

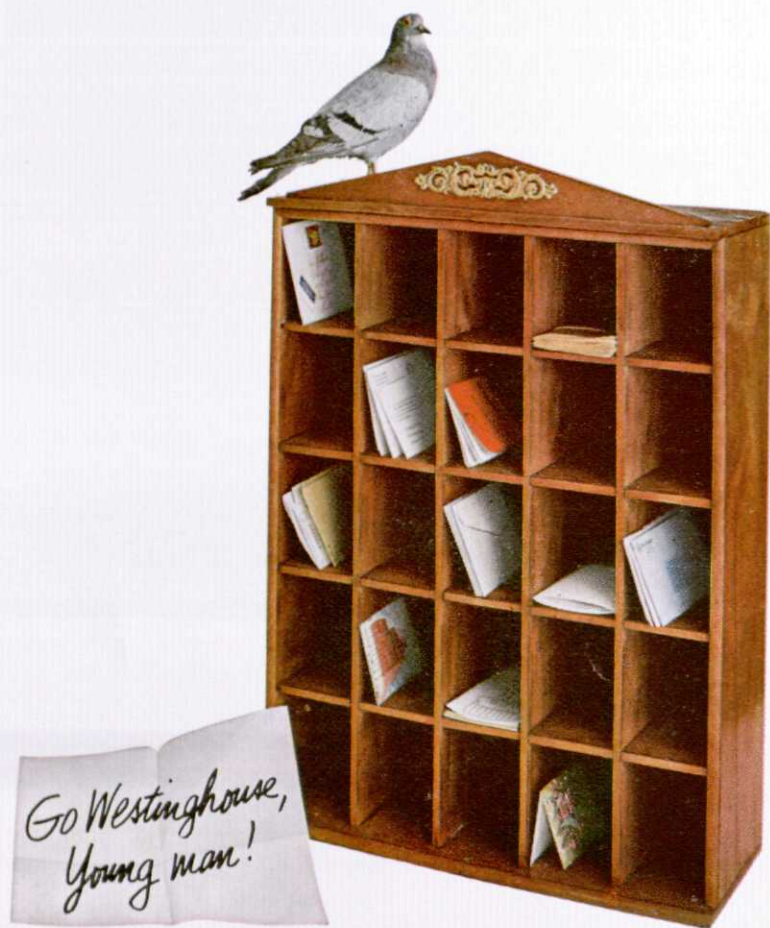
# SPARTAN ENGINEER

MARCH, 1967



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# SPARTAN engineer

VOLUME 20

NUMBER 3

MARCH, 1967

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This month's cover is done by Tom Price and is his interpretation of Bob Kaatz' article, From The Other Edge.

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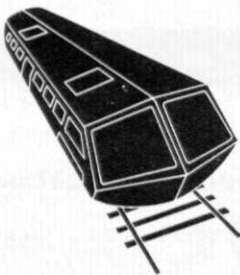
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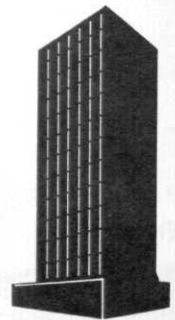
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# Assessment Of The Goals Of Engineering

*The editorial this month is being devoted to the following ten items which constitute a summary of a report by the Panel on Engineering Education on the goals of engineering. They are being printed in the hope that they will help the engineering student at M. S. U. analyze his college and the education which he is getting.*

- I. The growing demands upon the profession of engineering to assume leadership in the constructive integration of technological change and human fulfillment in a time of accelerating change requires a total of reassessment of engineering education.
- II. As an instrument of national purpose, engineering education should provide the formal basis for preparing the nation's engineering manpower with the capability, knowledge, understanding, and insight to fulfill the technological needs of society on a timely and effective basis. Such preparation should include the foundations for breadth of vision, leadership, and statesmanship with appropriate disciplinary balance and flexibility to meet new tasks and opportunities.
- III. There are a variety of useful patterns for institutional responsiveness to national engineering educational goals. Each institution should examine its resources and identify goals most suited to its own resources and capabilities.
- IV. To prepare engineering students for rapid technological change and for growing responsibilities in industry and government, the emphasis in instruction must be placed more upon the development of the potential capacities and insights in the individual and less upon the transfer of generally prescribed content in standardized courses.
- V. Since engineering students vary widely in preparation, capacity, interest, and potential contribution, it is contrary to sound educational policy to standardize curricula, degrees, methods, or periods of instruction across institutions at the expense of flexibility, experimentation, and wholesome diversity among and within institutions.
- VI. The educational process depends for its success upon close interaction between teacher and student. Steps should be taken to increase the opportunities for this interaction to occur to provide the essential guidance needed by the student in maturing as an individual, developing a sense of responsibility and a worthwhile set of values, and in becoming committed to ideals and a course of action.
- VII. Accreditation of schools of engineering in the future must be reexamined in light of the need for flexibility and diversity among institutions and programs. Standardization beyond a marginal limit of acceptability will retard rather than enhance the quality and effectiveness of engineering education.
- VIII. To the extent that the licensing principle represents a restrictive influence on flexibility and innovation in engineering education, the principle itself and the laws on which it is based should be reviewed and modifications considered by the professional and technical societies concerned.
- IX. Engineering societies should review their role in the total spectrum of engineering education, research, and practice and should develop objectives and programs responsive to advances in technology and the needs of the profession and society.
- X. Learning is a lifetime process, continuing through all of the formal phases and extending throughout the years of professional practice. It includes the sum of all experience outside the classroom and instruction within. The goals of education should give recognition to this principle and emphasize the need to optimize a lifetime of learning. Such optimization should consider both the effectiveness of the pre-college preparation and the means and methods of extending the postcollege educational process over the life span of the engineer.



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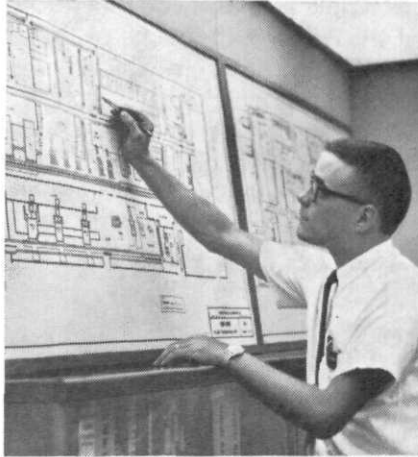
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**Top:** LUIS LOZANO (BS Met. E., Brooklyn Poly. '61) is research metallurgist at Anaconda American Brass Company's research and technical center.



**Top:** GEOFFREY IRELAND (BSME, U. of Louisville '63) is assistant plant engineer at Louisville works of Anaconda Aluminum Company.

**Below:** ROBERT SWIRBUL (BS Bus. Ad., U. of Tampa '58), center, district manager of Dallas sales office of Anaconda Wire and Cable Company, reviews cable specifications with power utility personnel.



**Left:** PETRUS DUTOIT (BS Mining Engrg., Montana Tech., '56), mining engineer, at the controls of a raise boring machine in the Mountain Con mine. This mine has the latest in underground mining equipment.

**Below:** LAWRENCE KENAUSIS (BS Chem., Holy Cross '53; MS Chem., Boston College '55; PhD Chem., U. of Penn. '61) is senior research metallurgist at Anaconda research and technical center in Waterbury, Connecticut.

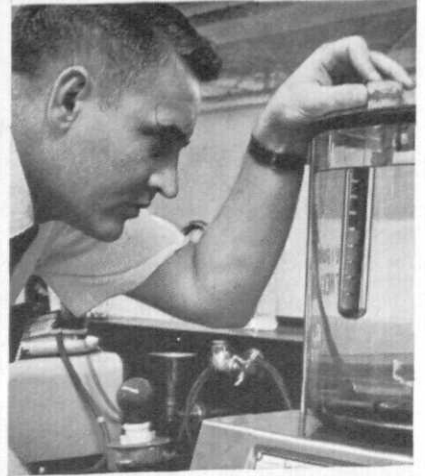


**Top:** JUDITH HIHNALA (BS Bact., Montana State '63) studies bacterial leaching of copper and zinc ore and concentrates in extractive metallurgical research laboratory.



**Top:** GLENN ZINN (BS Geol. E., Mich Tech. '66), geophysicist with the geophysical department's southwest office in Tucson, Arizona, is studying toward a master's degree in geophysics at University of Arizona.

**Below:** FRANKLIN ANDREWS (BS Math., Northern Ill U. '62), manager—quality assurance at Sycamore plant of Anaconda Wire and Cable Company, checks environmental stress crack test of polyethylene.



If you would like more information about the opportunities at Anaconda, or would like to apply for employment, write to: Director of Personnel, The Anaconda Company, 25 Broadway, New York, N.Y. 10004.

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# MAYBE ARMADILLOS WILL FLY THIS YEAR

## *Tau Beta Pi Pledge Essay*

by David J. Eaton

Two students, John and George, are involved in a discussion. Both are intellectually inclined and well informed, having read many volumes of philosophy, art, science, and history. But what are they saying? John says, "I can't be serious when I think of those people who trust in a God that personally supervises every atom in the universe." George chuckles in agreement. There is no argument, since both are assuming that they can base the powers of God on those of man. This is assuming too much. Certainly there are many things a man cannot do, but this does not, of course, imply that a being of higher ability could not as well. A man says he is sure that flying saucers are not interplanetary vehicles. Another says he is sure that they are. What foolishness! We have no way of determining a conclusion, so how can we form one?

The mark of an intellectual is not how well he knows the philosophy of St. Augustine, or how

many symphonies he can recognize, but how well he can think on his own. Thinking on his own, he should not read accounts of prophecies or ghosts and say "ridiculous." Rather he should say "interesting" or "maybe this is true". From there, he could investigate what might be the case if an account is true, or what effects the ideas have on his own thinking.

This problem of "assuming too much" has more practical aspects. It is sadly common. How often we check in only one direction when crossing a one-way street, ignoring the other possibilities. We drive cars without observing cross roads, because we have the "right of way". The highway accident rate would probably be much lower if every driver exchanged thoughts of "he won't cut in front of me" for "he could cut in front of me, so I will be ready."

Tomatoes never fall up, we argue, but how can we neglect the possibility that, say, every

forty thousand years, tomatoes do fall up? Perhaps tomatoes will start falling up this year. Perhaps squirrels will start chasing dogs next week. Perhaps all the steel in the world will dissolve tomorrow. Impossible? Probably, but the possibility is there. The important point is that we cannot say, "This can never be."

We regard a frog as having little conception of a man and no conception of the working of a screwdriver, a simple tool to a man. But consider this: frog is to man as man is to X. What concept does man have of X? Consider this: worm is to man as man is to Y. What concept does man have of Y? Consider this: mushroom is to man as man is to Z. What concept does man have of Z? The incredibility, the "impossibility" of X is great, of Y greater, of Z still greater. Is it not possible that there are many things man cannot begin to comprehend? There is no reason that he cannot or should not allow for this possibility.

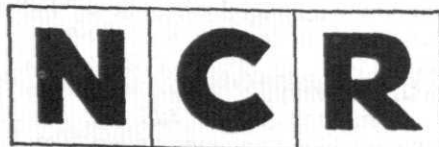
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When I was in high school, my math teacher said, "You should go into engineering. It's the field to go into these days, you know." Somewhat intrigued by his challenge and soberly realizing that I would soon have to make a decision as to whether I would go to college, get a job at home, or fulfill my military obligation, I initially decided that perhaps he was right. Engineering, why not? A fast growing field, financial gains galore, a respectable position, opportunity to use my talents, these were the ideas which raced through my mind.

When the time came to decide, I enrolled at a large, prominent engineering college, and the grind began. It was soon apparent that I was lacking in conviction and maturity, the result being that my major was largely social rather than technical. The second and more consequential result was that I was asked to withdraw from school because of poor academics.

Seeking to soothe my wounds, I joined the service where I could both hide and start afresh. Once again I entered the field of electronics, and was given extensive training. This early taste of success convinced me that all the "boozing around" I had done in college had cost me quite a lot. Later, I was given the opportunity to attend Officers' Training School, and the road seemed clear, except for that bad college record. I conveniently "forgot" to report that record. On the last day of school I was rudely shocked with the discovery that they had found me out. I was expelled immediately and reassigned to my previous duties in electronics.

I thought the world had come to an end for me, and in some respects, perhaps it had. I had had my fill of all the short cuts and activities which had kept me from reaching my goals. It was at this particular time that I was confronted with the fact that God had not been included in any of my well laid plans, and in my hurry to succeed, I had not considered the aspect of eternity. At first, the idea of God's having any claim on me seemed impertinent, for what had God ever done for me that I should owe Him anything? Gradually I had to admit that it was not God who owed me

anything, but I who owed Him everything. He had already given His Supreme Gift. It was now mine to respond.

In the months that followed, my commitment brought on a new conflict. It seemed to me that the concepts of service to God and a career in electronics were mutually exclusive. Finally I realized that I was not supposed to change personalities or magically acquire new talents, but that God expected me to use what He had by nature given me. Only then did I begin to find real fulfillment in my electronics work.

After being discharged from the service, I tried to enroll in college once again, this time with the conviction that my training was going to be used, not for me, but for my Lord. However, admission came only after great perseverance on my part, because of my previous college record.

Now that I'm back in school again, I find that my whole perspective has changed. One problem which has been solved is that of a goal. Previously, my decision to study engineering had been based mainly on the opinions of others, and on the pressures which society has brought to bear concerning a young man's future. All this was quite unreal, because I had not really looked at myself as an individual. Having come into a vital relationship with the Creator, Who made me and alone really knows me, I have confidence in His ability to lead me into the greatest possible fulfillment of myself. With this as my goal, I can yield my aptitudes and abilities to be used in any way whatever by God and have absolute peace about it.

Often the thought comes to mind of money and security. Who doesn't think of these things? It is one thing to think about them and quite another to be dominated by them. In my recent past, for the most part, I had thought only of the monetary aspects of my future career. Engineering, being a very lucrative field, was always high on my list of possible professions. The stress laid upon finances today is amazing, and it would appear at first that if one has money, all will be well. I find that money and the security de-

rived from it are not primary considerations at all, these things being transcended by the assurance that my labors are being and will be reimbursed in a most abundant fashion. This is a very comforting factor when I consider that this provision is promised even beyond the boundaries of time.

The closely related concept of success comes up quite frequently. Some maintain that it takes ambition, others say education, the right breaks, and so on. These are certainly all involved as ingredients, but the

# FROM THE OTHER EDGE

by Bob Kaatz

actual attainment of success is such a relative matter. It depends on where you are, who evaluates you, what you are doing, and some other things I haven't thought of. Success is a very elusive thing, such that one may never know whether he has succeeded or not and so some tensions arise. These tensions go away if I realize that as I am obedient to God, I've already succeeded. Abraham Lincoln once said, "I am not bound to succeed but I am bound to live up to what light I have." This seems to be the heart of the matter -- obedience to God.

It is a continual joy for me as I study in engineering to be able to see more and more how marvelous this world is. Things like the order that exists in the universe, the power involved in many of the processes that go on around us, or the intricate nature of these processes are brought up. Even though it is possible to regard these things by themselves apart from God, they seem incomplete or somewhat discontinuous to me unless

CONTINUED ON PAGE 36

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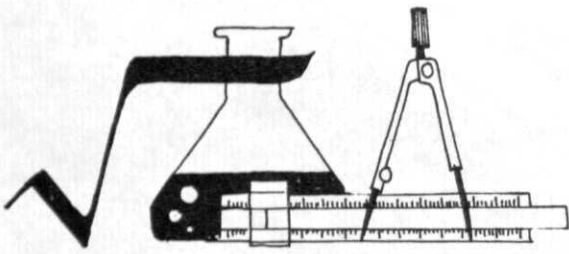
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# PLACEMENT BUREAU

The following is a tentative listing of companies interviewing Engineering majors during the months of April and May, 1967. Each Monday of the regular term the Placement Bureau publishes a bulleting 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 April 3-7

IBM  
General Motors  
Vitro Labs  
Naval Civil Engineering Lab  
Sarkes Tarzian, Inc.  
Miles Lab  
General Telephone & Electronics  
McGill Manufacturing, Inc.  
Hawaii Telephone Company

Week of April 10-14

General Electric  
IBM  
Twin Disc Clutch Co.  
National Water Quality Lab  
Tee Pak, Inc.  
A.T. & T. Long Lines  
Lyband Ross

Week of April 17-21

General Magnetic Corp.  
Vestal Chemical Lab  
Fisher Body -- Div. of G.M.  
Corning Glass Works  
Abex Corp.  
General Motors Technical Center  
Continental Motors Corp.  
Mechanical Handling Systems  
Electro -- Voice  
RCA  
General Cable Co.  
Roche Laboratories  
Automatic Signal  
McDowell Wellman Engineering Corp.

Aluminum Extrusion Inc.  
Polymer International Corp.  
Oriko Pharmaceutical Corp.  
Associated Spring Corp.  
Burroughs Wellcome & Co.

Week of April 24-28

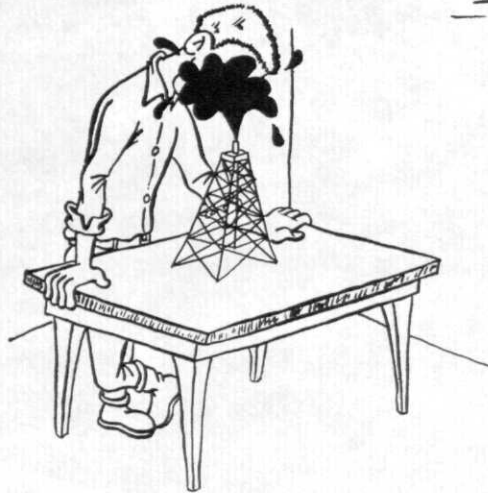
Federal Power Commission  
Guardsmark, Inc.  
Avis Industrial Corp.

Week of May 1-5

Factory Mutual Engineering Div.  
Keeler Brass Co.

Week of May 8-12

Burroughs Wellcome & Co.



## ARCH.

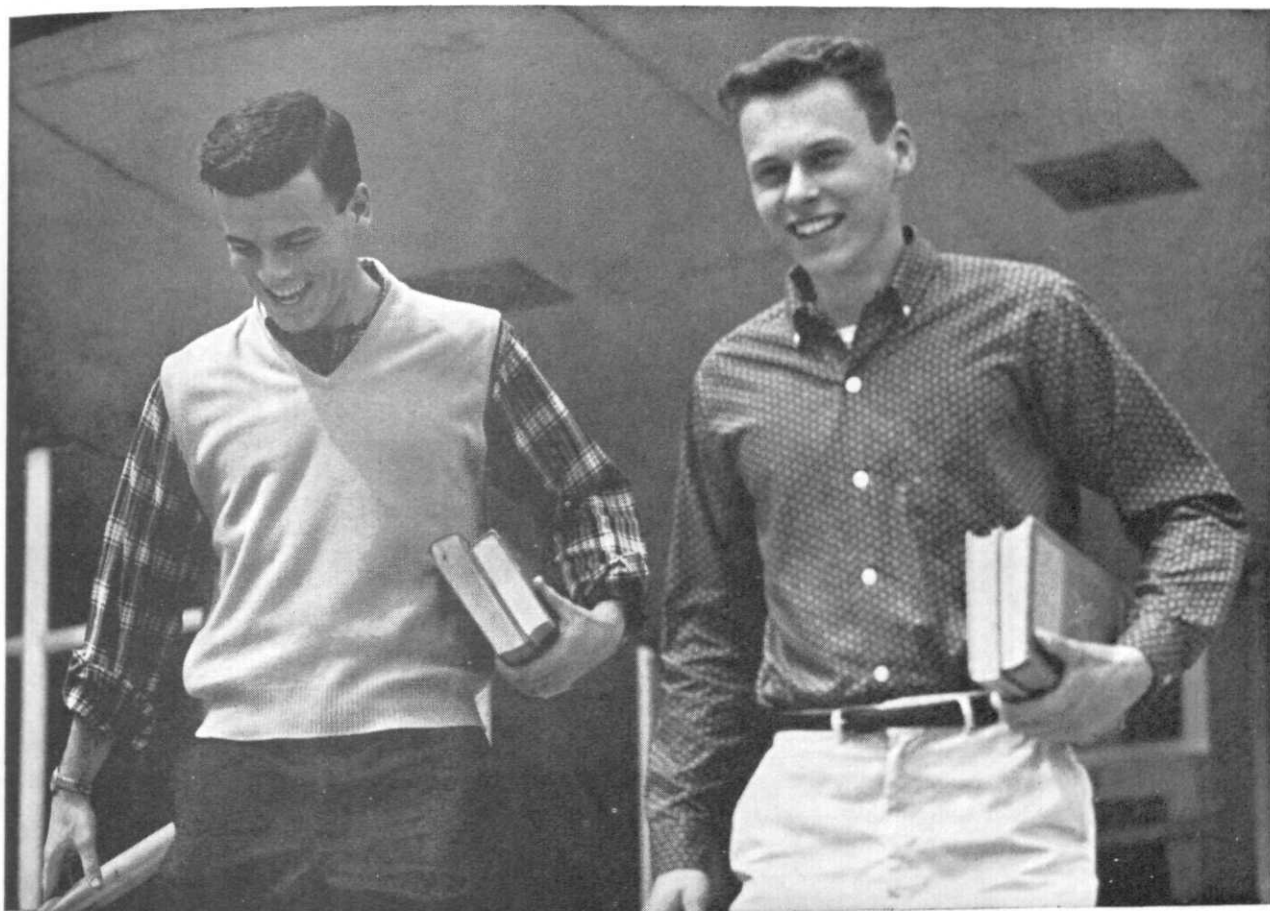


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If you're ambitious, flexible and imaginative, well trained in chemistry, physics, chemical, electrical or mechanical engineering, marketing, finance, accounting or industrial relations, we'd like to talk to you—regardless of your military commitments.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



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# Put yourself in our place.

Step right into the picture on a marine propulsion problem. Or into our nuclear fuel laboratory. Or the design of one of the biggest boilers ever built 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.

Come grow with us at Babcock & Wilcox.

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

Want to talk about the future? Your future? See your placement officer. Or write to Manager, College Recruiting, The Babcock & Wilcox Company, 161 East 42nd St., New York, N.Y. 10017. A good place to work and grow.



**Babcock & Wilcox**

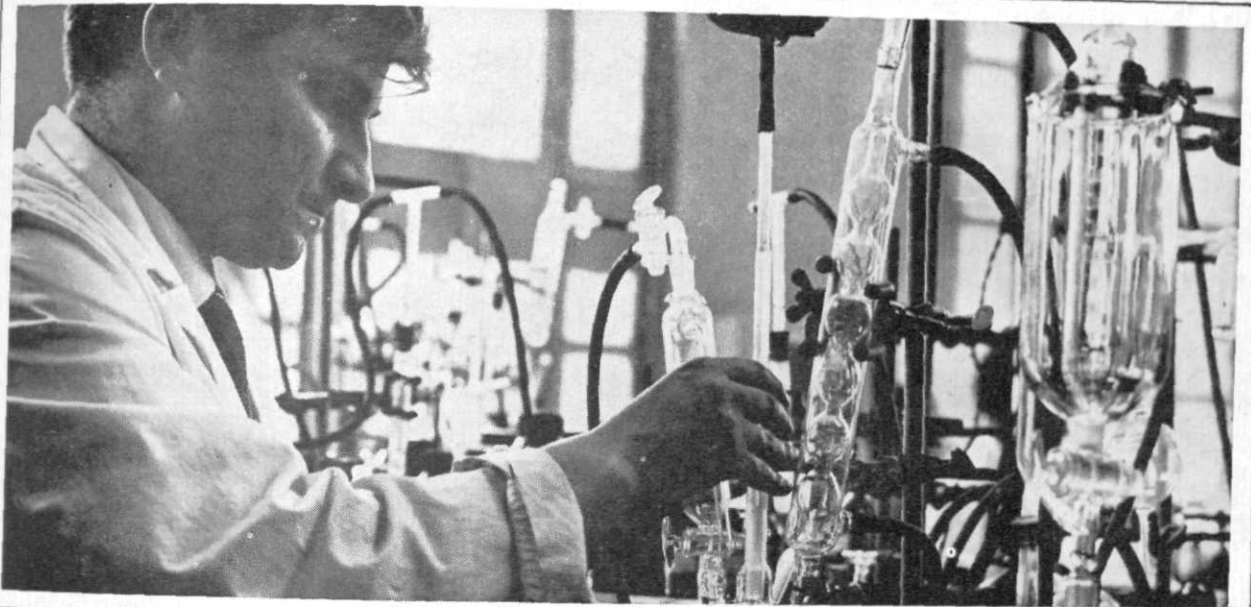


Photo: Montecatini Co.

ENGINEERS/SCIENTISTS

**H**ow many new  
microcircuit packaging ideas  
...new system configurations  
...and punctured  
trial balloons will we need,  
to spare this Milan scientist  
an experiment  
he doesn't need.

In the last year alone, hundreds of new synthetic materials and metal alloys, both ferrous and non-ferrous, have been developed. In this avalanche of new materials, how can a scientist best search the literature to do original work without duplicating someone else's effort and wasting his own valuable time? One answer may be Graphic Communications that can give him all the known facts on a specific subject from a central memory bank.

Presenting knowledge in many forms quickly and cheaply to millions who are remote from it today is a Xerox goal. Our aim is to get information from man to machine and back to man within seconds. We're close to it. We're already working on exciting new concepts of communications such as 3-dimensional imaging, color xerography and global transmission of images through computer systems. All designed to condense the information explosion and transmit its ideas at speed approximating real-time. This is our aim.

Why not pursue it with us.

Your degree in Engineering, Science, Statistics or Mathematics can qualify you for openings at Xerox in fundamental and applied research, engineering, manufacturing, programming and marketing/sales.

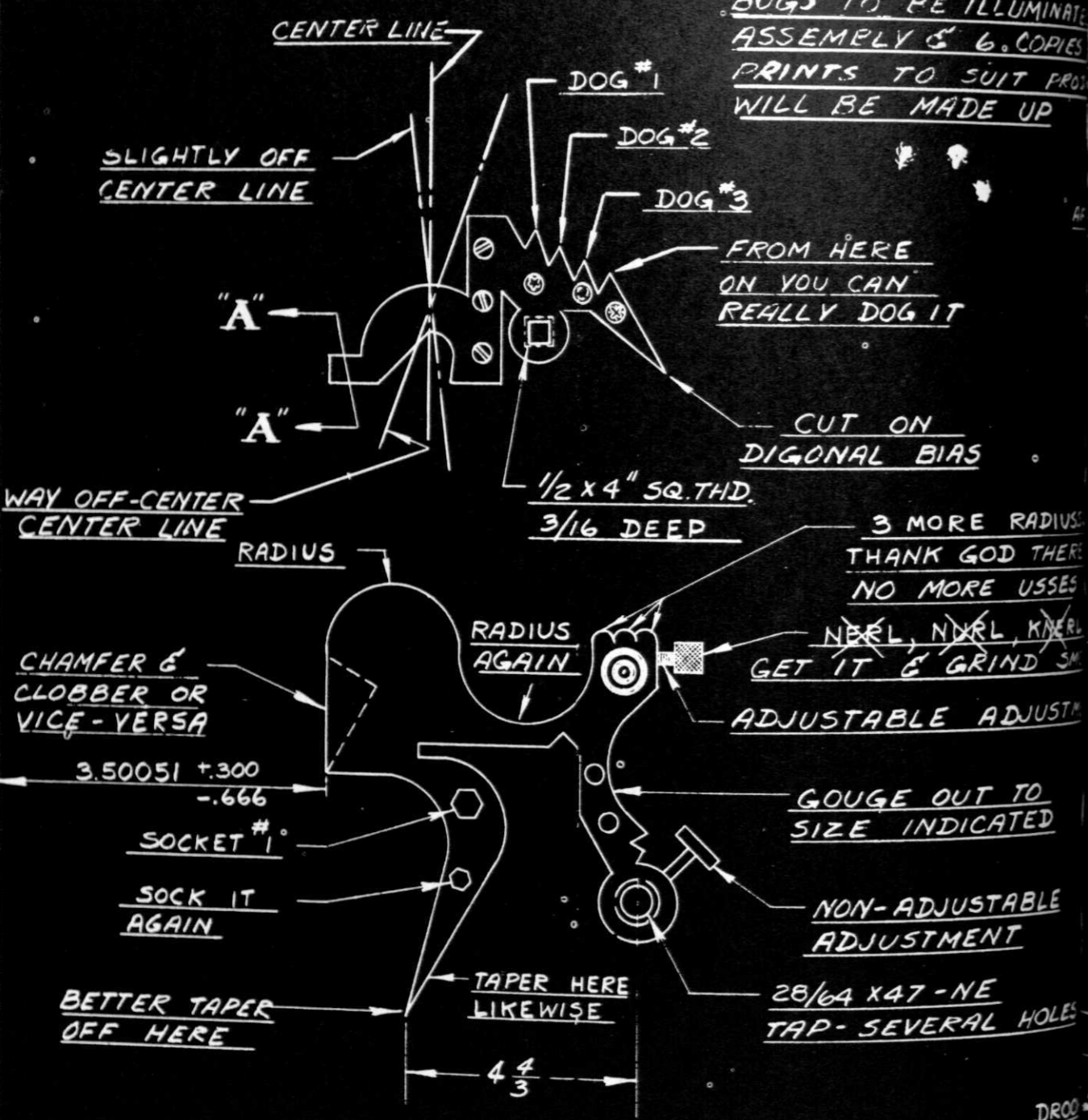
To learn more, see your Placement Director or write to Mr. Stephen G. Crawford, Xerox Corporation, P.O. Box 1540, Rochester, New York 14603.

**XEROX**

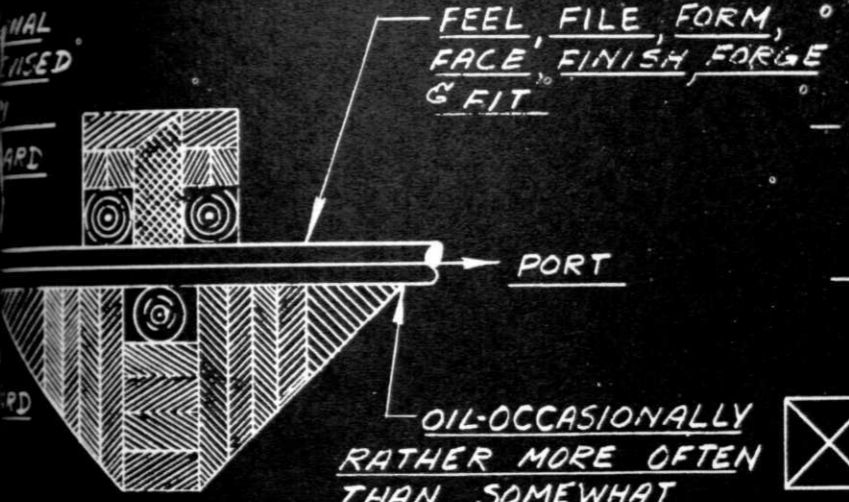
An Equal Opportunity Employer (M/F)

# WATER COOLED ELECTRONIC FIGLIGGIE

ICUR12.



NOTE:  
BUGS TO BE ILLUMINATED  
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PRINTS TO SUIT PROSM  
WILL BE MADE UP



GOVERNMENT REJECTED  
FOR YOUR PROTECTION

- BREAK ALL CORNERS  
SHARP UNLESS  
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- ANY SIMILARTY BETWEEN  
THIS MACHINE & AN IDENTICAL  
MACHINE IS PURELY INCONSEQUENTIAL



COPIES SENT TO  
DAMN NEAR  
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DATE:



CAUTION!!  
KEEP UPPER BOTTOM RIGHT HAND CORNER OVER ABOUT 1/16 LOWER THAN LEFT-HAND CENTER CORNER WHICH SHOULD BE DOWN A LITTLE HIGHER THAN MIDWAY APPROXIMATELY  
NOTE!!  
AN 8X10 FT. 3 COLOR REPRODUCTION OF THIS DRAWING SUITABLE FOR FRAMING CAN BE OBTAINED BY SENDING 25¢ IN COIN & THE HEADS FROM 3 JUNIOR DESIGN ENGINEERS TO THE AMALAGAMATED WIDGET WORKS, WEST LOCKWASHER PA.

SCALE	MATERIAL	NAME OF PART	PART NO
1/16 CLEAR	DR. T. SQUARE 1-11	AMALGAMATED WIDGET WORKS	
FAST	CK I.M. COMPAUSED	WEST LOCKWASHER PA	
UNLIMITED	WELD ONDR	WATER COOLED ELECTRONIC FIGLIGGIE	
PAR 6		DATE OF RE. PART NO	ICUR12
	FIRST USED ON		
	REV NO	REVISION	DATE BY CK APD
	REV NO	REVISION	DATE BY CK APD

**NEWS**

**for**

1966  
1967

**ENGINEERING**

**GRADUATES**



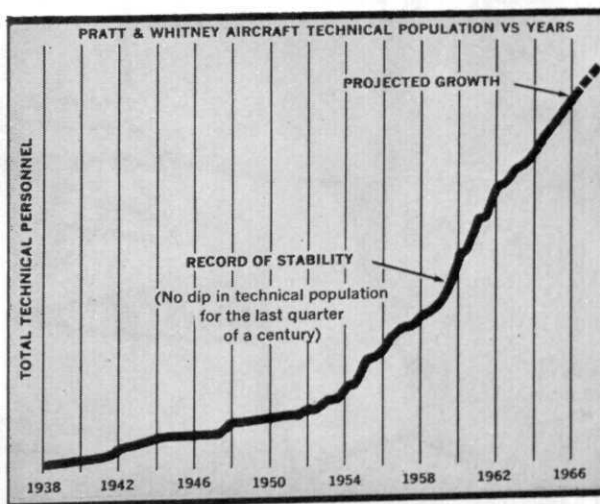
# Continued expansion of our military and commercial business provides openings for virtually every technical talent.

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

DIVISION OF UNITED AIRCRAFT CORP.



An Equal Opportunity Employer



**Last year, thousands of lawyers, bankers, accountants, engineers, doctors and businessmen went back to college.**

**And not just for the football games.**

We'd like to clear up what appears to be a misunderstanding. It is somewhat popular on campus to decry a business career on the grounds that you stop learning once you start working for Cliché Nuts & Bolts.

That idea is groundless.

We can't speak for Cliché, but we can for ourselves — Western Electric, the manufacturing and supply unit of the Bell System. 6 out of 10 college graduates who have joined us over the past 10 years, for example, have continued their higher education.

How're these for openers:

W.E.'s Tuition Refund Plan lets employees pursue degrees while

working for us. Over 6 thousand have attended schools in 41 states under this plan. We refund more than \$1 million in tuition costs to employees a year.

To name another program: advanced engineering study, under the direction of Lehigh University, is conducted at our Engineering Research Center in Princeton, N. J. Selected employees are sent there from all over the country for two year's concentrated study leading to a master's degree.

You get the idea. We're for more learning in our business. After all,

Western Electric doesn't make buggy whips. We make advanced communications equipment. And the Bell telephone network will need even more sophisticated devices by the time your fifth reunion rolls around. The state of the art, never static, is where the action is.

At Western Electric, what's happening is the excitement and satisfaction of continued doing and learning. If this happens to appeal to you, no matter what degree you're aiming for, check us out. And grab a piece of the action.



**Western Electric**  
MANUFACTURING & SUPPLY UNIT OF THE BELL SYSTEM

# ENGINEERING

word play

**M**ASS

HEAT

CONDUCTOR

MECHANICS

SCREWS

ELECTRON

WAVES

RESISTOR

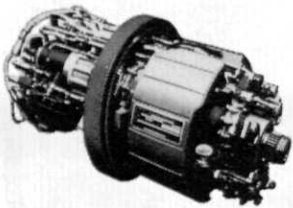
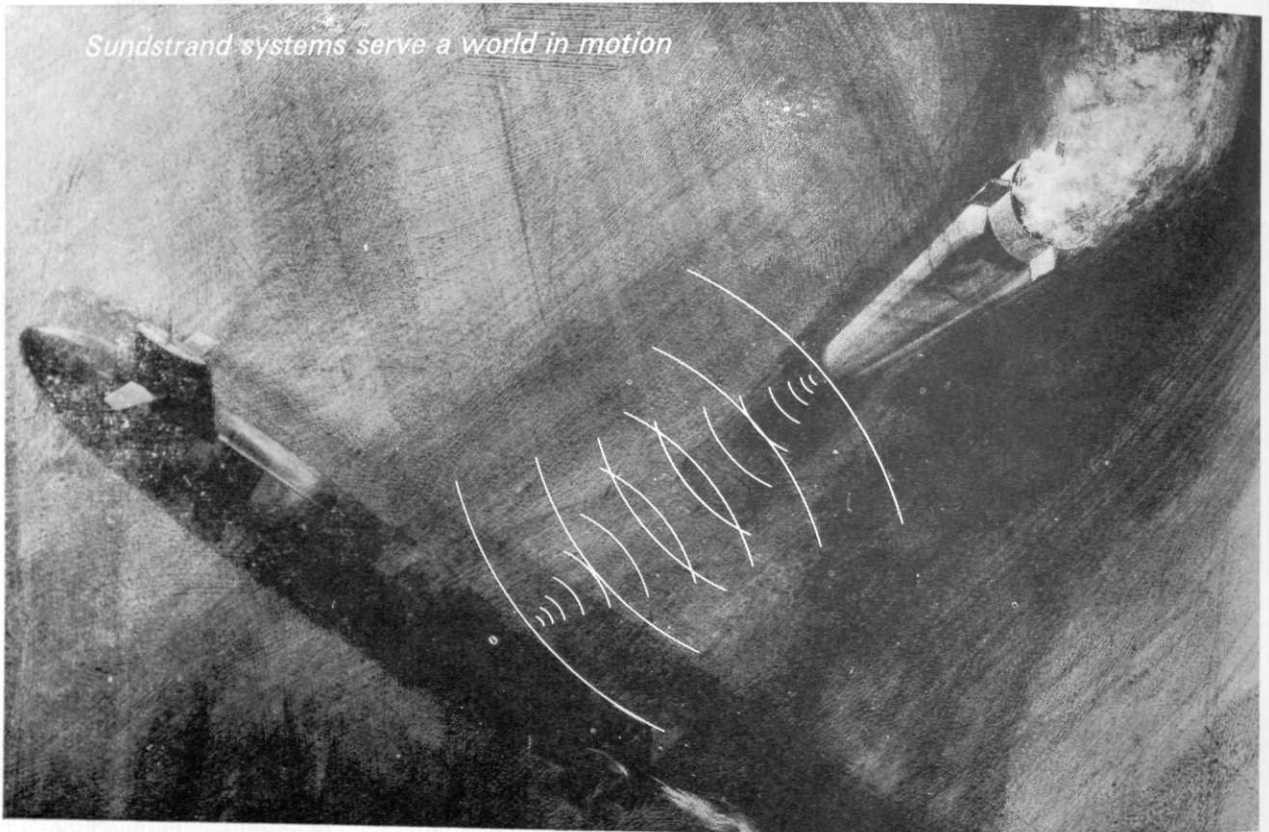


CONDUCTOR

RESISTOR



Sundstrand systems serve a world in motion



The challenge of torpedo propulsion at Sundstrand includes design, development, qualification, and initial production of sophisticated propulsion systems for advanced design torpedoes. These programs involve high-speed turbo-machinery for both open and closed-cycle systems, and experimental work with the latest high-performance fuels suitable for torpedo propulsion.

Sundstrand offers excellent career opportunities. Sundstrand engineers work on a variety of projects under excellent working conditions, enjoy definite project responsibility and follow-through. Consistent emphasis on engineering results in a sizable investment in research and development. Our new special test facility in Rockford, Ill., provides unmatched capability for R&D and production testing of Otto-fueled, open-cycle torpedo propulsion systems; closed-cycle organic Rankine-cycle power systems; miniature missile power units burning hydrazine propellants.

Consider a career at Sundstrand. We employ nearly 6000 people, enjoy approximately \$100 million annual sales—a steadily growing, medium-sized company, *on the move!* Torpedo propulsion, thermodynamics, supersonic transport, solid-state electronics, isotope power for space vehicles, hydrostatic transmissions for vehicle propulsion—these are the tomorrow-oriented fields we investigate. Join us!



## Home in on torpedo propulsion at Sundstrand

Now that you know something about us, how about letting us know something about you?

Talk with the Sundstrand Employment Manager when he visits your campus on March 9

Or, send your resume in confidence to  
**SUNDSTRAND PERSONNEL CENTER**  
1401 23rd Avenue, Rockford, Ill. 61101  
*An equal opportunity employer*

### Positions now open in the following areas:

- Turbo-machinery and thermodynamics
- Combustion engineering
- Gear design and manufacture
- Aircraft hydraulic pump and motor development
- Acoustics engineering
- Bearing design
- Circuit design and electronic packaging
- Application engineering
- Vehicle transmission design
- Electrical test equipment
- Manufacturing engineering

the day you start here  
is the day  
we start helping you  
outgrow  
your  
job

The way we look at it (not only here at Electric Boat Division, but in General Dynamics as a whole) good employes—properly placed, trained and motivated—are our fastest growing asset. So, right from the start, we'll be doing everything in our power to help you develop your full potential through a strongly-implemented management-sponsored program that makes your professional development a matter of planning, not chance.

This program, called "people development", is designed to spot your special capabilities—to help you move, to progress, even to change your product area or technical discipline if that's what it takes to increase the certainty of your success. Part of the program is a philosophy that charges each supervisor, whatever his level, with developing his own replacement. And our supervisors are adept at recognizing individual achievement and calling appropriate attention to it. Part of it, too, is one of the most extensive and far-sighted educational, study and post graduate pro-

grams ever offered by any company, to encourage continued academic proficiency. Hundreds of people in our Division participate each year.

But the thing that gives this approach of ours real point is the challenge and excitement of the field you'll be working in—Oceanology—a field as new as the Aerospace industry was new a dozen years ago, and as promising; a field that encompasses every means of undersea operation and exploration known to man.

And here, whether you're working on a deep diving research vehicle or an atomic sub, the opportunities for innovation (as well as growth for the innovative) are endless. For instance, every atomic submarine we build is treated as a new and different problem. Even ships in the same class differ since each succeeding one is, in fact, the state-of-the-art at the time we're building it. Within any sub, advances might

occur in nuclear shielding design; in heat transfer efficiency; in sound and vibration control; in new materials; in chemically based life support systems; or in a dozen other areas. And because of the close collaboration among men of many different technical disciplines, your thinking might spark a new idea in any one of them. Just as their thinking might spark yours.

Living and working in Groton, Connecticut is a rewarding experience in itself. For in this unique nautical community you are not only close to the men and women who build and sail submarines, but to all the abundant pleasures of the sea. (Not that you're far from more metropolitan pleasures if that's your preference.)

---

So, if you've missed our on-campus interviews, but would like to know more about how we will help you outgrow job after job here at Electric Boat, write to Mr. Donald K. Whynott. Ask for our new informative brochure.

**GENERAL DYNAMICS**  
**Electric Boat Division**  
Groton, Connecticut

An Equal Opportunity Employer • U.S. citizenship is required



**JOE MENDELSON, PLANT ENGINEER**  
Ch.E., University of Maryland '63



**BILL OLDAKOWSKI, TECHNICAL ASSISTANT, HOT-STRIP MILL**  
Ind'l Admin., Yale University '63



## *They're on the move* at *Bethlehem Steel*

Have you heard about all the opportunities for engineers and other technical graduates at Bethlehem Steel? 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 Manager of Personnel, Bethlehem Steel Corporation, Bethlehem, Pa. 18016.



*An equal opportunity employer in the Plans for Progress Program*

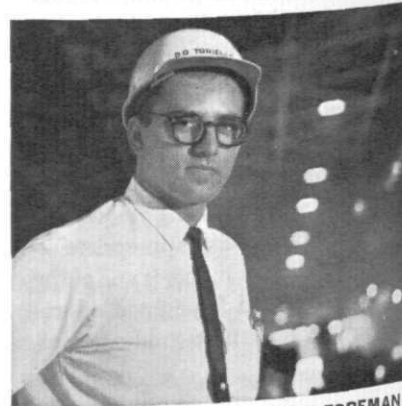
**JIM PFEIFFER, RESEARCH ENGINEER**  
Ch.E., Pennsylvania State University '62



**KARL KUGLER, COMBUSTION ENGINEER**  
M.E., State University of New York (Buffalo) '62



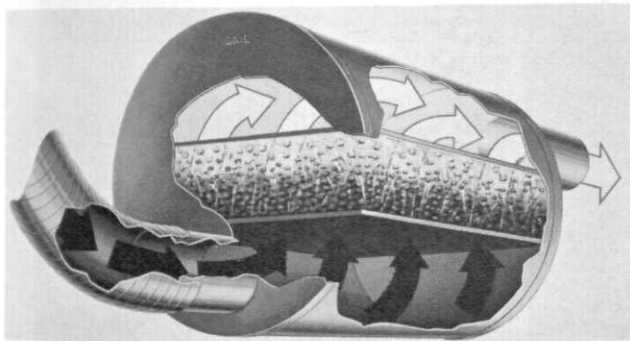
**CHARLIE MARTIN, ELECTRICAL ENGINEER**  
E.E., Lafayette '62



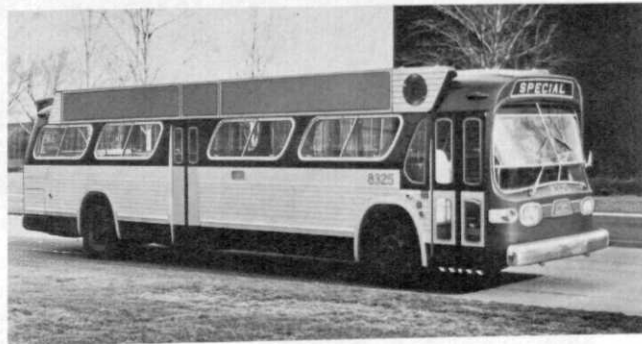
**DOM TORIELLO, OPEN-HEARTH FOREMAN**  
Met.E., Case Institute of Technology '63

# Industrial News

Flexible, jacketed glass fibers for light transmission in single lengths up to 10,000 feet are available from Corning Glass Works. The fibers are jacketed in tough plastic for ease in handling and for use in automated processing equipment. Corning flexible glass fibers can be twisted and flexed without interruption of light transmission. Applications for high temperature resistant glass fibers include transmission of remote light or optical data in instrumentation, processing, inspection, and illumination systems. Initial selling price is 10 cents per foot in quantities of 50,000 feet. As volume increases, the price will fall to five cents or less per foot, depending on quantity and specifications, Corning said.



Here is a cutaway sketch of GMC Truck & Coach Division's new experimental catalytic muffler. Arrows indicate the flow of exhaust gases through a chamber containing ceramic pellets coated with a catalytic agent.



Ten transit buses similar to the one shown here are equipped with experimental catalytic mufflers for further evaluation in New York City's mass transportation system.

Ten buses equipped with experimental catalytic mufflers have been delivered to the New York City Transit Authority by GMC Truck & Coach Division of General Motors for further evaluation in the field of diesel bus exhaust odor control.

The vehicles were among the last of 682 GMC buses ordered by New York last fall in a long-range program to modernize its transportation system.

GMC Chief Engineer Harold O. Flynn said the muffler's catalyst consists of chemically coated ceramic pellets.

The flow of hot exhaust gases through the muffler activates the pellets to promote the oxidation of unburned hydrocarbons and also agitates them to reduce buildup in the catalytic bed.

Mufflers similar to those being placed in New York are being evaluated in several other selected bus fleets. In Detroit, they have operated for more than 40,000 miles without limiting engine performance or requiring the addition of new catalytic pellets.

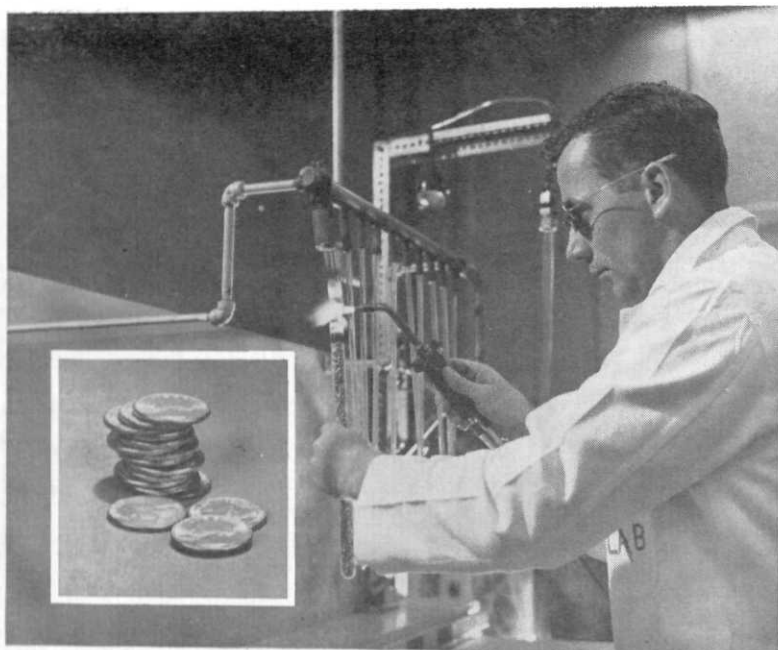
In addition to the catalytic muffler development, Flynn said that GMC Truck & Coach Division is conducting research in other areas.

They include the investigation of fuel additives and masking agents, recirculation of exhaust gases, exhaust dispersion devices, after-burners, design of injection and combustion systems, air injection, air induction including swirl, engine lubricant efforts, and combustion chamber shapes.

He said development of the new experimental catalytic mufflers was a joint venture, with the W. R. Grace & Company of Baltimore, Md., supplying the catalyst and Nelson Muffler Company of Stoughton, Wisc., providing the mufflers.

**A SLICK WAY TO COUNT MONEY.** Between two Bell System coin telephones are Carolyn Choate, stacks of money, and small plastic parts. There's a logical connection. Carolyn is an employee of Western Electric's Oklahoma City plant, which makes coin telephones. Since the phones have but one slot for three coins (nickels, dimes, and quarters), there must be a way to identify the money inserted for a call. That's the job of the plastic parts, which are molded to tolerances as exact as 5/10,000th of an inch. They work together to send electronic "beeps" to the Bell System operator (one beep for a nickel, two for a dime, five for a quarter). A special plastic is used instead of metal so the parts are, in effect, self-lubricating. Western Electric engineers term it "a very low coefficient of friction." In other words, a slick way to count money.



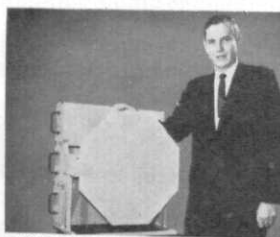


*metallurgical materials  
move ahead fast  
...so can you!*

**TI ALSO MOVES AHEAD FAST  
IN ...**



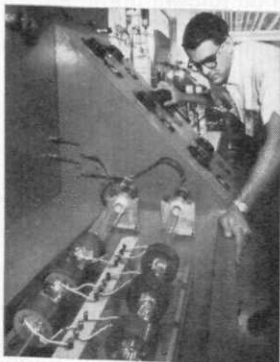
SPACE SYSTEMS



MICROELECTRONIC RADAR



DIGITAL SYSTEMS



SEMICONDUCTOR MATERIALS



SEMICONDUCTOR INTEGRATED CIRCUITS



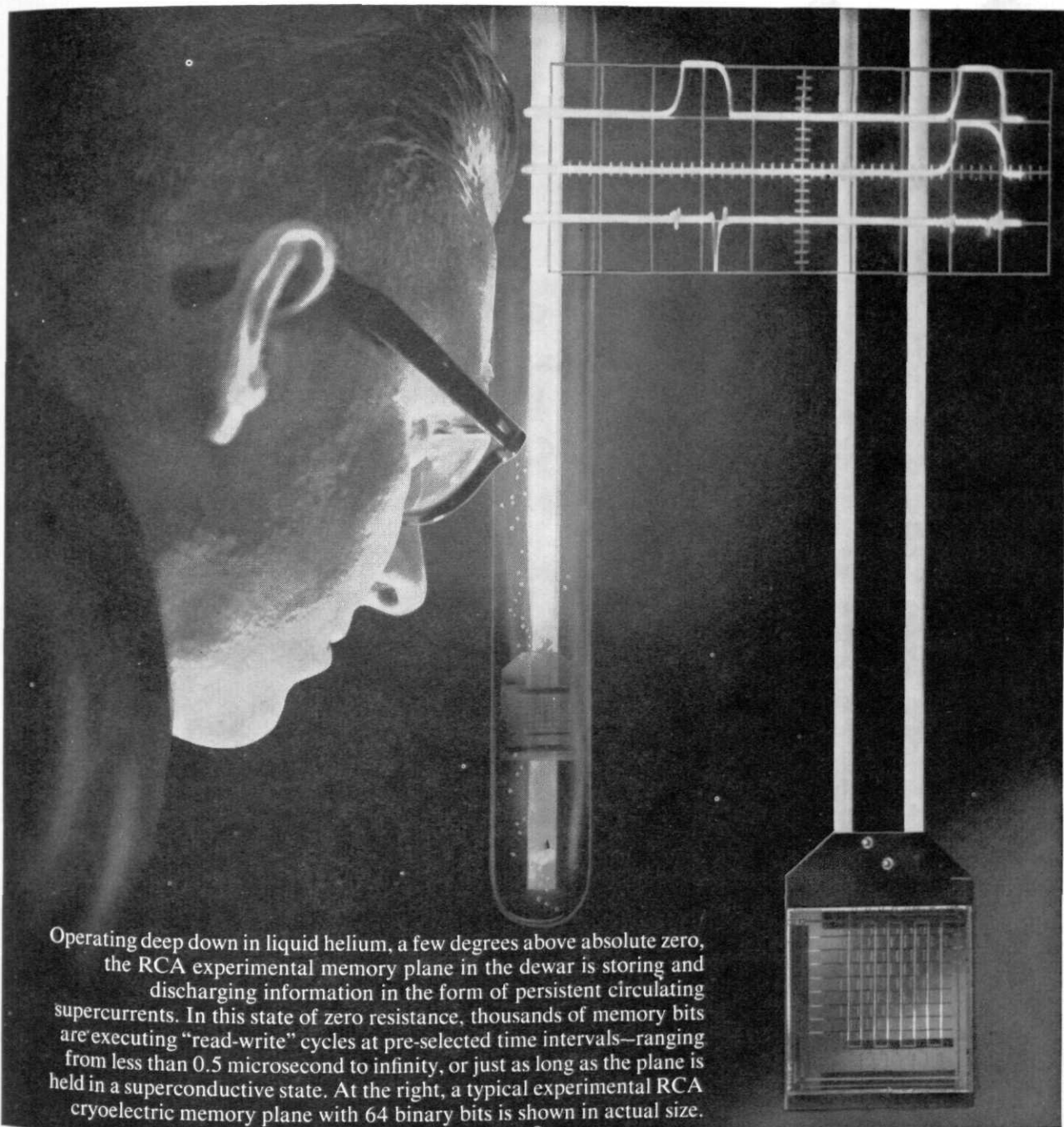
SIGNAL PROCESSING



COHERENT OPTICS

How do you make coin material — without silver — that a vending machine can't tell from a conventional silver quarter? How do you make a piece of wire with the electrical conductivity of copper and the tensile strength of steel? How can you provide a wearing surface equivalent to diamond at a small fraction of the price? These are the kinds of material problems you might work on at Texas Instruments. Materials scientists solve problems like these by cladding dissimilar metals together to form a new material that has properties unattainable with any monolithic alloy. Applied to such products as thermostats and controls, TI metallurgical skills solve problems like knowing when to turn off your coffee pot or when to stop a large industrial motor. Creative skills in materials and many other technologies have helped TI double in size about every three years for the past two decades. You might be interested in other TI technologies, a few of which are illustrated here. All have as a common bond a high level of innovation... by creative people working in a creative environment. TI's growth and diversity offer exceptional opportunities for outstanding college graduates at all degree levels and in many disciplines. For information about metallurgical materials at Texas Instruments — or any other technology illustrated here — write Jack Troster, indicating your area of interest. To obtain information about current professional openings, consult your college placement director, or send your confidential resume to Jack Troster, Dept. C-482, P. O. Box 5474, Dallas, Texas 75222. An equal opportunity employer.

**TEXAS INSTRUMENTS  
INCORPORATED**



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.

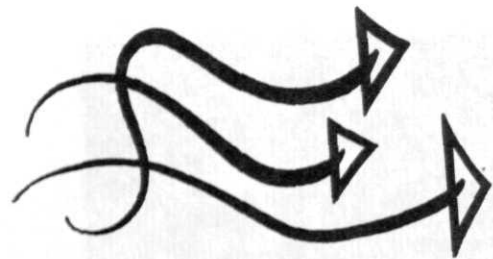
You owe it to yourself to find out more about the great range of activities at RCA. See your college placement director, or write to College Relations, Radio Corporation of America, Cherry Hill, New Jersey 08101.

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

*An Equal Opportunity Employer*



**The Most Trusted Name in Electronics**



## NUTCH

*What lust hath the lowly jellyroll,  
None more banal than a stale fig newton,  
Sincerity is a soggy oreo,  
Extinction the belly button of an oatmeal cookie.*

Jack Simmons

## ODE TO A GROUND WIRE

*Oh to thee oh ground wire,  
You cover me when I need you;  
Like my mother of the womb,  
You are totally fundamental,  
Basic*

*You are the commonest,  
Not even the Marxian Proletariat  
Cover the chassis like you.*

*To be positive and negative  
At different times;  
Only you, Only you;  
Can be at once once,  
Then neether niither later.*

*To be in the nitty-gritty,  
Down in the earth  
Strong, sweet, brown and fundamental,  
Earth  
Your brothers capacitor,  
Resistor, or semi-conductor  
Never get down THERE*

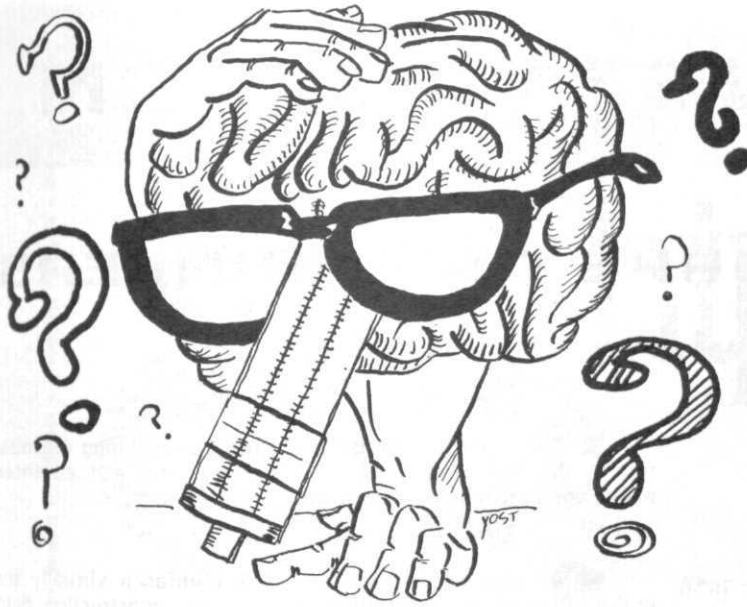
*To be isolated in the cabinet;  
Yet be so Ontologically there,  
In the case, but out  
In the earth:  
So Earthy is to  
BE*

John Henry Dekker

# POEMS

*THERE NEVER WAS A TRUER LOVE,  
THAN NEVER WAS.*

Jack Simmons



# BRAIN SPRAINERS

Editors note: Answers to the following problems will appear in the May issue.

1. Find the digit represented by each letter in this multiplication problem. No two letters represent the same number and no letter represents two numbers.

LYNDON

B

JOHNSON

2. Below are given three sets of numbers. In each set the second number is derived from

the first by some general rule which holds for the entire group. Find the general rule and the number to go with the last pair in each set.

- a) 5-52, 6-63, 7-94, 9-18, 8-?
- b) 5-56, 6-87, 7-19, 8-401, 9-?
- c) 11-121, 12-144, 13-169, 14, 1861, 16-1273, 15-?

3. How many multiples of 11 are there from one to one trillion that are even and also squares?

Answers to January's Problems

1. Smith forgets to bring his wife flowers; there is no in-

dependence.

2. Both fighters flew the same distance, 400 miles, since each flew for 240/300 hours during the operation.
3. 6 cuts. No matter how the cutting is done, the faces of the central cube must result from separate cuts. The job may be done without any piling.
4. The garrison had 49,500 lbs. of bread.
5. The computation is in the duodecimal scale (to the base 12), so  $1/5$  of 10 is  $2 \frac{2}{5}$ .
6. Not always.

## The Engineer's Psalm

Dr. \_\_\_\_\_ is my instructor;  
I shall not pass.  
He maketh me to exhibit mine ignorance before the whole class.  
He telleth me more than I can write.  
He lowereth my grade.  
Yea, though I walk through the corridors of knowledge, I do not learn.  
He tries to teach me;  
He writeth the equations before me in hopes I will understand them.  
He bombardeth my head with integrations,  
My sliderule freezeth up,  
Surely enthalpies and entropies shall follow me all the days of my life,  
And I shall dwell in the College of Engineering forever.





# CONSTRUCTION

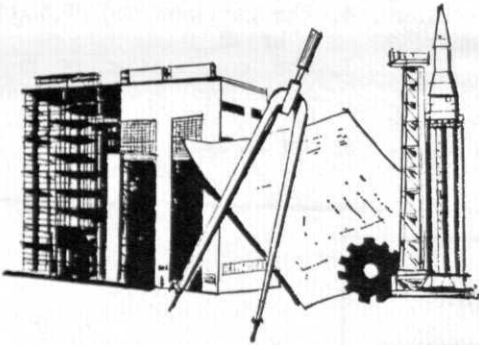
## THE ARMY CORPS OF ENGINEERS

offers you a challenging civilian career with:

■ The world's foremost and largest engineering organization in the construction field, pioneering new and advanced engineering practices and concepts.



■ An organization whose work embraces virtually the entire range of modern engineering in the construction field. Projects include research into basic science, engineering investigations and regional planning; design, construction, operations, maintenance, and management of hydro-electric power dams, flood control facilities, harbors and navigable streams; design, construction and maintenance of family housing, runways, hangars, roadways, hospitals, and nuclear power installations; and construction of intercontinental ballistic missile and space launching sites. In addition are the allied fields of cartography, geodesy, mathematics, and engineer intelligence.



■ An organization that recognizes each engineer as an individual, providing well-rounded career development programs with on-the-job training; courses at government expense in colleges, universities, and seminars as necessary to assure steady progression to top professional and managerial levels; encouragement and assistance in attaining professional registration and recognition; and an opportunity to win national and international awards.

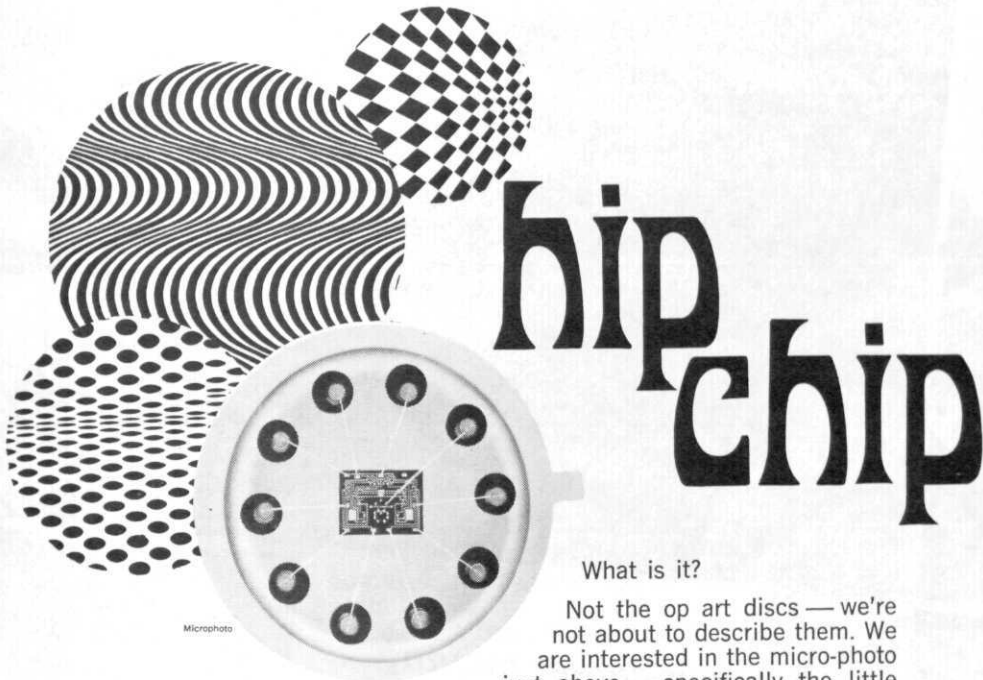
■ An organization with offices and projects in nearly every one of the 50 States and in many foreign countries that encourages employees to further their development by accepting new and challenging assignments.

■ An organization which provides excellent rates of pay with liberal fringe benefits, including generous retirement annuity, complete health and life insurance coverage, paid vacation leave, military training leave with pay, generous sick leave; and special pay awards for outstanding performance and suggestions that improve operating efficiency.

If you're thinking this all too good to be true, you're wrong! All of the above is available to you in a civilian engineer career with the U. S. Army Corps of Engineers. If you are interested, you can get further information from the Chief of Engineers, Department of the Army, Washington, D.C. 20315.

**AN EQUAL OPPORTUNITY EMPLOYER**

**WRITE FOR AN ILLUSTRATED BROCHURE "YOUR CAREER."**



# hip chip

What is it?

Not the op art discs — we're not about to describe them. We are interested in the micro-photo just above — specifically the little rectangle in the center. It's a minuscule chip of silicon produced in Motorola's semiconductor labs—on the verge of creating a scientific revolution all its own.

The chip's dimensions are 0.060" by 0.080"—about the size of a baby B-B. That tiny area incorporates 14 transistors, 10 resistors and 2 capacitors—performing the same circuit functions as the 26 discrete components shown below. It's Motorola's chip off a new block of electronics—it's an integrated circuit.

But why all the fuss?

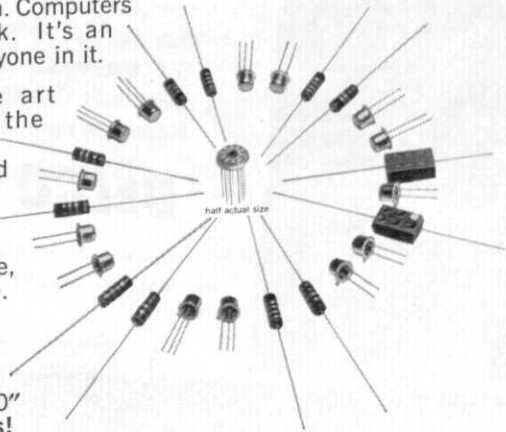
Because the integrated circuit is the key to untold electronics marvels, hitherto impractical. Because its small size, weight, and power consumption lessen the cost of complex systems and improve performance. Because it's more reliable, to boot.

Integrated circuits already are used in design plans for amazing new computers — computers which will, in effect, function as special extensions of the human brain. Computers which, in time, will almost think. It's an exciting business. It challenges everyone in it.

Within a year, the solid state art will develop the means to store the content of the Encyclopaedia Britannica in a one inch cube—a solid state memory system. One day, every important university library will have electronic knowledge banks connected, perhaps by satellite, for instant exchange of information.

People generally are impressed by the chip with 26 components. But hang on. We've now got one in the lab not much larger (0.120" by 0.120") . . . with 524 components!

Hip chip? You bet.

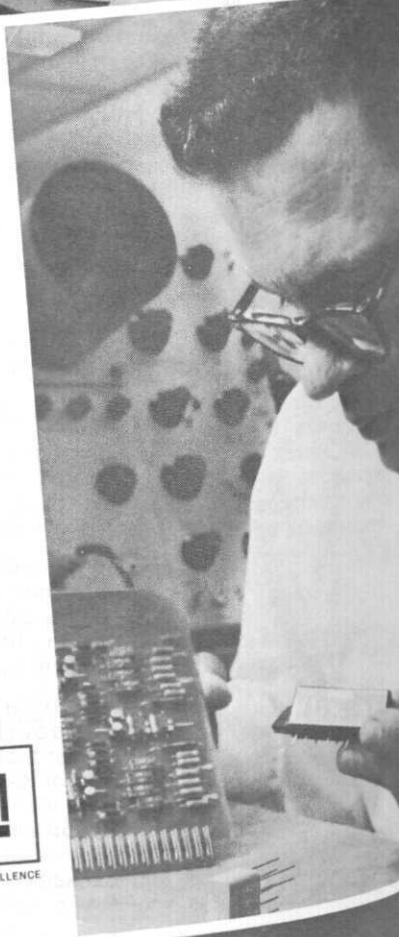


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# ENGRINEERS

She (cooly): "You bad boy, don't you kiss me again."

He: "I won't. I'm just trying to find out who has the gin at this party."

WENCH: Something to turn the head of a dolt.

They arrested her for soliciting, but she pleaded not guilty, claiming she was only calling her dog Tiz. . . . "Here Tiz, Here Tiz."

SE

A fugitive scientist from a Boris Karloff horror picture dreamed up a serum that would bring inanimate objects to life. He surreptitiously tried it out on the statue of a great general in Central Park. Sure enough, the statue gave a quiver and a moment later the general, creaking a bit in the joints, climbed down from the pedestal. The scientist was overjoyed.

"I have given you life," he exulted. "Now tell me, General, what is the first thing you are going to do with it?"

"That's easy," rasped the general, ripping a gun from his holster. "I'm going to shoot about two million pigeons."

SE

She has a contagious smile. . . trench mouth.

SE

The little girl was sitting demurely on the couch, watching her mother smoking a cigarette. Her little nose was wrinkled and in her pale blue eyes was an expression of disillusionment. Finally, unable to stand it any longer, she burst in her quavering falsetto:

"Mother, when in the hell are you going to learn to inhale?"

"Why that toothbrush in your coat lapel?"

"It's my class pin -- I go to Colgate."

SE

Chem. E.: "May I take you home? I like to take experienced girls home."

Coed: "But I'm not experienced."

Chem. E.: "You're not home yet either."

Did you hear about the engineer who tried to beat a train to the railroad crossing?

He hit the 29th car.

SE

The GIs were searching a village just after the battle of WWII. Entering a large house they found a coffin in the middle of the room. Opening the coffin they found an old grey haired man sadly erasing a musical manuscript. When questioned who he was and what he was doing, the old man replied: "I'm Beethoven, and I'm decomposing."

No man is completely worthless, he can always serve as a horrible example.

SE

"And then I said, 'Well, if I can't make it in industry, I can always teach.' Then the prof stopped laughing."

SE

"Beg your pardon, but aren't you an engineering student?"

"No, it's just that I couldn't find my suspenders this morning, my razor blades were gone, and a bus ran over my hat."

A jealous husband returned home early from a business trip and found his wife in the undress.

"There's a man in the house," he said searching every room. When he went into the bathroom he discovered a shadow hiding behind the shower curtain. Immediately he opened it and found a man standing in the tub. The man jerked the curtain closed again.

"Please," he said, "I haven't finished voting yet."

SE

She was a gorgeous girl, And he was a loving male. He praised her shape in English, French, Italian, and Braille.

Then there was the one-fingered pick-pocket who could only steal lifesavers.

SE

"I'll bet you can't tell me why they don't allow Volkswagens in Africa."

"I give up, why don't they allow Volkswagens in Africa?" "Because wild elephants will make love to anything with a trunk in front."

How about a 23-hour deodorant? A guy should have at least one hour to himself.

SE

The young father was explaining a sure-fire method for putting the baby to sleep.

"I toss him up in the air again and again."

"How does that put him to sleep?" asked the neighbor

"We have very low ceilings."

SE

CONTINUED FROM PAGE 11

they are linked to the One responsible for them. Actually the biblical truths do not find an enemy here but they are fortified and explained further by the discoveries we have made. This has given me an added incentive in my studies here in school.

The preceding all seems very reasonable to me but to some it is not so. Usually opposition will come from those who have not looked into these things and as a result they have no answer except that of denying or refuting. It is my studied conviction that God's claim on my life is valid and that His call to me is sincere. To deny this claim or call is to place oneself in a dangerous position, the clay does not say to the potter, "No." I do not claim to have all the answers but the most important question has been answered: I KNOW WHOM I HAVE BELIEVED AND AM PERSUADED THAT HE IS ABLE TO KEEP THAT WHICH I HAVE COMMITTED UNTO HIM AGAINST THAT DAY.

*It is in process* - So wrapped in red tape that the situation is almost hopeless.

*We will look into it* - By the time the wheel makes a full turn, we assume you will have forgotten about it.

*A program* - Any assignment that can't be completed by one telephone call.

*Expedite* - To confound confusion with commotion.

*Channels* - The guy who has a desk between two expeditors.

*Consultant (or Expert)* - Any ordinary guy more than 50 miles from home.

*To activate* - To make carbons and add more names to the memo.

*To implement a program* - Hire more people and expand the office.

*Under consideration* - Never heard of it.

*Under active consideration* - We are looking in the files for it.

*A meeting* - A mass mulling by masterminds.

*A conference* - A place where conversation is substituted for the dreariness of labor and the loneliness of thought.

*To negotiate* - To seek a meeting of minds without a knocking together of heads.

*Re-orientation* - Getting used to working again.

*Reliable source* - The guy you just met.

*Informed source* - The guy who told the guy you just met.

*Unimpeachable source* - The guy who started the rumor originally.

*A clarification* - To fill in the background with so many details that the foreground goes underground.

*We are making a survey* - We need more time to think of an answer.

*Note and initial* - Let's spread the responsibility for this.

*See me or let's discuss* - Come down to my office, I'm lonesome.

*Let's get together on this* - I'm assuming you're as confused as I am.

*Give us the benefit of your thinking* - We'll listen to what you have to say as long as it doesn't interfere with what we have already decided to do.

*Will advise you in due course* - If we figure it out, we'll let you know.

*Take some dictation* - Come on over honey and we'll talk.

*To give someone the picture* - A long confused and inaccurate statement to a newcomer.

*Point up the issue* - To expand one page to fifteen pages.

*We are aware of it* - We had hoped that the fool who started it would have forgotten about it by this time.

*Confidential* - Spy bait and besides the stamp looks important.

*Restricted* - Uncle Joe already has it, and we are waiting to see if he can make any sense out of it.

*With modifications* - Will be shipped to you in kit form - put it together (if you can) yourself. Glue optional.

*Interpretation* - Your warped opinion pitted against your advisory's good sense.



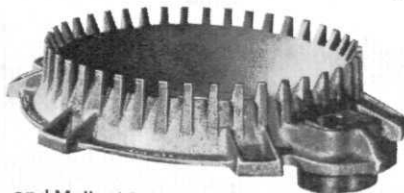
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would be prohibitively expensive to produce by any method other than casting. By using the casting process for economy,

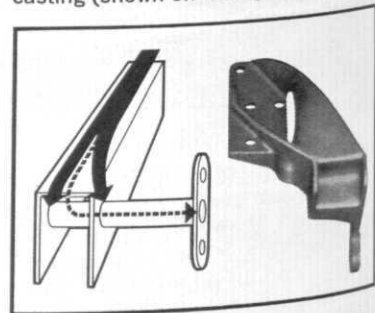


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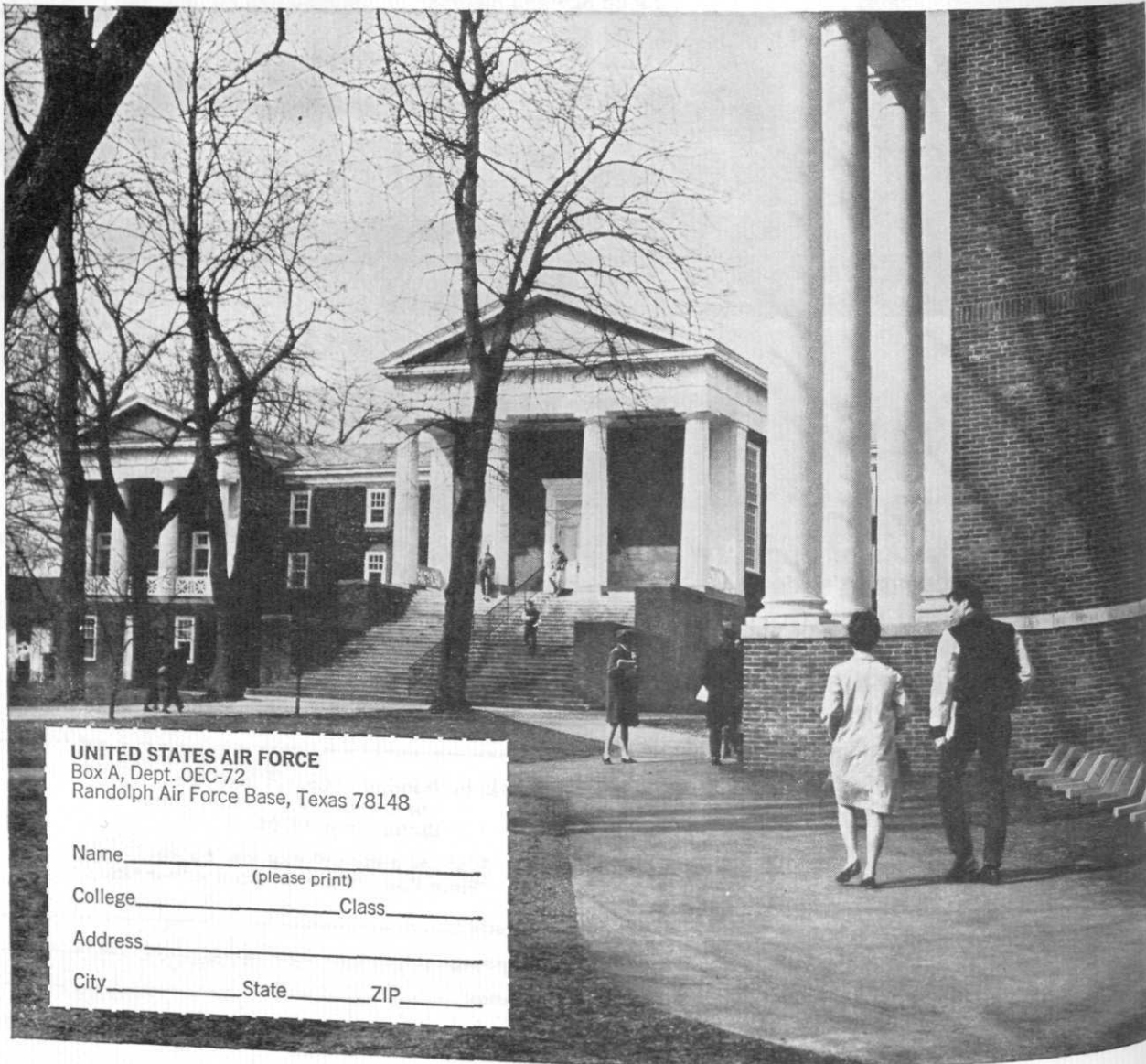
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