spacecraft, missiles, rockets, helicopters, or even seacraft.

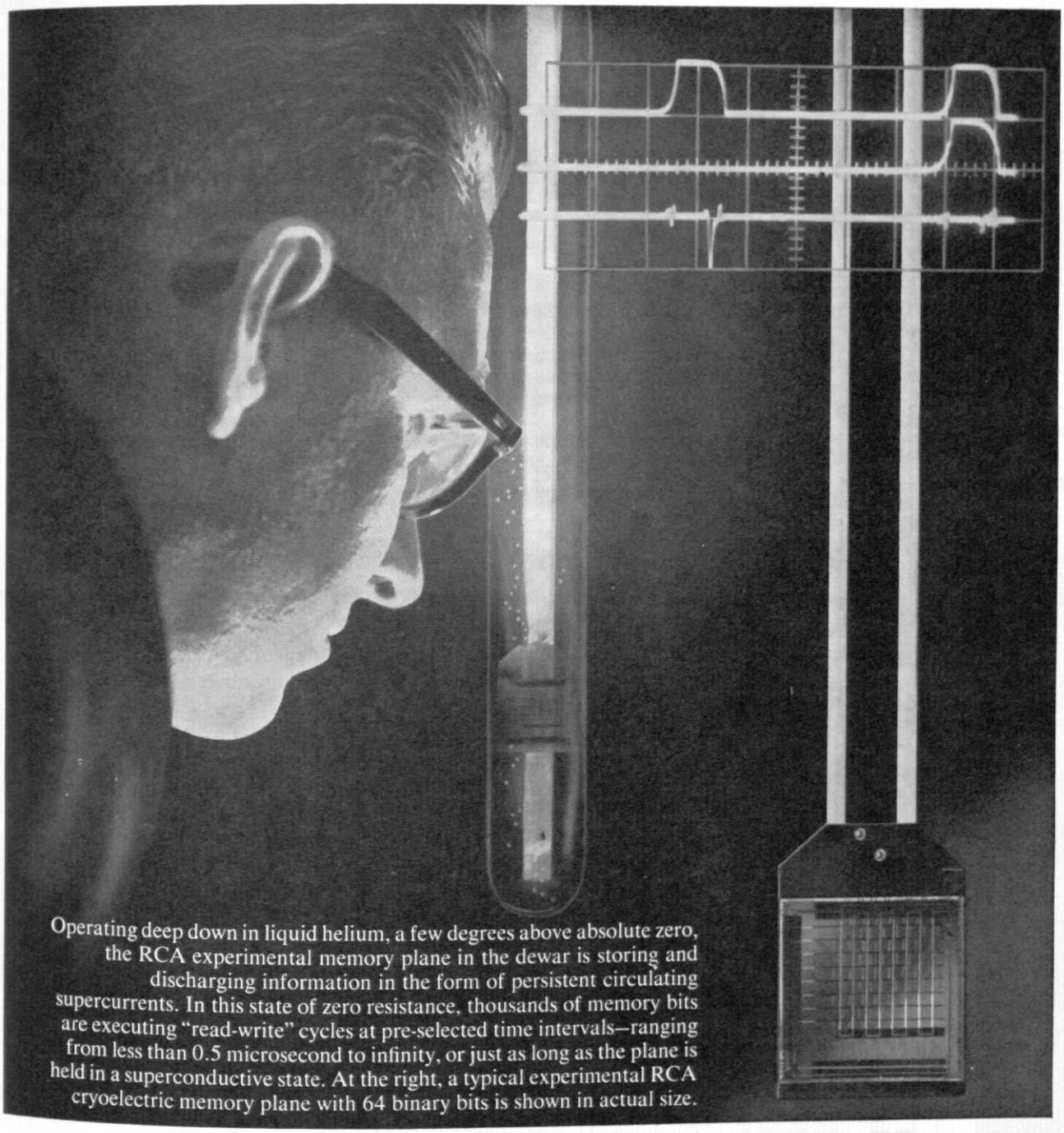
Pick your spot in applied research, design, test, manufacturing, service or facilities engineering, or computer technology. You can become part of a Boeing program-in-being, at the leading edge of aerospace technology. Or you might want to get in on the ground floor of a pioneering new project.

You'll work in small groups where initiative and ability get maximum exposure. And if you desire an advanced degree and qualify, Boeing will help you financially with its Graduate Study Program at leading universities and colleges near company facilities.

Often it will be sheer hard work. But we think you'll want it that way when you're helping to create something unique—while building a solid career. See your college placement office or write directly to: Mr. T. J. Johnston, The Boeing Company, P.O. Box 3707, Seattle, Wash. 98124. Boeing is an equal opportunity employer.

BOEING

Divisions: Commercial Airplane • Missile & Supersonic Transport • Vertol • Wichita • Also, Boeing Information Systems • Space • Scientific Research Laboratories



Operating deep down in liquid helium, a few degrees above absolute zero, the RCA experimental memory plane in the dewar is storing and discharging information in the form of persistent circulating supercurrents. In this state of zero resistance, thousands of memory bits are executing "read-write" cycles at pre-selected time intervals—ranging from less than 0.5 microsecond to infinity, or just as long as the plane is held in a superconductive state. At the right, a typical experimental RCA cryoelectric memory plane with 64 binary bits is shown in actual size.

RCA Knows How *in Electronic Components and Devices*

You are facing a very important decision. When you select the company that you want to join, consider how important it is for your future career to join the leader. For example, in this one area alone—Electronic Components and Devices—you will find that RCA has set standards of engineering excellence, in an environment for learning, that is second to none.

EE, ME and IE opportunities exist for *all* degree levels in every phase of research, design and development, information systems, manufacturing, computer marketing, and purchasing with RCA.

Another consideration – we believe in individual growth. There are training programs, graduate education programs, and in-house courses—all designed to encourage your individual development and growth. In addition, you will work in a distinguished scientific and engineering environment.

You owe it to yourself to find out more about the great range of activities at RCA. See your college placement director, or write to College Relations, Radio Corporation of America, Cherry Hill, New Jersey 08101.

Whatever your field of interest—we would like to hear from you.

An Equal Opportunity Employer

RCA **The Most Trusted Name in Electronics**

ENGRINEERS

"Peter, are you sure it is I you are in love with and not my clothes?"

"Test me, darling."

An old colored mammy had quadruplets. She named them Eenie, Meenie, Minie, and Fred. She said she didn't want any Moe.

Papa Stork: "Well, I guess I'll go out and deliver a few baby boys."

Mama Stork: "Believe I'll go out and deliver a few baby girls."

Baby Stork: "Well I guess I'll go out and scare the hell out of some college kids."

Then there was the groom who finished his wifes first breakfast, muttering, "Can't cook either."

Little Joey was a chemist.
Little Joey is no more.
What he thought was H2O
Was H2SO4

An Indian with young ideas managed to swap his 40-year-old squaw for two 20 year-old maidens at the annual tribal pow-wow.

The next year he returned and asked for his former wife back.

"Me not wired for two 20," he explained.

Found on a fall registration card of a freshman engineering student at MSU:

Name of Parents: Mommy and Daddy.

And then there was the one about the rather forlorn engineer who, on seeing a pigeon flying directly overhead, exclaimed "Go ahead, everyone else does!"

M.E.: "I went out with a girl last night who really had something."

E.E.: "So?"

M.E.: "I think I've got it."

She: I want a man who can hold me close to him, like Gable; who can kiss me like Gregory Peck; who can make my blood boil, like Tyrone Power; who can breathe fire into my body and soul, like Victor Mature. Can you do all that?"

He: "I'm afraid not! But I can bite you, like Lassie."

Definition of a cad:
A man who tells his wife he is sterile after she becomes pregnant.

Know what they call an abortion in Czechoslovakia?
A cancelled Czech.

Mother: "Well, son, what have you been doing all day?"

Son: "Shooting craps, mother."

Mother: "That must stop. Those little things have as much right to live as you do."

"What are you doing in the cellar, children?"

"Making love," came the reply.

"That's nice. Don't fight."

The meek little bank clerk had his suspicions. One day he left work early and, sure enough, at home he found a strange hat and umbrella in the hallway and his wife was on the couch in the living room in the arms of another man. Wild for revenge, the husband picked up the man's umbrella and snapped it in two across his knee.

"There!" he exclaimed. "Now I hope it rains!"

Nine out of ten engineers who tried Camels preferred women.

The house guests were assembled with their hosts in the living room after dinner, chatting pleasantly, when the five-year-old daughter of the host appeared suddenly in the room, her clothes dripping with water. She could scarcely articulate, so great was her emotion, and her parents rose in consternation as she entered:

"You-you," the little girl babbled, pointing to the male of the house guests, "You're the one who left the seat up."

Then there was the M.E. who thought that steel wool was the fleece from a hydraulic ram.

A small kid, running out of a burlesque show was grabbed by a doorman who asked him what was the matter. The kid said, "My Mama told me if I ever looked at anything bad I'd turn to stone . . .and I can feel it starting!"

CONTINUED ON PAGE 43

Engineers Image. . .

CONTINUED FROM PAGE 17

"En-gi-neer! En-gi-neer!
Your problems are my
problems.
We stand tall, oh En-gi-neer!

By now my friend was standing on his chair, and the last verse was fairly shouted across the cafeteria. He set down again, to the roar of enthusiastic applause.

"What do you think?" he asked.

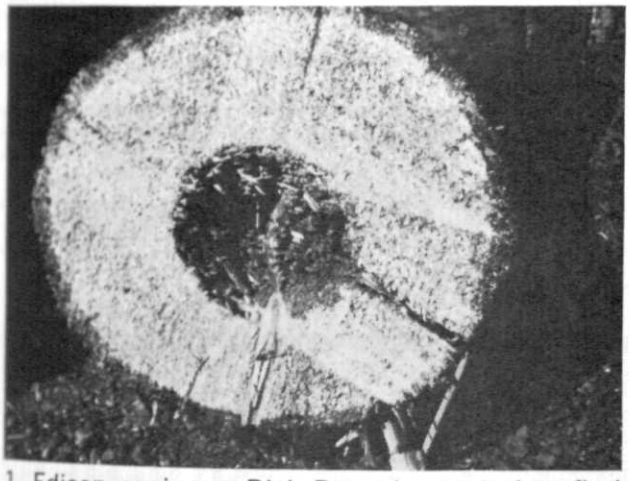
"You'll go a long way," I said as I rose to leave. "Who knows? You might even start your own Lecture-Concert Series, or a literary magazine for engineers -- the possibilities are endless. Good luck with your new image."

"Thanks," he said, and as I walked away I thought I heard him mutter, "Literary magazine, yeah. I could call it Electronic Zeitgeist. . ."

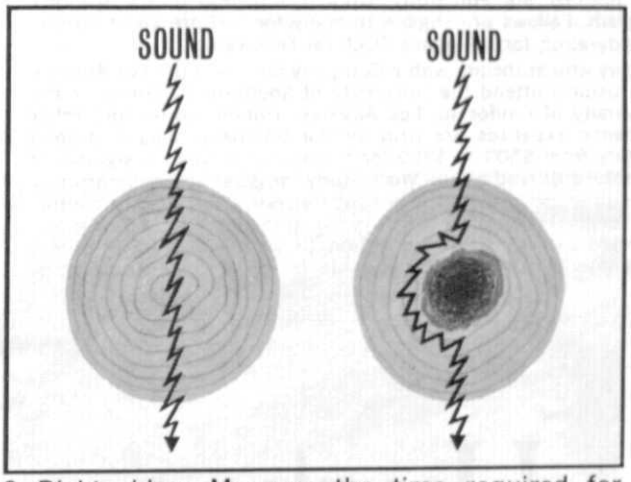
THE ADVERTISER'S INDEX

Got an idea?

Detroit Edison's interested.



1. Edison engineer, Dick Popeck, wanted to find a more effective method of determining the amount of pole decay.



2. Dick's idea: Measure the time required for sound to travel through a pole. Sound takes longer to traverse a decayed pole.

3. Transistorized circuitry was designed. And a Sonic Pole Tester was built and tested.

4. Ed Hines, Director of Research, (left) discusses patent coverage with inventor Dick Popeck.

New ideas grow at Detroit Edison. The picture story here shows the progress of one, from its conception through its development, to finalization.

The development of the sonic pole testing device* has benefited the company and the young inventor both economically and professionally. The device helps Detroit Edison serve the electric industry's customers better and more economically.

Uses for the sonic pole tester range from the examination of wooden railroad bridges to the determination of the soundness of standing timber.

Detroit Edison's forward looking management . . . its engineering and research facilities . . . along with its liberal patent policy . . . make it an ideal place for the young man with ideas.

If you are interested in putting your ideas and energies to work—write to George Sold, The Detroit Edison Company, 2000 Second Avenue, Detroit, Michigan 48226, or visit the Edison representative when he interviews on campus. *U.S. Patent Applied for

DETROIT EDISON

HOWARD HUGHES DOCTORAL FELLOWSHIPS. Applications for the Howard Hughes Doctoral Fellowships in engineering, physics, or mathematics are now available for the academic year beginning in Autumn 1967.

The program offers the qualified candidate an outstanding opportunity for study and research at a selected university, plus professional industrial summer experience at a Hughes facility. Each Doctoral Fellowship includes tuition, books and thesis preparation expenses, plus stipend ranging from $2,200 to $3,100, depending upon the Program year and the number of candidate's dependents. Full salary is paid the Fellow during his summer work at Hughes. Salaries are reviewed periodically and increased with the growth of the individual. Fellowships are awarded to outstanding students who have completed a master's degree (or equivalent) and have been accepted as a candidate for the doctoral degree.

HUGHES MASTERS FELLOWSHIPS. Approximately 100 new awards for '67-'68 are available to qualified applicants with a baccalaureate degree in engineering, mathematics or physics. Most of these awards are Work-Study Fellowships; a very limited number are Full-Study. Upon completion of the Masters Program, Fellows are eligible to apply for and are given special consideration for a Hughes Doctoral Fellowship.

Fellows who associate with a Company facility in the Los Angeles area usually attend the University of Southern California or the University of California, Los Angeles. Tuition, books and other academic expenses are paid by the Company, plus a stipend ranging from $500 to $850 for the academic year. A significant advantage offered by the Work-Study Program is the opportunity to acquire professional experience working with highly competent engineers and scientists while pursuing the M.S. degree. Selected Fellows have the option to work in several different assignments during the Fellowship period to help them decide on their field of concentration and optimum work assignment.

Fellows earn full salary during the summer and pro-rata salary for 24 hours work a week during the academic year. The combined salary and stipend enables Fellow to enjoy an income in excess of $6,500 per year during his two years as a Work-Study Fellow. Salaries are increased commensurate with professional growth and Fellows are eligible for regular Company benefits.

Work assignments are matched closely to the Fellow's interests. Primary emphasis at Hughes is research and development in the field of electronics for application to defense systems and space technology. Fields of interest include stability and trajectory analysis, energy conversion, structural design and analysis — computer and reliability technology, circuit and information theory, plasma electronics, microminiaturization, and human factor analysis — research, development and product design on such devices as parametric amplifiers, masers and lasers, microwave tubes, antenna arrays, electron-tube and solid-state displays, and components — design analysis, integration and testing of space and airborne missile and vehicle systems, infrared search and tracking systems, and computer, data processing and display systems — theoretical and experimental work in solid-state and ion physics.

Citizenship: American citizenship and eligibility for security clearance are required.

Closing date for all applications: Early application is advisable. All materials should be postmarked not later than February 1 for the Doctoral Fellowships, and March 1 for the Masters Fellowships.

How to apply: To apply for either the Doctoral or Masters Fellowship, write to: Mr. James C. Cox, Manager, Personnel Administration — Corporate Industrial Relations, Hughes Aircraft Company, P.O. Box 90515, Los Angeles, California 90009.

Hughes Fellowship Programs

Creating a new world with electronics

HUGHES

HUGHES AIRCRAFT COMPANY

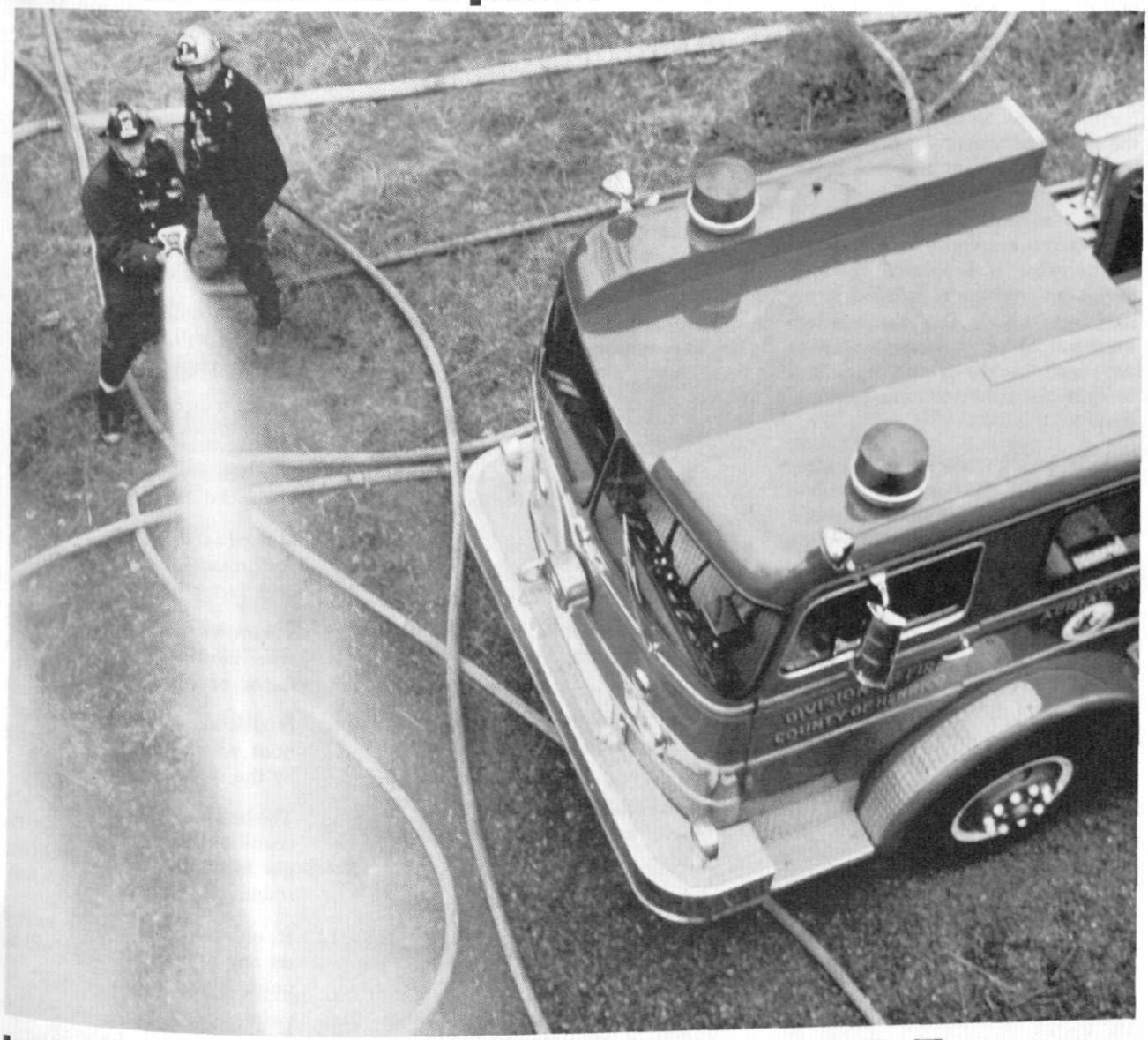
An equal opportunity employer.

Who says your only future at International Harvester will be in farm equipment?

This snorkel-equipped fire-fighter is only one of hundreds of different trucks made by International, world's largest producer of heavy-duty trucks. We're also a leader in construction equipment. Our farm equipment business is at an all-time high. We're an important steelmaker, too. We even make marine engines. And we're rapidly expanding our aerospace side.

When you choose a career with International Harvester, you choose a career in POWER. Providing mechanical power for everything from high-speed tractors to helicopters is our business. A two-billion-dollar-a-year business. Because we make so many different mechanical power products, we need a variety of engineering talent. Especially mechanical, industrial, agricultural, metallurgical, general and civil engineers. We offer you an ideal combination of opportunity, responsibility and individual treatment. There's plenty of room for you to grow at IH.

Does this look like a plow?



International Harvester puts power in your hands

Interested? Contact your Placement Officer to see an IH representative when he visits your campus. Or write directly to Supervisor of College Relations, International Harvester, 401 North Michigan Avenue, Chicago, Illinois 60611.

AN EQUAL OPPORTUNITY EMPLOYER

Finagle's Axioms and the Snafu Equation

As Engineering students, it is important that we should know not only the goals and extent of engineering, but also the horizons and limitations. One of the primary differences between a scientist and an engineer is that whereas a scientist wants to know exactly what is happening inside a device, an engineer is satisfied if the device works well. True, theory is very important to an engineer, but let us not forget that our primary purpose is to apply the theory to some beneficial purpose.

In applying theories, it is often necessary, in the interest of labor-savings, to make "engineering approximations," some of which tend to leave Pure scientists and mathematicians white-faced and shuddering. As engineers, however, we merely shrug and proceed, often throwing caution to the winds.

Because of the many approximations and assumptions which are commonly used, there is usually some inconsistency in experimental work.

There are some twenty-nine axioms, known as Finagle's axioms, which should be known by every engineer who is concerned with experimentation, calculation, production or testing.

They are presented here in two sections, one concerned with experimentation and calculation, the other with production and testing. The axioms are arranged in semi-logical order, (i.e. as logically as possible), and are numbered separately in each section.

There is also an equation, called the general snafu equation, which relates actual experimental results with actual correct results. The equation, with its empirical proof is presented, in the form of a theorem, immediately following the list of axioms.

NOTE: This list of axioms may not be complete. If the reader is aware of any other axioms, please notify the author of them, c/o this publication. It will be greatly appreciated. cmp

Finagle's Axioms

On Experimentation & Calculations

1. In any calculation or experiment, any error which can creep in will do so.
2. Those factors which cannot go wrong, will probably go wrong anyway.
3. No matter what goes wrong, it will probably look right.
4. Any error will be in the direction of most harm.
5. Constants, especially those from engineering handbooks, must be treated as variables.
6. When an error has been found and corrected, it will be found to have been correct in the first place.
7. Any data, which, when included in a calculation, produces the desired result, are fair data for the calculation.
8. (Corollary to #7) If enough data is available, anything may be proven by statistical means.
9. Hell hath no fury like an unjustified assumption.

On Production & Testing

1. The most vital dimension on any plan or drawing stands the greatest chance of being omitted.
2. Major design changes will always arrive after construction is nearly complete.
3. Parts that positively cannot be assembled in improper order will be.
4. Interchangable parts won't.
5. A part requiring service or adjustment will be in the least accessable position.
6. Service conditions as given in specifications will be exceeded.
7. All delivery promises must be multiplied by a factor of 2.00.
8. Manufacturers specifications of performance must be multiplied by a factor of 0.50.
9. Salesmen's claims for performance must be multiplied by a factor of 0.25.
10. Installation and operating instructions will be promptly discarded by the shipping department.
11. The best approximation of service conditions in the lab will not begin to meet those conditions encountered in the field.
12. If only one bid can be secured on any project, the price will be unreasonable.
13. If a safety factor is set through service experience at a maximum value, someone will promptly devise a method to exceed said safety factor.

CONTINUED ON PAGE 43

14. Identical units which test in identical fashion will behave dissimilarly in the field.

15. If a test installation functions perfectly, all subsequent production units will malfunction.

16. Warranty and guarantee clauses are voided by payment of the invoice.

The Snafu Equation

Theorem;

The results of an experiment performed under controlled laboratory conditions by competent personnel, using accurately calibrated equipment can be described by the following non-convergent infinite power series, whose coefficients are semi-random functions of space and time.

$$x^1 = K_1x + K_2x^2 + K_3x^3 + K_4x^4 + K_5x^5 + K_6x^6 + \ldots .$$

Where:

x^1 represents the correct results;

x represents the experimental results;

K_1 represents Finagle's constant (variable);

K_2 represents the fudge factor;

K_3 represents the Bugger variable (constancy);

K_4 represents the Diddle factor;

K_5, K_6, K_7, . . . are as yet unknown, although

K_5 is generally known as the to-hellwithit factor.

NOTE: The proof is not rigorous, but empirical. In fact, no known rigorous proof exists, which bothers us not at all.

Suppose that a certain experiment, say Q, is performed under the specified conditions at some time t at the south end of a lab, say at position x_1, positive x being to the north. Suppose that Q is performed by a second similar group at the north end, say $x_1 + 30$, also at time t. It will soon be discovered that the conclusions of the two groups do not agree. If both groups repeat the experiment at some later time, say t^1, it will be seen that neither group can duplicate the previous data; i.e., there will be four sets of conclusions, no two of which are the same.

Further attempts at duplication will only produce more sets of inconsistent data. Thus, it is seen that the Snafu equation holds, although since the K's vary in semi-random fashion (i.e. sometimes random, sometimes not, thus preventing use of random number tables in the solution), it is of little practical use. This may, indeed, be the reason that K_5 appears to be the most commonly used term.

jokes . . .

CONTINUED FROM PAGE 36

"Chivalry has changed since the days of Sir Walter Raleigh, but contrary to rumor, it hasn't died out altogether. A man will still lay his coat at the feet of a pretty girl; the difference is that nowadays it's intended to keep her back from getting dirty.

"Gee Mom, none of the other guys are wearing lipstick."
"Shut up! We're almost at the draft board."

"Drink?"
"No."
"Neck?"
"No."
"Well, do you eat hay?"
"Of course not!"
"Gad, you're not fit company for man or beast."

The husband, answering the phone, said: "I don't know; call the weather bureau," and hung up.
"What was that?" asked his wife.
"Some fellow asking if the coast was clear."

From ASMSU we get word of a new student organization called Students Anonymous. If you get a strong desire to study, call them, and they'll send someone over to drink with you.

The boss was chasing his secretary as usual. He suggested, "Let's go up to my apartment tonight."
She answered, "I am very didactic and pithy in my refusal of your derogatory, vituperative, and vitriolic proposition."
He said, "I don't get it."
She answered, "That's what I've been trying to tell you."

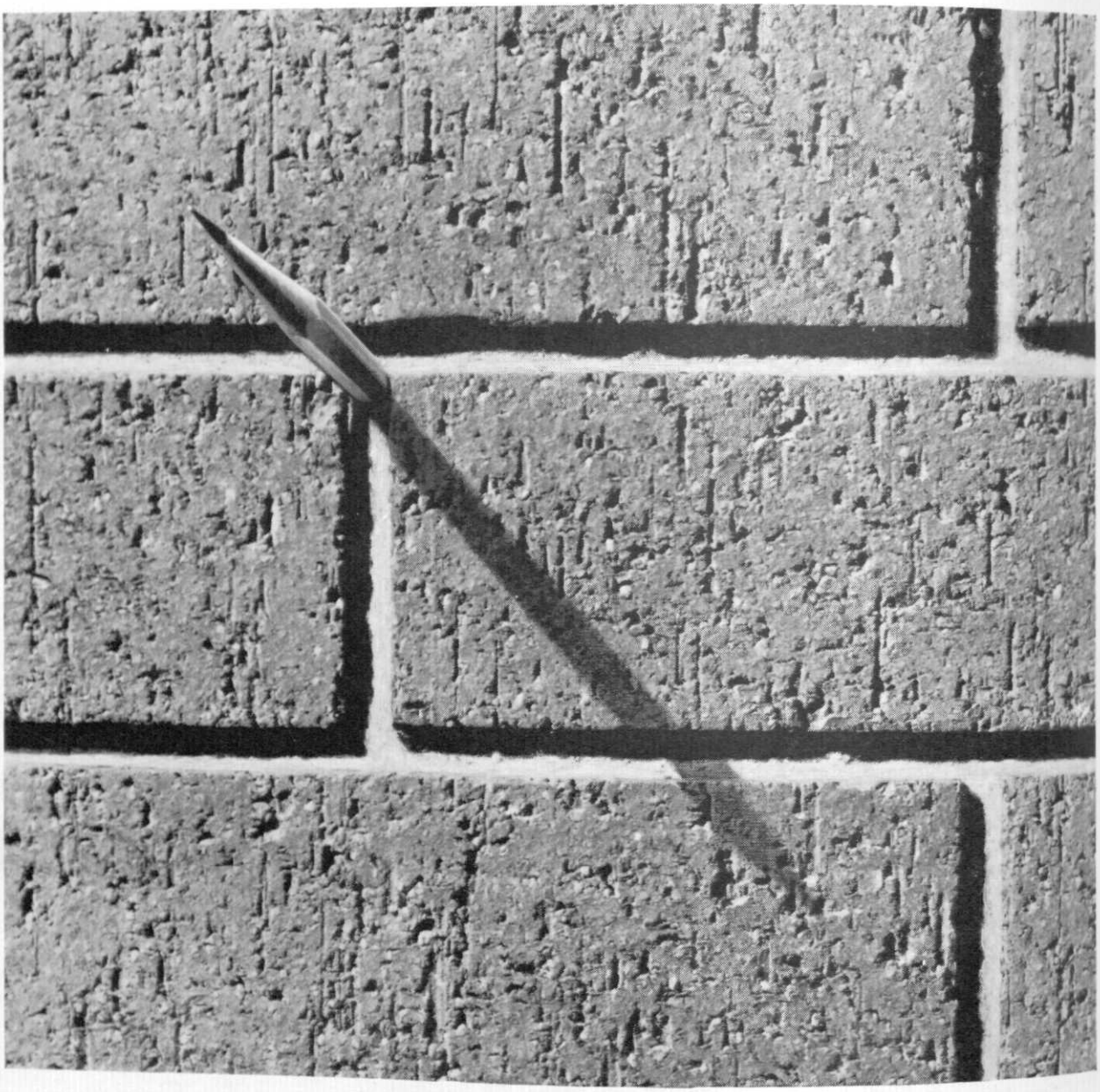
Mother (putting Junior to bed): "Shh. . .the sandman is coming."
Junior: "For fifty cents I won't tell Daddy."

Definition of a Metallurgist:
A person who can look at the steel grey eyes of a platinum blond and determine whether she is a precious metal or a common ore.

John stopped the car, turned off the ignition, and pounced on his female prey.
She: "You aren't pulling that 'out of gas' routine, are you?"
He: "No, this is the 'Here after' routine."
She: "What's that?"
He: "If you aren't here after what I'm here after, you'll be here after I'm gone.

Student (in Bookstore): "How much is this paper?"
Clerk: "A dollar and seventy cents a ream."
Student: "It sure is".

A research director of a major agency was ordered to prepare a study on fleas. He put a flea on his desk and trained it to jump over his finger at his command. Then he pulled out two of the fleas legs. "Jump," he ordered, and the flea jumped. Two more legs came off. Again the flea jumped on order. Finally, he pulled off the last two. "Jump," he commanded. The flea did not move. With that, the director wrote in his journal: "When a flea loses six legs it becomes deaf."



An idea can go through anything

Here's a close-up of our new $5,000,000 facility called Timken Research.

We expect great ideas to come out of this building.

It's located outside Canton, Ohio, about ten miles from our headquarters and main plant.

Timken Research is one of the largest research and development centers in the bearing industry. Here we match up tough problems and inquisitive people.

Applied research flourishes here, cloistered, nourished and encouraged. Our engineers and metallurgists work on product development and equipment development. They have one aim: to produce Timken® bearings, Timken steel and Timken rock bits that will deliver even longer life at lower cost in more applications.

The Timken Roller Bearing Company, Canton, Ohio. Manufacturers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.

QUALITY TURNS ON
TIMKEN®
TAPERED ROLLER
BEARINGS

An Equal Opportunity Employer

Timken bearings sold in 116 countries, manufactured in Australia, Brazil, Canada, England, France, South Africa and U.S.A.

It's a good system if you like it

There are slots.
Slots need people to fill them.
Someone exists who was born and educated to fill each slot.
Find him. Drop him in. Tell him how lucky he is. Look in once in a while to make sure he still fits his slot.

This orderly concept has much to commend it, plus one fault: some of the people most worth finding don't like it. Some very fine employers have not yet discovered the fault. It is not up to us to point it out to them. Luckily for us, we needn't be so tightly bound to the slot system.

We can offer *choice*. A certain combination of the factors diversification, size, centralization, and corporate philosophy makes it feasible to offer so much choice.

Choice at the outset. Choice later on. Choice between quiet persistence and the bold risks of the insistent innovator. Choice between theory and practice. Choice between work in the North and South. Choice between work wanted by the government and work wanted directly by families, by business, by education, by medicine, by science. To the extent that the slot idea helps channel choice we use it, of course.

A corporation such as this is one means of coordinating the strength of large numbers of effective persons. You may feel that in the years ahead this type of organization must change. You may feel that it must not change. Either way, to get a chance to steer you have to come on board.

Advice to electrical engineers, mechanical engineers, chemical engineers, chemists, and physicists—still on campus or as much as ten years past the academic procession: while one starts by filling a slot, it soon proves more fun to make one. No detailed list of openings appended herewith. Next week it would be different. G. C. Durkin *is Director of Business and Technical Personnel, Eastman Kodak Company, Rochester, N. Y. 14650.*

HELP DEVELOP...

. . . new concepts and products
. . . new facilities and processes
. . . new applications and markets

. . . in your technical career with General Electric

Contact your Placement Officer or write:
D. E. Irwin, General Electric Company,
Section 699-18, Schenectady, N. Y. 12305.

Progress Is Our Most Important Product

GENERAL ELECTRIC

AN EQUAL OPPORTUNITY EMPLOYER