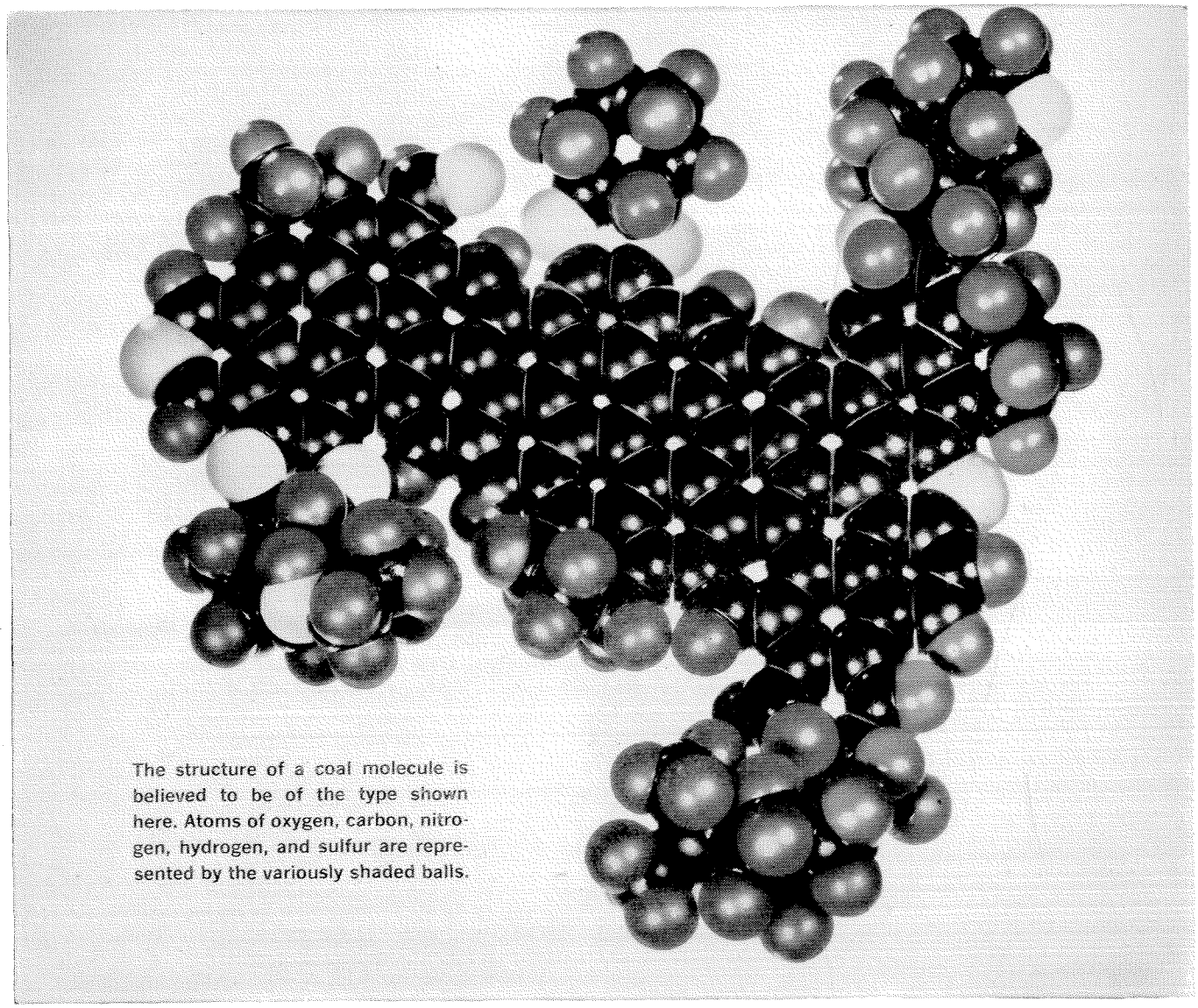
ENGINEERING | AND | SCIENCE

MARCH / 1958

Development Program . . . page 17

PUBLISHED AT THE CALIFORNIA INSTITUTE OF TECHNOLOGY



The structure of a coal molecule is believed to be of the type shown here. Atoms of oxygen, carbon, nitrogen, hydrogen, and sulfur are represented by the variously shaded balls.

Here's the alma mater of 200,000 successful grads

More than 1900 chemicals have been found in coal, and over 200,000 different products are made from them—products like plastics, synthetic rubber, synthetic fibers, and resins. There's still more to come. Only a fraction of the 1900 chemicals in coal are currently used commercially.

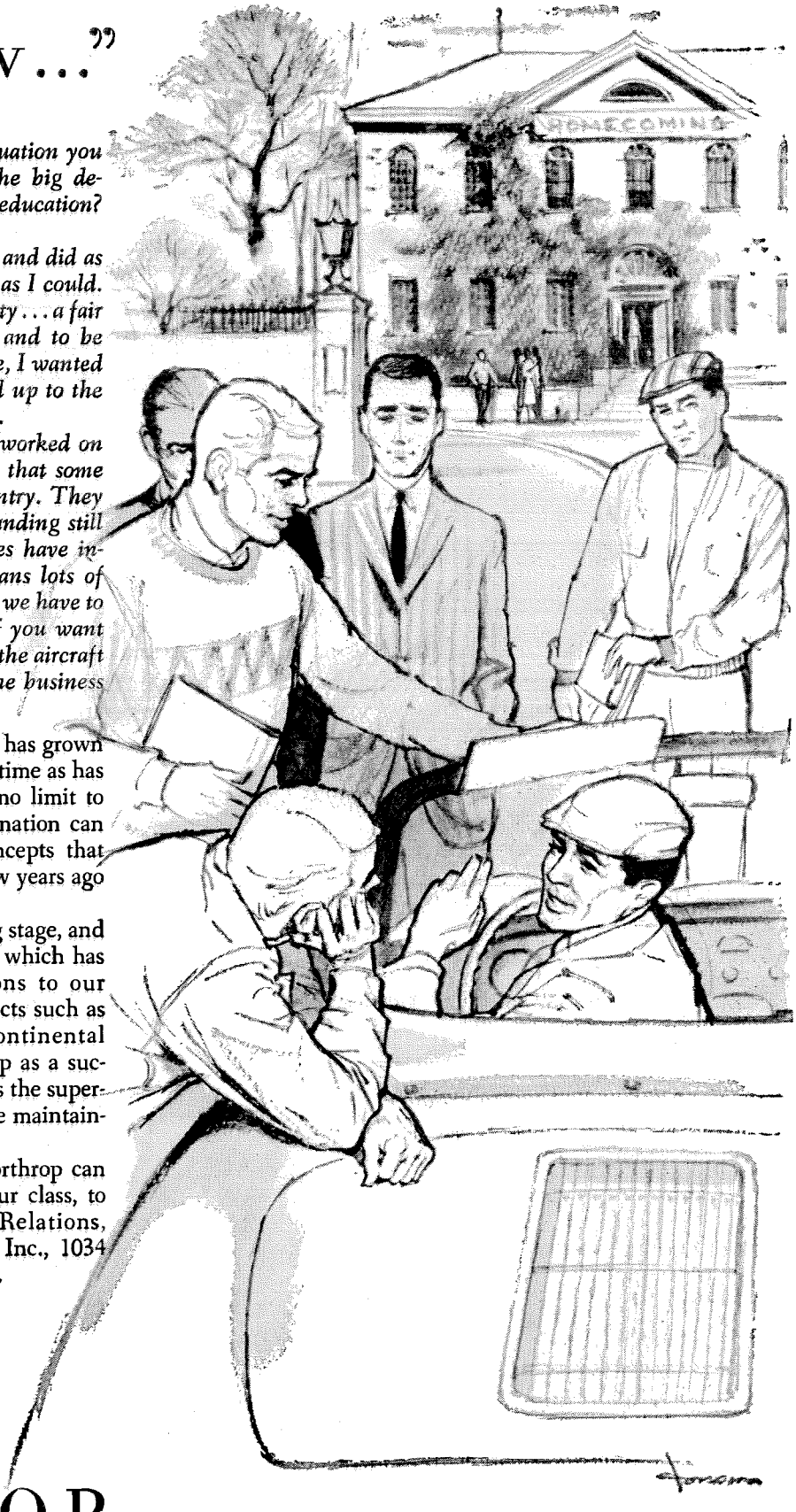
Today, United States Steel and other producers of coal chemicals continue to study coal, its structure, and its future potential as a source of basic chemicals.

Why, you may ask, are we so interested in chemicals when our principal business is steel? The reason is that it's just good business. In producing coke for our steel-making operations, we also produce chemicals. Thus we are always interested in anything, and *anybody*, that will help to advance the technology of these related products, improve their quality, and in general reduce the over-all cost of manufacture and provide better products and better service for our customers.

It's a big job and we need a lot of good people to do it—physicists, chemists, geologists, all kinds of engineers—people with *your* training. If you want to explore the earth's surface for ore, delve into the commercial use of coal chemicals, help rocket designers solve new problems with new steels, there might well be a place for you at United States Steel. Write for our booklet, "Paths of Opportunity"—United States Steel, Personnel Division, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

USS **United States Steel**

"I'm in the business and I know..."



"Not too long ago I was in the same situation you fellows are in now. Senior year and the big decisions. What am I going to do with my education? What am I going to do for a living?

"Well, I talked to a number of people and did as much letter writing and looking around as I could. The way I figured it, I wanted opportunity... a fair chance to put my capabilities to work and to be recognized for what I could do. Of course, I wanted to be well paid, too. It all seemed to add up to the aircraft industry... and to me it still does.

"In the space of just a few years I've worked on quite a few projects, important projects that some day may mean a great deal to this country. They sure meant a lot to me. And I wasn't standing still either. My salary and my responsibilities have increased with each promotion. That means lots of challenges, new and tough problems that we have to solve, but that's the way I like it. So, if you want some advice from this "old grad," choose the aircraft industry. It's the wisest choice, I'm in the business and I know."

Probably no other industry in America has grown so fast *and advanced so far* in a short time as has the aircraft industry. And yet there is no limit to how far man's inventiveness and imagination can push the boundaries. Radical new concepts that would have been unthought of just a few years ago are the drawing-board problems of today.

Truly aviation is still in the pioneering stage, and one of the leaders is Northrop Aircraft, which has been making successful contributions to our nation's defense for over 18 years. Projects such as the Snark SM-62, world's first intercontinental guided missile, have identified Northrop as a successful pioneer. And new aircraft such as the supersonic, twin-jet T-38 advanced trainer are maintaining this reputation.

Let us tell you more about what Northrop can offer you. Write now, regardless of your class, to Manager of Engineering Industrial Relations, Northrop Division, Northrop Aircraft, Inc., 1034 East Broadway, Hawthorne, California.

NORTHROP

A Division of Northrop Aircraft, Inc.

BUILDERS OF THE FIRST INTERCONTINENTAL GUIDED MISSILE

Announcing

a forthcoming book of particular interest to the readers of

ENGINEERING AND SCIENCE

Frontiers in Science

Thirty-one articles of interest to scientists and engineers, all originally published in this magazine.

***Edited by* EDWARD HUTCHINGS, JR.**
with editorial commentary and interpretations
***by* GEORGE W. BEADLE, HARRISON BROWN, *and* HUNTER MEAD**
***and an Introduction by* L. A. DUBRIDGE**

Frontiers in Science—presenting contributions by twenty-eight Caltech faculty members and research investigators and distinguished visitors to the campus—will be published in May, 1958 by Basic Books, Inc., New York, at $6.00.

Spanning the world of science and technology and its relation to social forces, the contents include such articles as: *The Origin of Life* (Norman H. Horowitz); *Birth and Death of a Star* (Allan Sandage); *The Value of Science* (Richard P. Feynman); *Forecasting the Future* (Sir Charles Darwin); *The Structure of Proteins* (Linus Pauling and Robert B. Corey); *The Size of the Universe* (E. Hutchings, Jr.); *The Relation of Science and Religion* (Richard P. Feynman); *The Genetic Effects of Irradiation on Human Populations* (A. H. Sturtevant); *The Inhabitants of Mars* (Frank Salisbury); *The Place of Technology in Civilization* (Fred Hoyle); and other contributions by J. Robert Oppenheimer, Alfred Stern, James M. Kendall, Henry Borsook, Lyman Fretwell, Arthur W. Galston, Harry Rubin, Elting E. Morison, R. W. Sperry, John S. Stamm, James Bonner, Hugo Benioff, Frank Press, Albert G. Wilson, Margaret and Geoffrey Burbidge, Ira S. Bowen, L. A. DuBridge, Linus Pauling and Fred Hoyle.

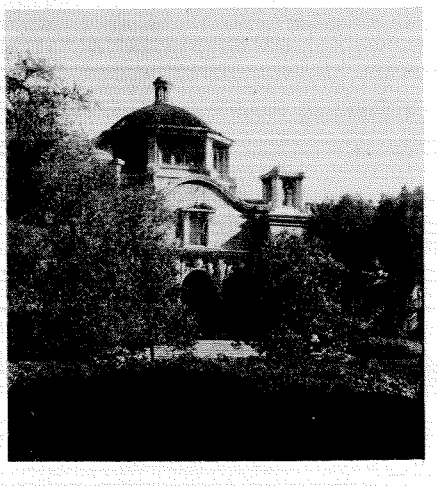
"Here, in the language of the adventurers themselves," as Dr. DuBridge writes in his *Introduction*, "are stories of conquest, of battles now being fought on various salients of the advancing front of science"—a vivid and representative picture of life, work, and thought at the California Institute of Technology today.

368 pages, 45 illustrations, $6.00

Orders may be placed at the Caltech bookstore or with the publisher, Basic Books, Inc., 59 Fourth Ave., New York 3.

ENGINEERING AND SCIENCE

IN THIS ISSUE



PRESIDENT DUBRIDGE has now publicly announced "the most ambitious undertaking in the history of the Institute"—a campaign to raise $16,100,000 in new capital funds. This is the first organized appeal for capital funds that Caltech has ever made.

On page 17 of this issue Dr. DuBridge gives some of the background of this campaign, and explains some of its needs and purposes. Additional funds will make it possible for the Institute to increase faculty salaries and to begin to build some of the student housing and research facilities that Caltech so badly needs. On pages 20-26 are architects' drawings of some of the proposed new buildings.

JUST ABOUT ALL the material in this publication comes from Caltech, but we have gone off the reservation for the satellite poem on page 10. It's by Richard Armour, professor of English at Scripps College and — as you can see—light-verse expert.

PICTURE CREDITS

Cover	Graphic Arts, Caltech
p. 28	ASCIT Photos
p. 29	ASCIT, Wes Hershey, Graphic Arts

MARCH, 1958 VOLUME XXI NUMBER 6

PUBLISHED AT THE CALIFORNIA INSTITUTE OF TECHNOLOGY

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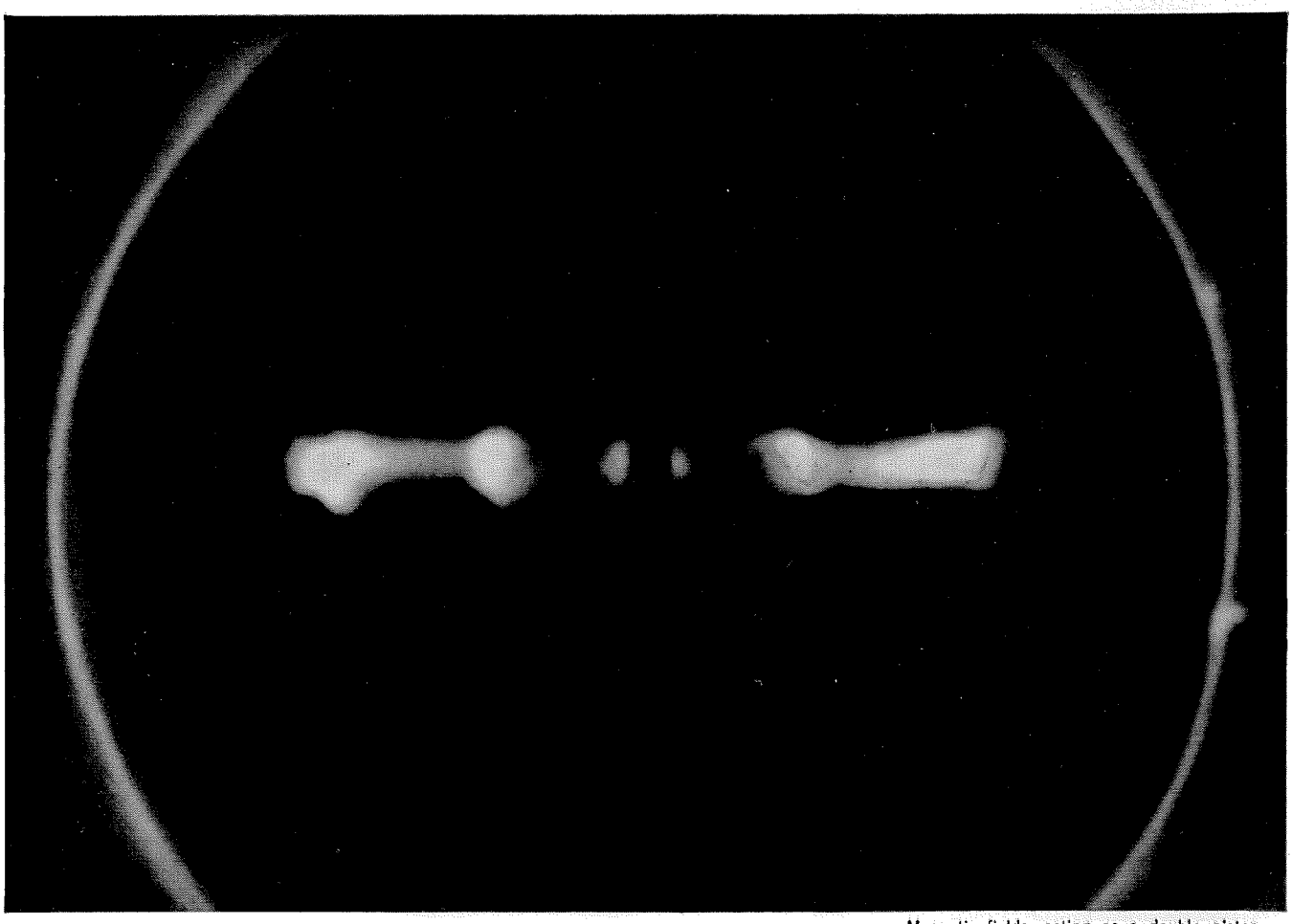

Magnetic fields, acting as a double piston, drive luminous ionized shock waves through transparent tube. One-tenth microsecond exposure in STL's Physical Research Laboratory.

MAGNETOHYDRODYNAMICS and SPACE TECHNOLOGY

Magnetohydrodynamics provides one of the most promising approaches for attaining the velocities and specific impulses that will be required for manned space flight to a planet, landing, and returning.

The critical problem in attaining velocities of hundreds of thousands of miles per hour is the containment of temperatures comparable to those in the interior of stars. Because the temperature of the driving reaction will have to rise as the square of the exhaust velocity, temperatures greater than one million degrees will be encountered in reaction chambers. Magnetohydrodynamics offers a unique solution to the basic problem of containing the reaction without contact with the chamber walls.

Briefly, the physical principles of magnetohydrodynamics are these. Since gas at such temperatures is completely ionized and is an effective conductor of electricity, the introduction of currents in the gas (in this state called a plasma) creates an electromagnetic field. This field makes it possible to control the plasma by applying an external opposing magnetic field which creates a magnetic bottle to contain the charged gas particles. Similarly, a magnetic-field piston can be used to accelerate the particles. Such magnetohydrodynamic reactions are expected to develop exhaust velocities that are an order of magnitude greater than those generated by present chemical rockets.

At Space Technology Laboratories, both analytical and laboratory work are proceeding in the field of magnetohydrodynamics. This work illustrates the advanced research in STL's Physical Research Laboratory, which emphasizes the application of basic physical principles to the requirements of space technology.

In support of its over-all systems engineering responsibility for the Air Force Ballistic Missile programs, and in anticipation of future system requirements, STL is engaged in a wide variety of research and experimental development activity. Projects are in progress in electronics, aerodynamics, propulsion, and structures.

The scope of work at Space Technology Laboratories requires a staff of unusual technical breadth and competence. Inquiries regarding the many opportunities on the Technical Staff are invited.

SPACE TECHNOLOGY LABORATORIES

A Division of The Ramo-Wooldridge Corporation

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All this good news from one company in one year

Westinghouse Sells Eight-Million-Dollar Order To Austria

To Westinghouse

$17 Million Navy Contract

Manufacturing Operations At Cheswick

Westinghouse President Sees 1958 Net Hitting New Post-War Record

Three Part Rail Car Designed By Westinghouse

Backlog Mounts At Westinghouse

Westinghouse Constructing Three 19,200-kw Generator

Westinghouse Develops Generating System For Supersonic Bomber

Assembly Line Is Set For A-Power Equipmen

Jet Contract Goes To Westinghouse

Generator Contract South's Biggest

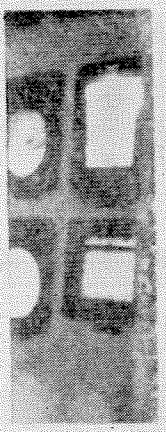
Work For East Pittsburgh

$9,700,000 Order Let For Turbines

Westinghouse Equipment To Power Vess... Planes

Westinghouse Sales Up 22% To New High

Nine-Month Profit Totals $49,102,000



From First Commercial Plant

Atomic Power Lights City

SHIPPINGPORT SWINGS INTO OPERATION

Westinghouse Gets Contract For Hospital's Power Work

Westinghouse Builds Tallest Heat Treati...

Westinghouse Builds Two Most ...ful Hoisting Units in Nation

Westinghouse Develops Ultra-Pure Silicon

WORLD'S PUREST SILICON — one of the k... materials used in "solid state" electronic devic... has been made available to American manufactur... by Westinghouse Electric Corporation.

Westinghouse plans to license other companies ... manufacture of the new ult... ns and developments leadi... originated with a company ... was supplemented by certi... made by Westinghouse.

Westinghouse Renews Employe Stock Purchasing Plan on June 1

PITTSBURGH Pa., May 13— Westinghouse Electric Corp. will offer 400,000 shares of common stock to employes under a re-establishment of the former employe stock purchase plan beginning June 1, it was announced today by Gwilym A. Price, chair-... and president.

ployes. He said that about 22,500 employes now own company stock.

"The proposed plan will be the same as the 1950 employe stock plan and is, in effect, a resumption of the previous program," he said. "The program will begin June 1 with the first six-month

'Sherwood' Joined By Westinghouse

Thermonuclear Work ...

Westinghouse Inventors Set New Record

Westinghouse... first with the future

Books

The Black Cloud
by Fred Hoyle
Harper & Brothers, N. Y. $2.95

Reviewed by Robert S. Richardson
Mount Wilson and Palomar Observatories

Fred Hoyle has written books on astronomy and philosophy, and while his fellow scientists may disagree with his statements, or even find them downright annoying, I think most would admit that they are also stimulating and thought-provoking. At least people read them. It is awfully hard to ignore Hoyle.

The Black Cloud represents Hoyle's first venture into fiction. As might be expected, it is science-fiction laid a few decades in the future, dealing with a group of astronomers confronted by a mysterious menace from outer space. In this instance, the menace is a black cloud, or simply "the Cloud," which is heading straight for the Sun. (They name it Joe later on.) The earliest story of this type I can recall is "The Star," written some 50 years ago by H. G. Wells. But whereas H. G. Wells was content merely to tell what happened as the menace came rushing sunward, Hoyle *creates* these happenings in vivid detail.

The discovery

The scene opens on Palomar Mountain, where the first plates of the region around the Cloud are taken by a young astronomer at the 18-inch Schmidt telescope. The Cloud itself is not discovered till several days later when the plates are examined in the office of the Observatory. A senior staff member checks on the strange object. He considers it sufficiently important to ask the Director to call a meeting in the library at once. A theoretical astronomer estimates the Cloud should reach the Sun in about 18 months.

The action then shifts to London where British astronomers arrive independently at the same conclusion. The disturbing part is the density of the Cloud, which appears to be high enough to blot out the Sun entirely. What to do? The astronomers get together and after some debate decide to inform their respective governments. Difficulties follow thick and fast, with the government officials bungling badly, and the Cloud getting more menacing and behaving more erratically every day.

It is not until we are about a third of the way through the book that the author finally settles upon Chris Kingsley, 38, a professor of astronomy at the University of Cambridge, as his lead character. This shifting point of view in the early chapters is often disconcerting.

Anonymous astronomers

Astronomers at Caltech and Mount Wilson who peruse the book hoping to find themselves or their friends therein will search in vain. Hoyle does not write from character. He gives his characters certain tags sufficient to distinguish them in fairly obvious ways, but to me they never emerge clearly. You have the feeling the author is so eager to get on to the next complication that he has scant time to waste in character building.

A wholly unforeseen development occurs toward the end of the book which I will not reveal, as this would spoil it for other readers. It must suffice to say that it is somewhat reminiscent of the Voice in the Whirlwind from the Book of Job.

The Black Cloud moves at a fast pace, never failing to hold your attention, and is recounted with so much authentic detail that you almost begin to believe it after a while. Incidentally, I found Hoyle's astronomers the most lively, enterprising lot I have ever encountered. Would there were more of them in real life.

Although fiction allows a writer much more freedom of expression than prose, in my opinion it also makes much greater demands upon his ability as a writer. I sincerely hope that Hoyle will not be content

continued on page 10

A Vought Vignette
ONE OF A SERIES

The development engineer who exercised his option

When it comes to end products, Bill Crowder never finishes what he starts.

While Bill's colleagues were bringing to completion a missile that he initiated, Bill helped launch eight other major projects and some minor studies. A restless record. But that's his privilege in Chance Vought's Development Section.

Bill's department analyzes requirements for new weapons. Specs come from the military, or from Vought's own Advanced Development Planning Group. They outline an approaching void or shortcoming in our defense structure. It's up to Bill and from three to thirty project teammates to produce an idea that will fill the vacancy.

From Development's desks and bull sessions come new configurations. Some are radically different; others, close to conventional. The best are projected, electronically, into the environments they must dominate.

For example, Bill can forecast a proposed missile's flight behavior by studying analog traces and columns of IBM tabulations. Electronically, he can observe minute performance details such as gust effects on a recoverable missile's landing approach.

Tests like these refine from Bill's own offerings and those of others the configuration that best answers the problem. Once this pattern is "ballparked" for approximate actual size, it's ready for detail design . . . likely to become a full-scale project.

Time now for Bill to exercise an option all Vought development engineers enjoy. He may follow the project he's begun the full route to completion. Or he may remain in Development and accept a new assignment.

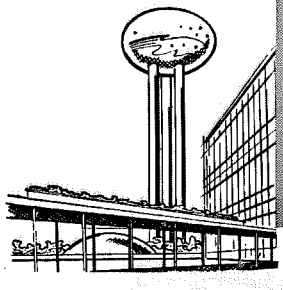
To himself, Bill justifies his choice something like this: "Changing assignments gives me a chance to shift gears . . . to change my approach . . . to broaden myself."

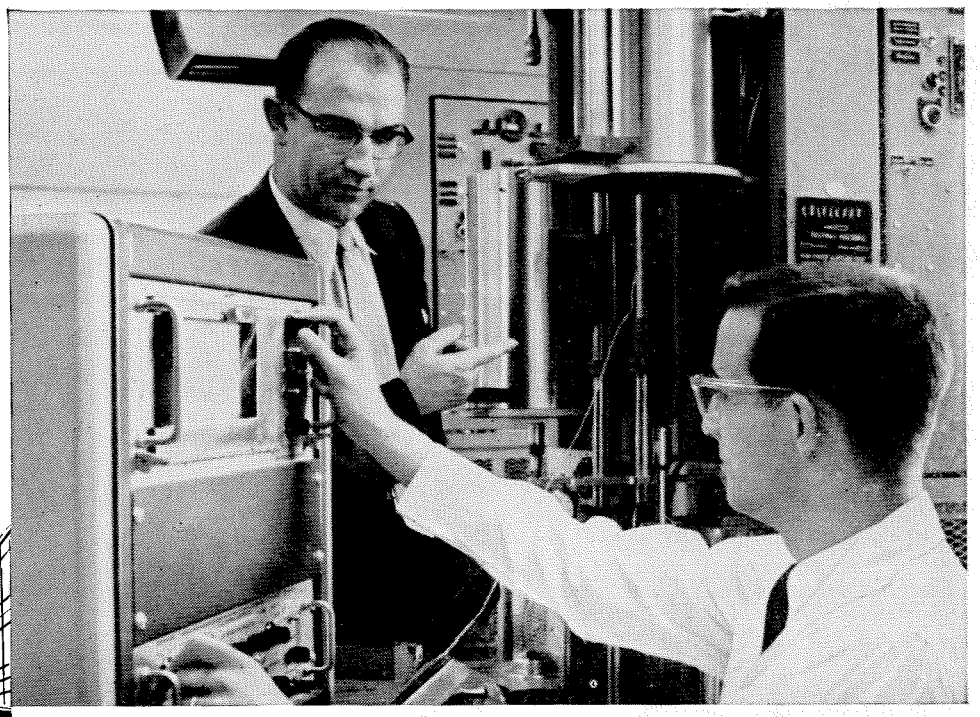
To project engineers, anxious for him to follow a promising project out of Development, Bill's "no thank you" is practically a matter of course.

They know he's already cleared his desk for the next new challenge.

At Chance Vought the Development Engineer explores a unique variety of configurations and operational environments. He may limit his analyses of land- and sea-based weapons to preliminary design studies, or he may accompany his project through the complete development cycle.

CHANCE VOUGHT AIRCRAFT
INCORPORATED · DALLAS, TEXAS





WORKING WITH A MASTER—Young Metallurgical Engineer James Hornaday, Jr.—B.S. '54, M.S. '56—develops new high-temperature coatings under guidance of Dr. Robert F. Thomson. Head of Metallurgical Engineering Department of GM's Research Staff, Dr. Thomson is recognized as one of the nation's leading metallurgists—has pioneered many advancements in his field.

Because *engineering* is a *profession* at GM—your professional stature grows year by year

HERE's something of serious importance to you as a young graduate engineer:

Are you taking just a job—or are you going out to really *practice* the respected profession for which you have been so fully trained?

Here at General Motors we long ago recognized that engineering is a profession—and began treating our engineers who work on our hundreds of products as professional men.

For example our engineers are used on assignments that give them an opportunity to use their training and education as they were meant to be used. To let them practice engineering.

Or take the fact that GM encourages its engineers to gain professional recognition by presenting technical papers to engineering societies.

Take, too, the encouragement our engineers receive in working for advanced degrees, in doing original research. The fact that over 179 of our engineers and scientists received over 164 patents for such work in a recent four-month period is one indication of the opportunity for creative work here at GM.

And these are but a few examples of the fact that engineering is a profession at General Motors.

Why do we place engineering in this special category? Because we know that from the work of our engineers at our 35 divisions and 126 plants in 71 cities and 19 states—and at our huge Technical Center near Detroit—will come the products that will keep General Motors on its progressive path.

Naturally, you get more than professional recognition. Your salary reflects your ability and progress.

And, of course, there is opportunity without limit. For 14 of the 33 GM Vice-Presidents are engineers, as are 23 of the 42 Division General Managers.

Today we are looking for young men who may fill tomorrow's GM executive positions. Should you wish to join us and practice your profession as you build your career, let us hear from you. It could be the most important letter of your life. • • •

GM positions now available in these fields:

MECHANICAL ENGINEERING • ELECTRICAL ENGINEERING
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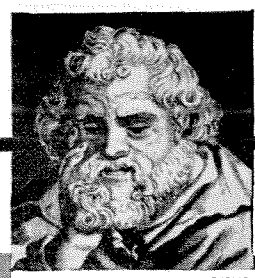
AERONAUTICAL ENGINEERING • CERAMIC ENGINEERING
MATHEMATICS • INDUSTRIAL DESIGN
PHYSICS • CHEMISTRY

GENERAL MOTORS CORPORATION

Personnel Staff, Detroit 2, Michigan



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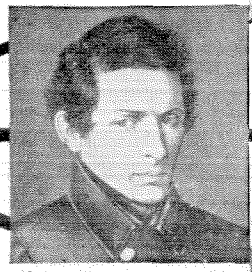


LOBACHEVSKY

GAUSS

PHOTOS BETTMANN ARCHIVE

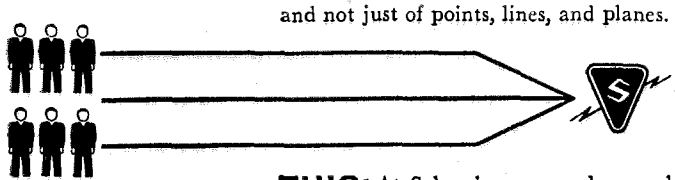
ENGINEERS *and* **SCIENTISTS**

when parallels meet

...as in advancement opportunities at Sylvania

It remained for Nicholas Lobachevsky to solve a riddle that bothered mathematicians for the better part of twenty-two centuries.* He was able to construct a rational geometry by denying Euclid's fifth postulate—by maintaining that parallels *do* meet.

Here at Sylvania Electric we have a noneuclidean geometry of our own, in which parallels also meet. It's a geometry of professional development, though, and not just of points, lines, and planes.



WHAT DO WE MEAN?

THIS: At Sylvania a man advances by one of two parallel paths.

If his interests and talents lie in the areas of engineering and scientific specialization, he advances as a *specialist.*

If his forte is in the areas of organization and administration, he advances through *management.*

These parallel paths meet in a common point: At Sylvania a man knows that he is given the fullest opportunity to develop and exercise his talents. He knows that a man goes as far and as fast as he is able in the path of his choice. Whether he chooses management or specialization, he finds *equal* rewards and compensation.

Graduates and men with advanced degrees in science and engineering will discover Research, Development, Manufacturing and Marketing careers at Sylvania—in specialization or management—in:

LIGHTING, RADIO, TV, HI-FI, ELECTRONICS, SEMICONDUCTORS, PHOTOGRAPHY, COMMUNICATIONS & NAVIGATION SYSTEMS, AIRBORNE DEFENSE, RADAR, ECM, MISSILES, COMPUTERS, CHEMICALS, PHOSPHORS, PLASTICS, METALS & WIRE.

Contact your college placement officer for an interview, or write us and ask for a copy of "Today & Tomorrow with Sylvania".

*WE MEAN NO DISCREDIT TO BOLYAI OR GAUSS. LOBACHEVSKY MUST TAKE CHRONOLOGICAL PRIORITY, HOWEVER.

SYLVANIA

SYLVANIA ELECTRIC PRODUCTS INC.
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to let *The Black Cloud* be a one-shot in the fiction field, as his first novel is so good that it surely deserves a second.

Fred Hoyle is a visiting professor of astronomy at Caltech, and a staff member of the Mount Wilson and Palomar Observatories.

Basic Feedback Control System Design

by C. J. Savant, Jr.
McGraw-Hill, N. Y. $9.50

Reviewed by C. H. Wilts
Professor of Electrical Engineering

In spite of the good potential indicated by material selection and organization in this book, the reviewer is forced to conclude that this is not just a poor book but a bad one. This is unfortunate, for the content seems well balanced for an introductory course, with a proper emphasis on the simpler modern techniques of analysis. However, careful examination indicates that it was put together with great haste and little care. The author has borrowed liberally from others, but has made many copying errors in doing so. In the author's own writing there are many small errors, far too many major errors, and also a strong indication of confusion in the author's mind on important points. Several proofs are wrong and many of the theorems and principles are stated incorrectly. For example, the statements of the important Nyquist, Hurwitz and Routh criteria are all incorrect.

Superficial treatment and inadequate explanations of various topics are scattered throughout the book. This appears to be primarily due to Dr. Savant's attempt to simplify the subject to the point where an average college sophomore can understand it. As a matter of fact, many of the subjects he attempts to treat can only be properly understood if the reader has a thorough understanding of ordinary linear differential equations and a good background in complex variable theory. An example is provided by the Nyquist theorem and its various modifications; the incorrect statement of the theorem coupled with the very inadequate explanation would lead to hopeless confusion on the part of a reader not already conversant with the subject. Such sections are in sharp contrast to others where the discussion is excessively lengthy and almost trivial.

Typical examples of carelessness are the errors made in copying figures 6-11, -13 and -20 from someone else's work. Typical examples of incorrect thinking are found in figure 10-25 and its explanation, and in the root locus proof on page 102. Even the illustration on the cover jacket (taken from chapter 10) is in error.

Factors such as these seriously detract from the usefulness of the book in an elementary course, or as a general elementary exposition on the subject. The casual reader, or a student without close supervision, will find the book unsatisfactory unless already exposed to the subject. On the other hand, since the book is aimed at the beginning student, the advanced reader or student will not find it useful either.

C. J. Savant got his BS in electrical engineering from Caltech in 1949, his MS in 1950 and his PhD in 1953.

STOWAWAYS

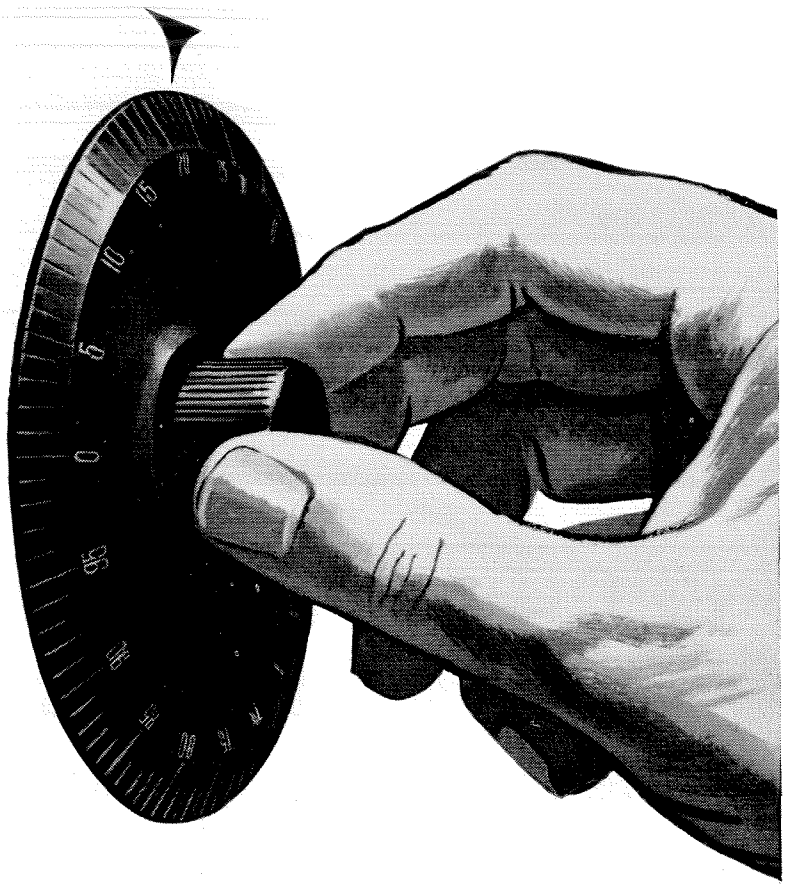
One of the scientists in charge says he thinks they will soon get the bugs out of the Vanguard — News item.

Our scientists have worked for days
With insect powder and with sprays,
But still, inside the satellite,
It seems the bugs are sticking tight.

Why get them out? Just leave them in
And send them on a little spin,
Thus we shall win at least the race
For this: a buggy ride in space.

—Richard Armour

A good combination is hard to beat



So is the future of the man who charts his course wisely. Choose a company that offers you the combination of opportunities so necessary to your professional growth. At Bendix you will find such a combination—a tradition of achievement and continued growth spanning more than three decades, a forward-thinking management team that is truly "engineering minded", unexcelled facilities, a diversity of products serving every basic industry. Engineering is a key factor in the company's operations. Bendix has a continuous need for the best engineering talent available.

Bendix has long adhered to a policy of advancement from within. Of the nine new divisions added during the past seven years, all have been staffed from within. With a diversity of products and engineering opportunities at hand, you may assure your future at one of twenty-four Bendix divisions located throughout the country, working in the field of your choice.

Bendix has need of men of talent in such fields as Electronics, Electromechanics, Ultrasonics, Systems, Computers, Automation and Controls, Radar, Nucleonics, Combustion, Air Navigation, Hydraulics, Instrumentation, Propulsion, Metallurgy, Communications, Carburetion, Solid State Physics, Aerophysics and Structures.

Check with the placement director for information regarding Bendix opportunities and interview dates. Or write to Dr. Gerald A. Rosselot, Director of University and Scientific Relations, Bendix Aviation Corporation, 1107 Fisher Building, Detroit 2, Michigan.

A thousand products **Bendix** AVIATION CORPORATION Fisher Bldg., Detroit 2, Mich. *a million ideas*

CAN YOU FIGURE IT OUT?

Problem: Determine the digits represented by dots in the multiplication example at the right.

```
  .1...
x  417
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  .....
 .....
.....
-------
9...057
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*Solution at bottom of page

Robert A. Pike tells what it's like to be . . . and why he likes being . . . a Research Physicist with IBM.

FIGURING OUT A CAREER?

Selecting a career can be puzzling, too. Here's how Bob Pike found the solution to *his* career problem—at IBM:

"I became interested in computers and transistors at college," Bob Pike recalls. "Upon graduation, I naturally turned to the computer field. IBM, as a leader in the field, looked like a good place for me." After a training period, he joined the Semi-Conductor Device Development Group in Research. Promoted to Associate Physicist soon afterward, his present assignment is leading a group of technicians in fabricating high-frequency, high-power PNP drift transistors. "These will be used as core drivers in a high-speed memory array," he says. His future? At the rate IBM and the electronic computer field are expanding, Bob Pike foresees excellent opportunity for advancement in the area of his choice.

There are many excellent opportunities for well-qualified engineers, physicists and mathematicians in IBM Research, Development and Manufacturing Engineering. Why not ask your College Placement Director when IBM will next interview on your campus? Or, for information about how your degree will fit you for an IBM career,

JUST WRITE TO:

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***SOLUTION**

Let the multiplicand be *D*1*CBA*. Since the units digit in the answer is **7**, the only value possible for *A* is **1**. This also fixes one of the dots in the hundreds column as a **1**; to get a **5** in the answer, the other dot must be a **4**. Hence *B* can only be a **2**. Similar reasoning will determine *C* as **9** and *D* as **2**. Answer = **21921**.

Engineers, Scientists, Mathematicians...

Two important reasons for starting your career with Lockheed Missile Systems

■ **Better Advancement Opportunities**

■ **Higher Degree Educational Program**

As greater emphasis is put on missile's role in U.S. defense, our own missile projects will continue to expand. This growth potential – coupled with our youth as a division – means better opportunities for you to move rapidly ahead in a career with Lockheed Missile Systems.

Under the Advanced Study Program, the Lockheed Graduate Study Council offers qualified students the opportunity to earn advanced degrees while employed in their chosen fields at Lockheed Missile Systems.

Eligible students must be U.S. citizens holding B.S. or M.S. degrees in engineering, mathematics, or science applicable to missile systems research and development.

Extensive laboratory facilities at Palo Alto and Sunnyvale, near Stanford University, provide an atmosphere to satisfy the most inquisitive scientific mind, yet pique the desire for further knowledge and achievement. Both locations are less than an hour's drive from San Francisco.

For further information, contact your Placement Officer, or write College Relations Office, Lockheed Missile Systems, 3251 Hanover Street, Palo Alto, California.

Lockheed MISSILE SYSTEMS

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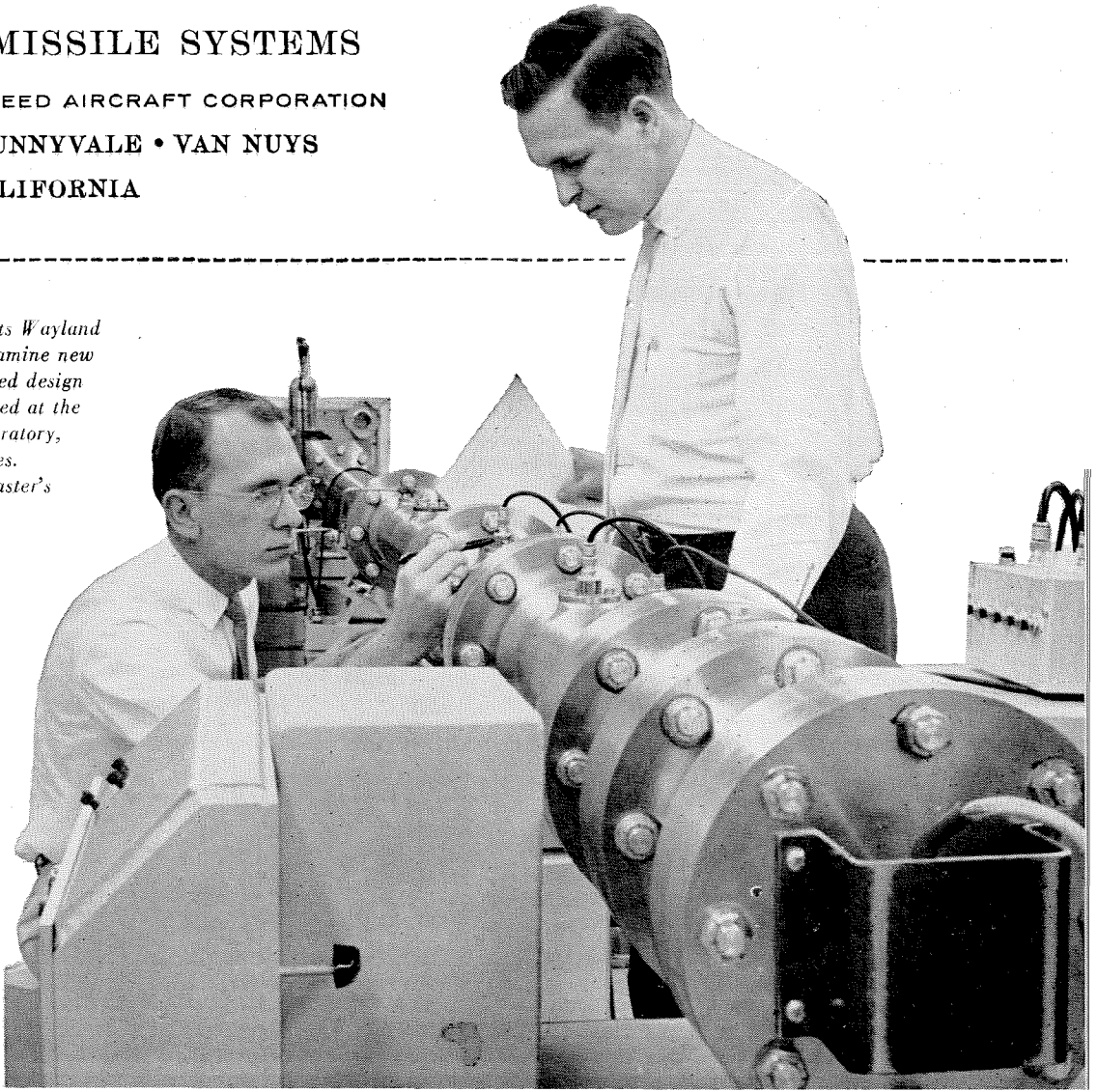

Advanced Study Program physics students Wayland Marlow III, right, and Jerry Kennedy examine new 44-foot shock tube being used for advanced design work on Polaris missile. Both are employed at the Lockheed research and development laboratory, Palo Alto, while earning advanced degrees. Kennedy, Oklahoma '56 is earning his master's degree at the University of California, Berkeley, while Marlow, Miami '55, will attend Stanford University for his doctorate.

the beginning of a **million dollar** detective story

Men, vehicles and instruments bound for the middle east

The cast of this story may include a part for you. GSI is a leader in the worldwide search for new petroleum reserves. Emphasis is shifting to foreign areas and there is a world of opportunity awaiting those who can qualify for a career in geophysical exploration.

GSI has openings for college graduates trained in geophysics, physics, engineering, math and geology.

For a rewarding career, which may take you from California to Calcutta, join the cast . . . join GSI.

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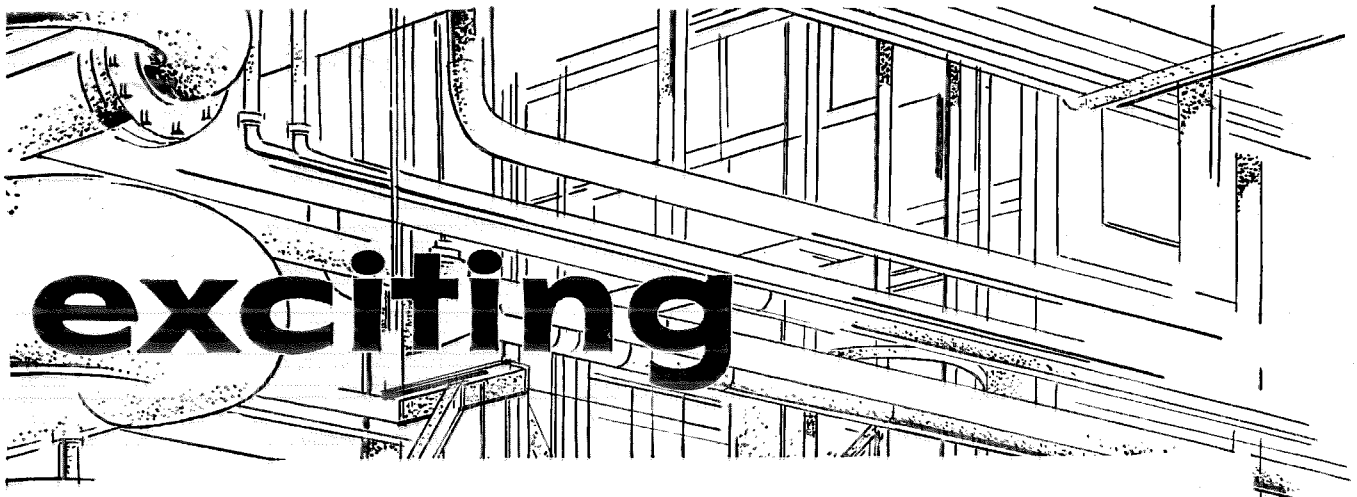


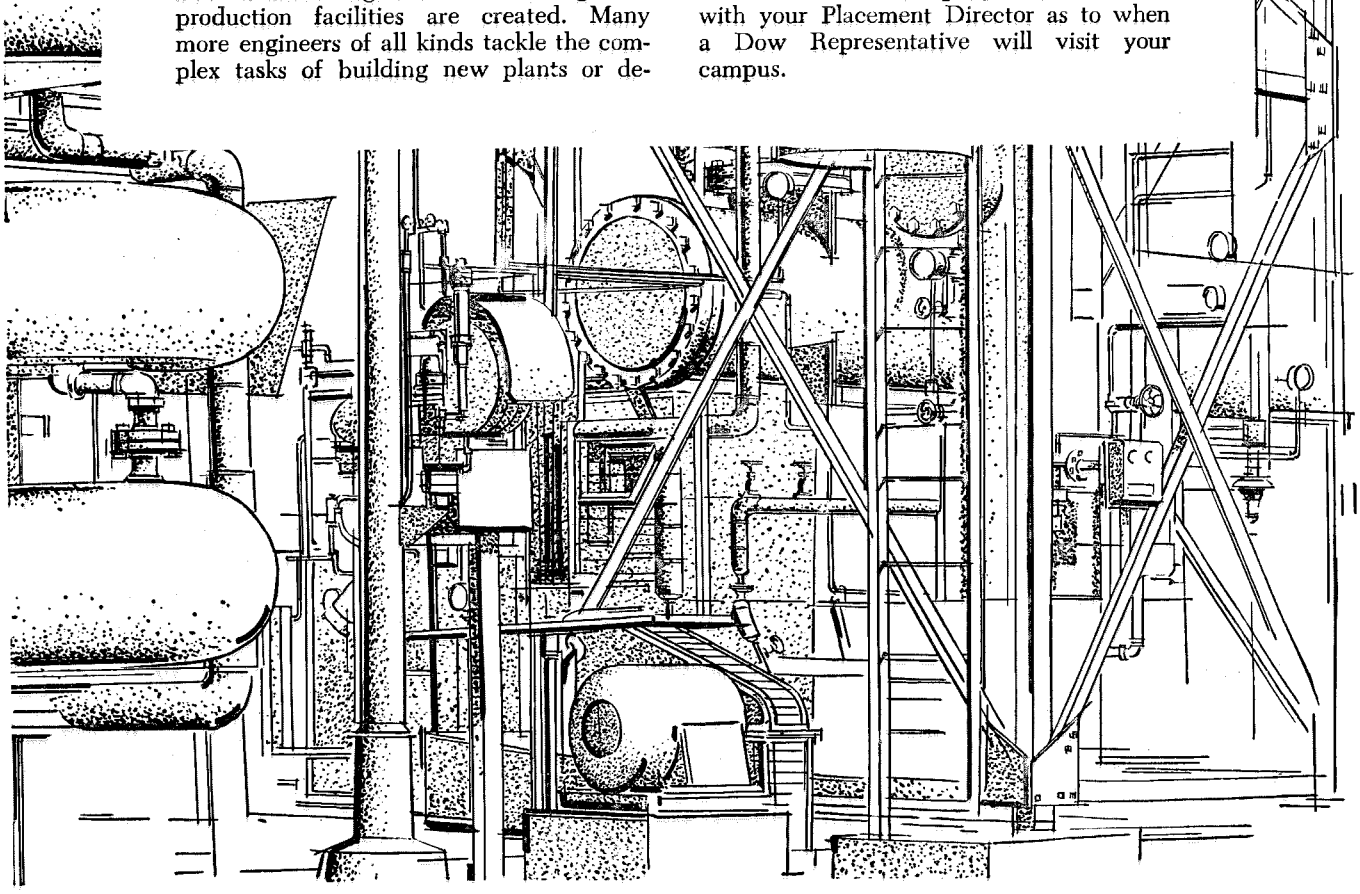
exciting

Modern chemistry is creating exciting new horizons that challenge the inventive minds of both scientist and student. Product synthesis, by bold adaptation of natural resources to our way of life, has pushed the frontiers of chemistry far beyond its early promises.

As the chemical industry forges ahead, inventing new processes and producing new materials which assure the progress and comfort of our society, research and development soar to new heights. Imaginative exploration advances under chemists and chemical engineers. New and greater production facilities are created. Many more engineers of all kinds tackle the complex tasks of building new plants or designing new processes to expand and perfect the many operations of this ever-growing industry.

Yes, today's chemistry is a fascinating world. Filled with exciting accomplishments and possibilities, it attracts young men and women of vision who will give the industry the inspiring leadership of tomorrow.

Write our Director of College Relations for a copy of our new booklet "Opportunities For College Trained People With The Dow Chemical Company". And consult with your Placement Director as to when a Dow Representative will visit your campus.



The Dow Chemical Company, Midland, Michigan

DOW

Thomas Henry Huxley...on pure and applied science

"I often wish that this phrase, 'applied science,' had never been invented. For it suggests that there is a sort of scientific knowledge of direct practical use, which can be studied apart from another sort of scientific knowledge, which is of no practical utility, and which is termed 'pure science.' But there is no more complete fallacy than this. What people call applied science is nothing but the application of pure science to particular classes of problems. It consists of deductions from those general principles, established by reasoning and observation, which constitute pure science. No one can safely make these deductions until he has a firm grasp of the principles." —*Science and Culture*

A DEVELOPMENT PROGRAM FOR CALTECH

A Statement by L. A. DuBridge

Among the colleges and universities of America there are a few which by reason of circumstance, of history and of experience must play especially key roles. These are the institutions which have already shown a capacity for scholarly leadership and which, through the accomplishments of their faculties and graduates, have rendered outstanding service to the nation.

The launching of Explorer I, a joint venture of the Army Ballistic Missile Agency and the Caltech Jet Propulsion Laboratory, is but one recent and unusually spectacular example of the way in which the nation has been served by Caltech. JPL, operated under contract with the U.S. Army, is managed by Caltech and many of its key scientists and engineers are Caltech products.

Their splendid achievement was not, however, a flash in the pan. It was the result of the Institute's 30 years of basic research in aeronautics and jet propulsion. Success was directly attributable to the fact that JPL has one of the best and most experienced rocket technology groups in the country.

Other Caltech groups, with equal dedication to excellence, have greatly advanced our knowledge—and thereby served our country—in such fields as electrical engineering, biology, chemistry, physics, seismology, aeronautics and others.

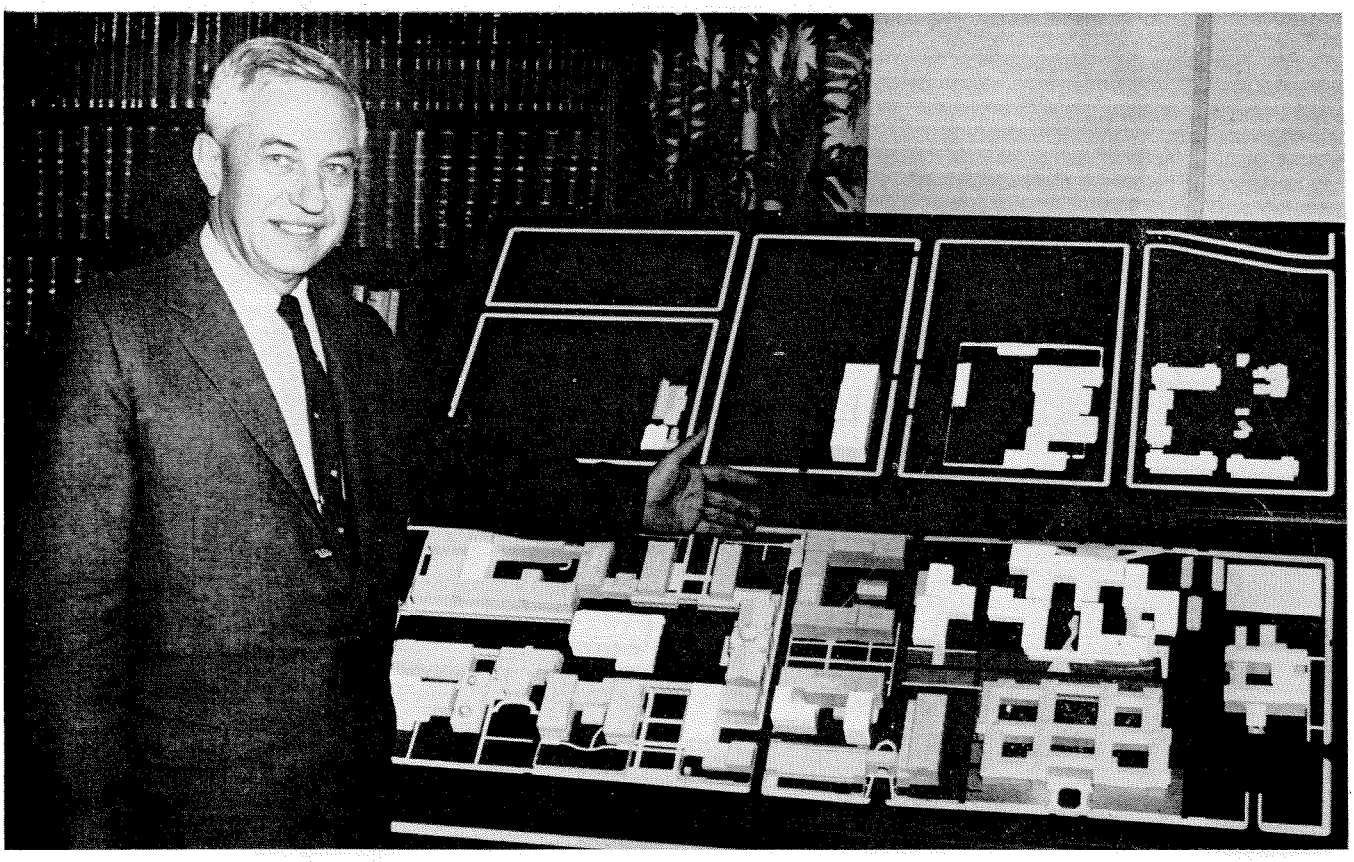
The achievements of the past are, however, but the threshold to the future. The coming 50 years will see undreamed of advances in knowledge and its applications. But the demand for superb intellectual leadership will increase. There will be a need for *more* scientists and engineers; there will be an even more urgent need for *better* ones.

Indeed, this future is already upon us, and it is not surprising that Caltech ranks high among the institutions that are being asked to provide intellectual leadership—leadership in research and in education.

Surely, Caltech must respond—and you may be sure that it is eager to respond.

But what does it take for this institution to continue its excellence and its alertness? There are three very simple things we must do: We must maintain a faculty unequalled in any institution of its kind in the country; we must maintain the finest student body that it is possible to attract; and we must maintain the resources and facilities to make both faculty members and students effective in their work.

I think we can say without fear of contradiction that we have as fine a student body as any institution in the country. We also have a top-notch faculty. I must add, however, that our position of maintaining a top-notch faculty is a precarious one. We have, in the last few years, failed to attract some of the best scientists and engineers in the country whom we wished very much to add to our staff. We failed because our resources and



President DuBridge and a model of the Caltech campus. Proposed new buildings are in white.

our facilities and our funds were not adequate to attract them to this institution in comparison with opportunities which they found available elsewhere. We have also failed to keep some first-class young faculty members on our staff when they found more attractive opportunities elsewhere. We can maintain and increase the strength of our faculty only by increasing the resources and facilities which today are not yet quite adequate to maintain our leadership.

Our resources, of course, have not been standing still. During the past ten years Caltech has doubled its endowment. The annual income from all sources—endowment, tuition, gifts, governmental contracts, etc. (not including the great Jet Propulsion Laboratory and other off-campus projects)—has also doubled.

The gifts which we receive annually for current purposes—for scholarships, for general operations, for research—have climbed from $300,000 in 1947 to over $2,000,000 in 1957.

Government contracts, which support many campus projects in basic science and engineering, have also climbed to about $2,000,000 per year.

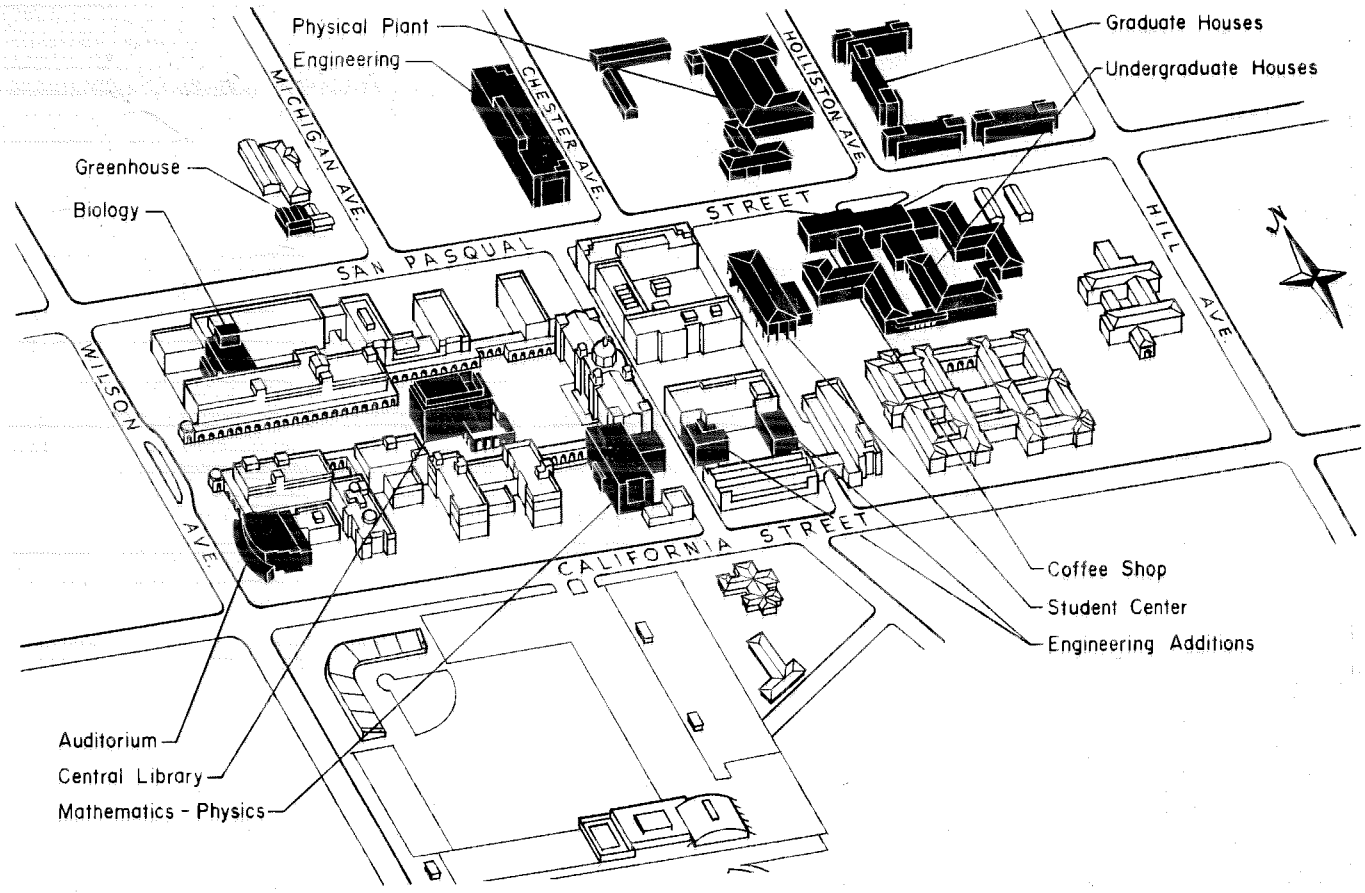
Tuition fees today supply only about one-eighth of our total income even when we exclude off-campus operations. Our tuition fees have been increased 50 percent in the last three years, and I think there is no doubt but they will soon go up substantially again. We must ask the students to bear a portion of the increasing costs; but at best the total income from tuition will be a small fraction of our annual budget.

We have received many important bequests for general endowment funds. In recent years we have also received gifts and bequests for three major buildings: the Norman Church Laboratory for Chemical Biology, the Eudora Hull Spalding Laboratory of Engineering, and the Scott Brown Gymnasium and Alumni Swimming Pool. There have been several smaller structures too, such as the Earhart Plant Research Laboratory and the Archibald Young Health Center.

All these things are fine, but they have proved far from adequate. Our financial resources have barely kept pace with inflation and our physical facilities are inadequate to keep us going ahead; we may be left standing still—or even falling behind.

As to the size of the student body, we do not intend to change substantially the number of freshmen that we admit to Caltech, but—with our present faculty and the resources that we can see ahead—we could admit a few more junior and senior transfers from junior colleges and liberal arts colleges. We could also substantially increase our number of graduate students with the facilities that we can now foresee. We would, therefore, increase the number of degrees that we grant—bachelors, masters and doctors—and thus help to supply scientists and engineers of high caliber which the country so sorely needs. We should be moving forward to do this, though quality rather than numbers is our primary goal.

We must also, as I have said, expand our facilities to retain our fine faculty, and we must attract new



Map showing the $12,700,000 worth of new buildings that Caltech needs.

faculty members to maintain our quality and expand and give new variety to our offerings. We must keep up in the many new fields that are now developing—the fields of electronic computers, nuclear energy, applied mathematics, solid state physics, low temperature physics, virus research, chemical geology and many other areas that are just coming of age.

We have a fine student body but we have woefully inadequate facilities to house them. An essential element of our educational program is lost when we lose the residential character of our college. We have almost no facilities for housing graduate students today and yet I can foresee the day not many years hence when we will have almost an equal number of graduate and undergraduate students.

We can, I am sure—in the future as well as in the past—obtain current support for our research programs and for our general educational budget. Foundations, corporations and government agencies are anxious to forward scientific and engineering research in this country; I am sure that, as new ideas and new programs in the research field come along, we can find support for them from the National Science Foundation, the Office of Naval Research, the Atomic Energy Commission and the Public Health Service, as well as the various private foundations. But these sources of support do not do two very vital things: They do not pay faculty salaries, and they do not build dormitories and libraries and laboratories. To meet these needs, the Institute must substantially increase its capital resources. And this must be done *now*.

Accordingly, the trustees of the California Institute of Technology have embarked on an intensive two-year campaign to secure an additional $16,100,000 in new capital funds.

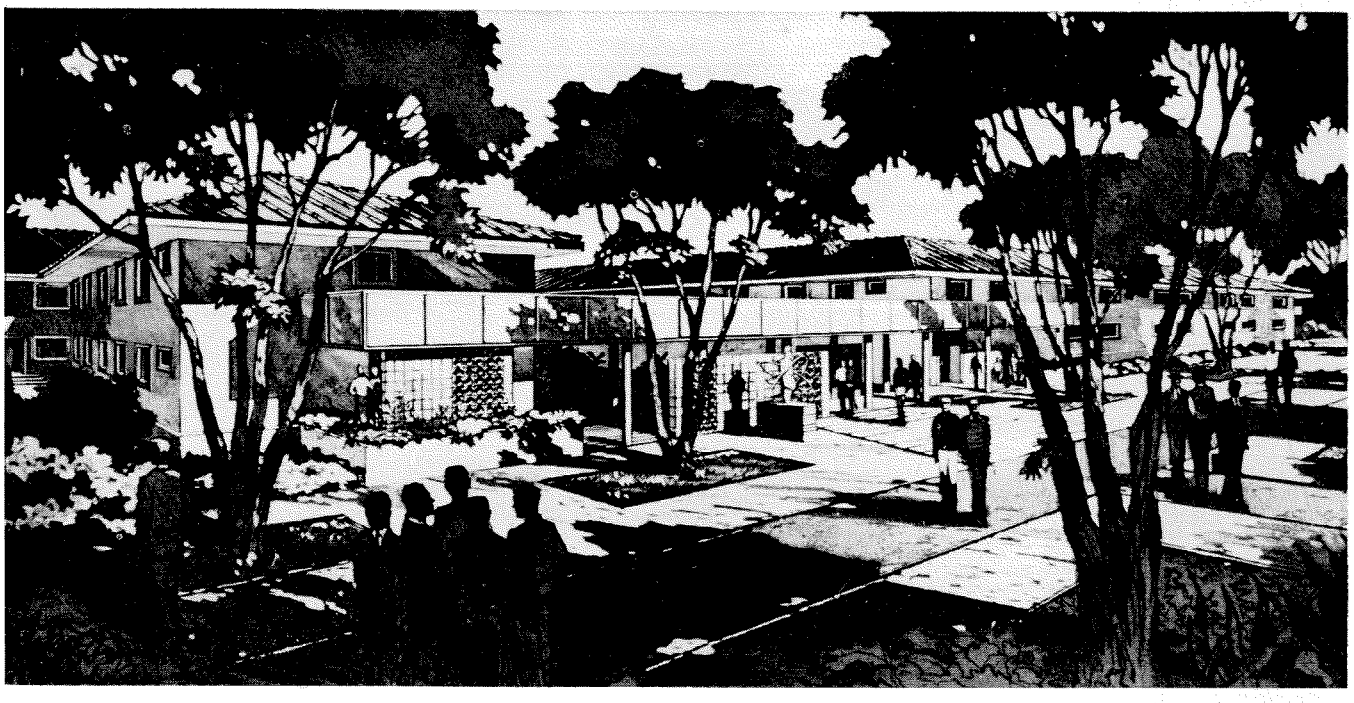
To succeed in this venture we shall need to tap, on a scale we have never before attempted, all possible sources of funds. We plan to approach every individual we can find in California and elsewhere who can possibly give us a few hundred dollars or more.

We shall approach every corporation in the nation of any size that can make a grant to our program; we shall approach foundations, both private and public; we shall approach such agencies of government as can make capital grants; and we shall approach the alumni.

In this campaign, we are going to try to tell the story of Caltech to every corner of the nation. We are not going to be modest, but we are going to try to tell the truth.

Advance subscriptions to a total of over $3,000,000 have already been secured. We now turn to individuals, foundations and corporations with the urgent request that the remaining $13,000,000 be promptly provided to enable Caltech to proceed without delay with its urgent tasks of education and research.

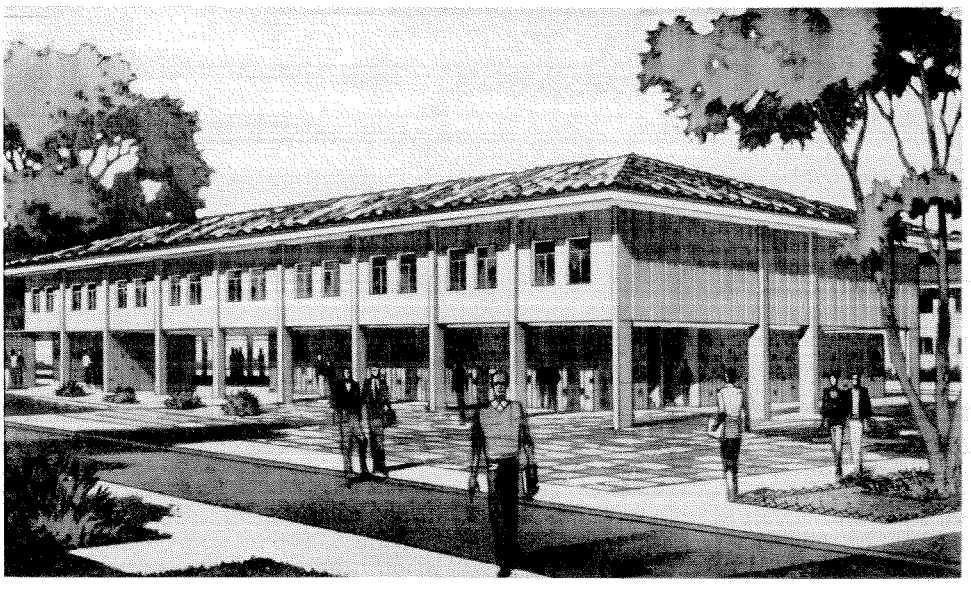
The buildings which we believe constitute the minimum requirements for our program in the next few years are shown on the following pages.



STUDENT HOUSES
$1,860,000

Three new student houses are urgently needed. The three buildings will be grouped around open courtyards, and they will have individual lounges and dining halls, but will share a kitchen, a game room, and a laundry. Each house will cost $620,000.

The Buildings Caltech Needs

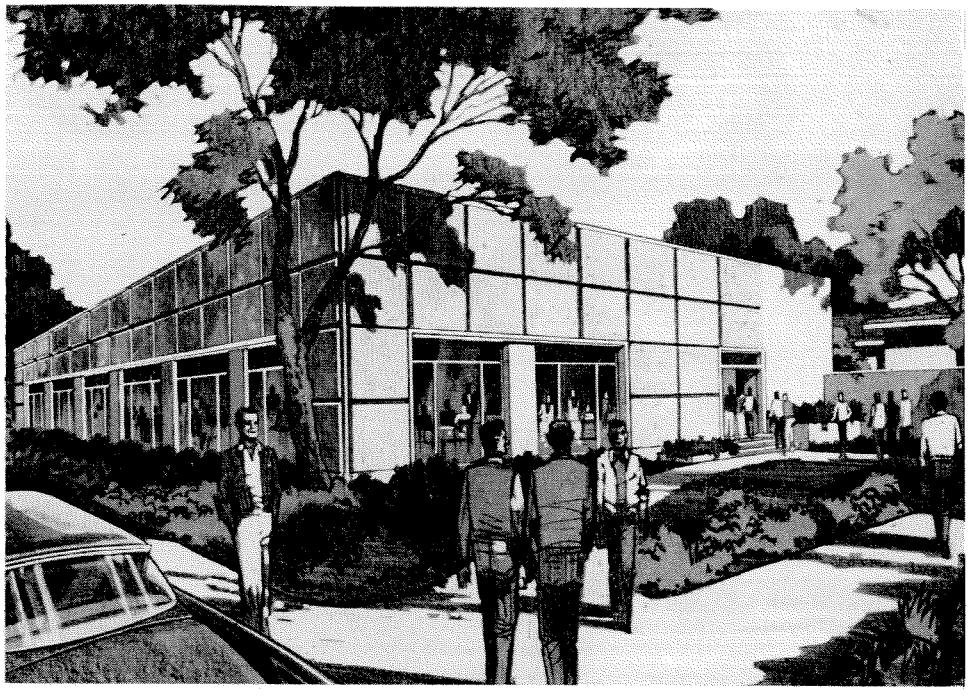


STUDENT UNION
$350,000

This student activities center will provide a home for the publications, clubs and organizations like the YMCA which are now scattered all around the campus. It will have a lounge for off-campus students, a snack room, and a new, enlarged campus bookstore.

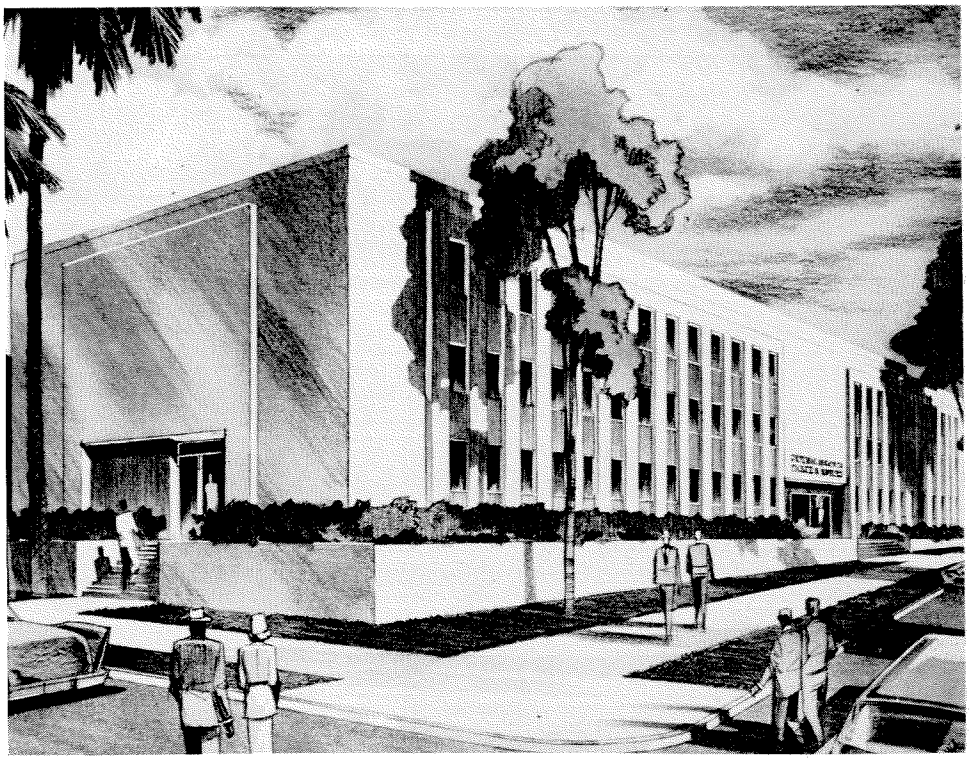
GRADUATE HOUSES
$1,400,000

Suitable campus living quarters are available for only an insignificant fraction of Caltech's graduate students today. Four graduate houses are needed to provide quarters for at least 200 unmarried students. Two of the houses will cost $280,000 each; two will cost $420,000 apiece.



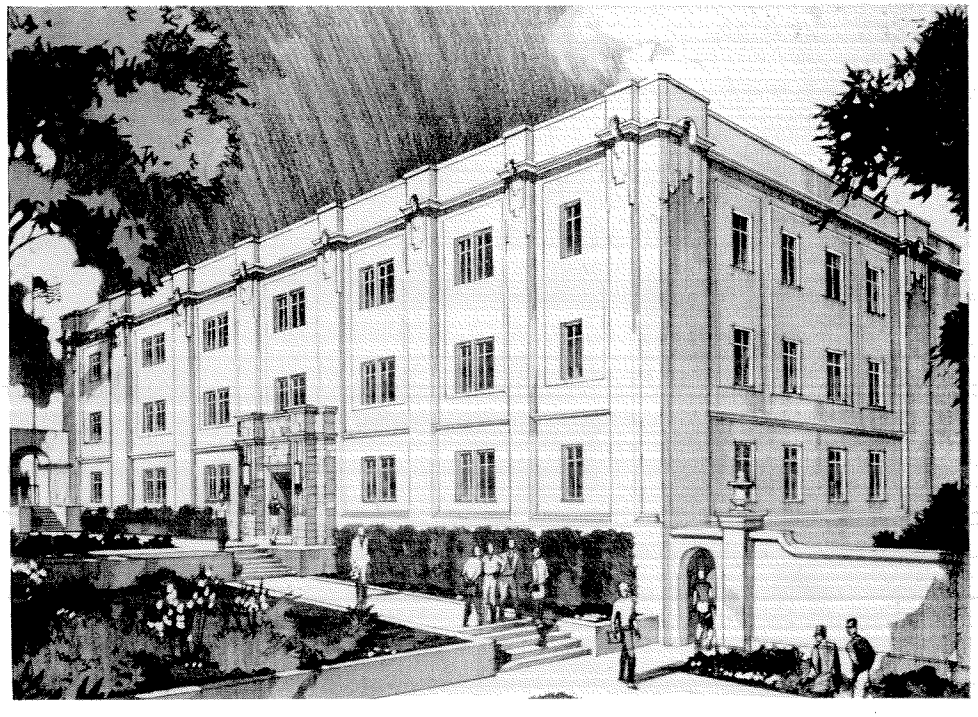
COFFEE SHOP
$140,000

There is no public eating place in the residential neighborhood around Caltech. Off-campus students, graduate students, faculty and about 1,000 Institute employees need a campus restaurant. The present coffee shop, in the Old Dorm, is due to be demolished to make room for the Student Union.



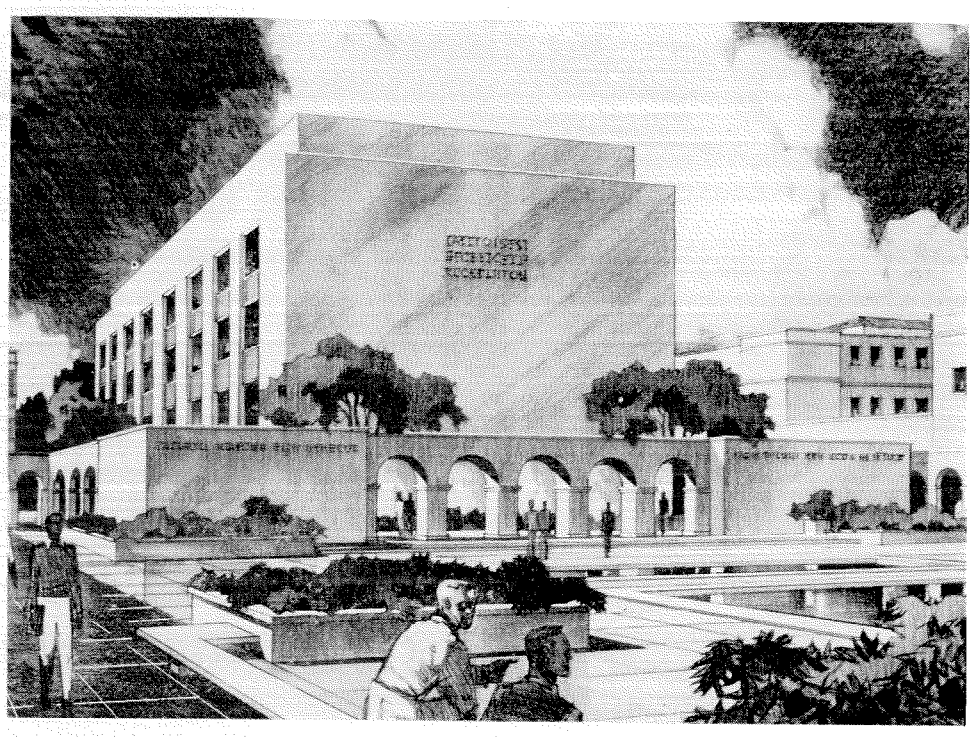
ENGINEERING BUILDINGS $3,000,000

A proposed new engineering building across from the main campus will allow for expanding work in civil, electrical and mechanical engineering. Additions to the Guggenheim Aeronautics Laboratory on campus are also planned, to house research in aeronautics and jet propulsion.



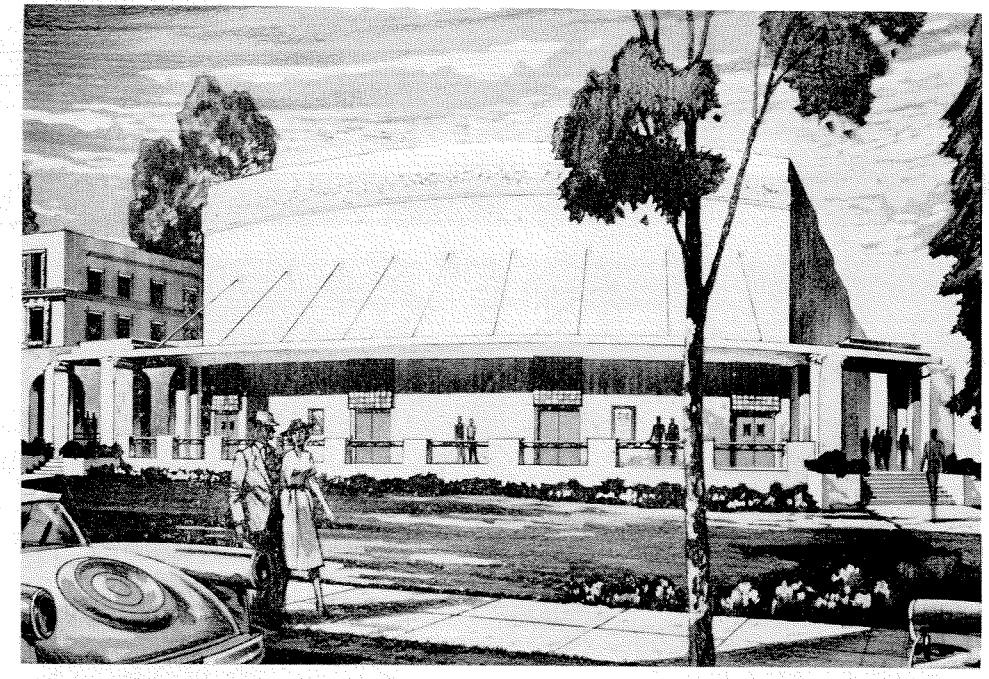
MATHEMATICS AND PHYSICS BUILDING $1,100,000

Reconversion of the present High Voltage Research Laboratory will provide permanent quarters for Caltech's mathematicians. The building will also house a new electrostatic generator, used in studies of nuclear reactions of light elements; and a low temperature physics laboratory.



CENTRAL LIBRARY
$2,400,000

A Central library will bring together more than 100,000 volumes now spread through departmental libraries. Bookstacks will be open to all readers, and there will be music rooms, reading areas, a rare-book room and a microprint room.

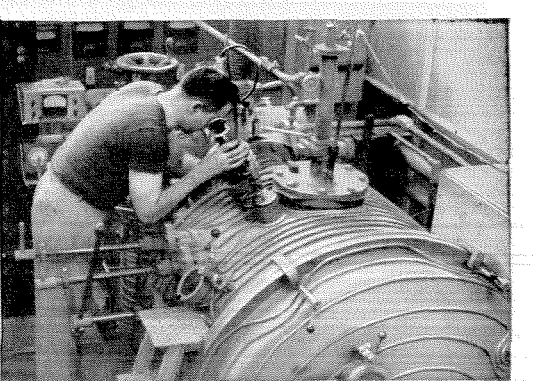


AUDITORIUM
$850,000

Caltech has no auditorium where the entire student body and faculty can gather. This proposed auditorium will have a main hall seating about 1,200 and will include small lecture and conference rooms, practice rooms for dramatic productions, and a room designed to serve as an interdenominational chapel.

Continued on page 26

What's doing...



Vacuum melting has opened up new horizons for development of alloys. Here, a Pratt & Whitney Aircraft metallurgist is shown as he supervises preparation of an experimental high-strength nickel-base alloy, melted and cast under high vacuum.

Induction melted heat of high-temperature alloy being poured in P & W A's experimental foundry. Molten metal is strained into large water tank, forming metal shot which is remelted and cast into test specimens and experimental parts. Development and evaluation of improved high-temperature alloys for advanced jet engines is one of the challenges facing metallurgists at P & W A.

at Pratt & Whitney Aircraft in the field of Materials Engineering

The development of more advanced, far more powerful aircraft engines depends to a high degree on the development of new and improved materials and methods of processing them. Such materials and methods, of course, are particularly important in the nuclear field.

At Pratt & Whitney Aircraft, the physical, metallurgical, chemical and mechanical properties of each new material are studied in minute detail, compared with properties of known materials, then carefully analyzed and evaluated according to their potential usefulness in aircraft engine application.

The nuclear physics of reactor materials as well as penetration and effects of radiation on matter are important aspects of the nuclear reactor program now under way at P & W A. Stress analysis by strain gage and X-ray diffraction is another notable phase of investigation.

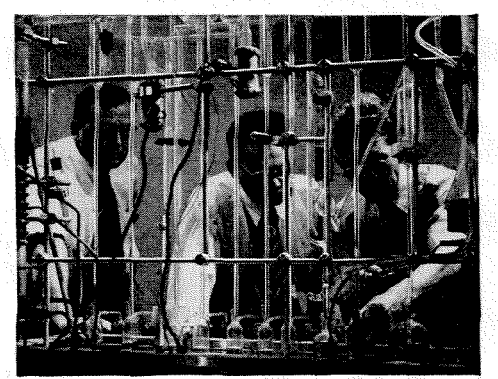
In the metallurgical field, materials work involves studies of corrosion resistance, high-temperature mechanical and physical properties of metals and alloys, and fabrication techniques.

Mechanical-testing work delves into design and supervision of test equipment to evaluate fatigue, wear, and elevated-temperature strength of materials. It also involves determination of the influence of part design on these properties.

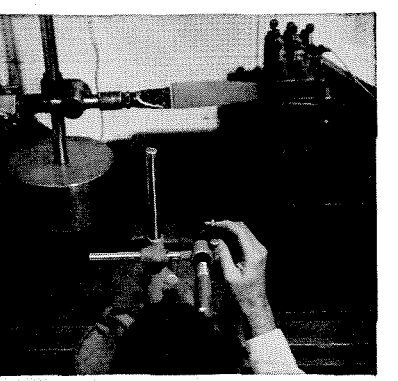
In the field of chemistry, investigations are made of fuels, high-temperature lubricants, elastomeric compounds, electro-chemical and organic coatings. Inorganic substances, too, must be prepared and their properties determined.

While materials engineering assignments, themselves, involve different types of engineering talent, the field is only one of a broadly diversified engineering program at Pratt & Whitney Aircraft. That program — with other far-reaching activities in the fields of mechanical design, aerodynamics, combustion and instrumentation — spells out a gratifying future for many of today's engineering students.

Engineer measures residual stress in a compressor blade non-destructively, using X-ray diffraction. Stress analysis plays important part in developing advanced aircraft engine designs.



The important effects of gases on the properties of metals have been increasingly recognized. Pratt & Whitney chemists are shown setting up apparatus to determine gas content of materials such as titanium alloys.



P & W A engineer uses air jet to vibrate compressor blade at its natural frequency, measuring amplitude with a cathetometer. Similar fatigue tests use electromagnetic excitation.

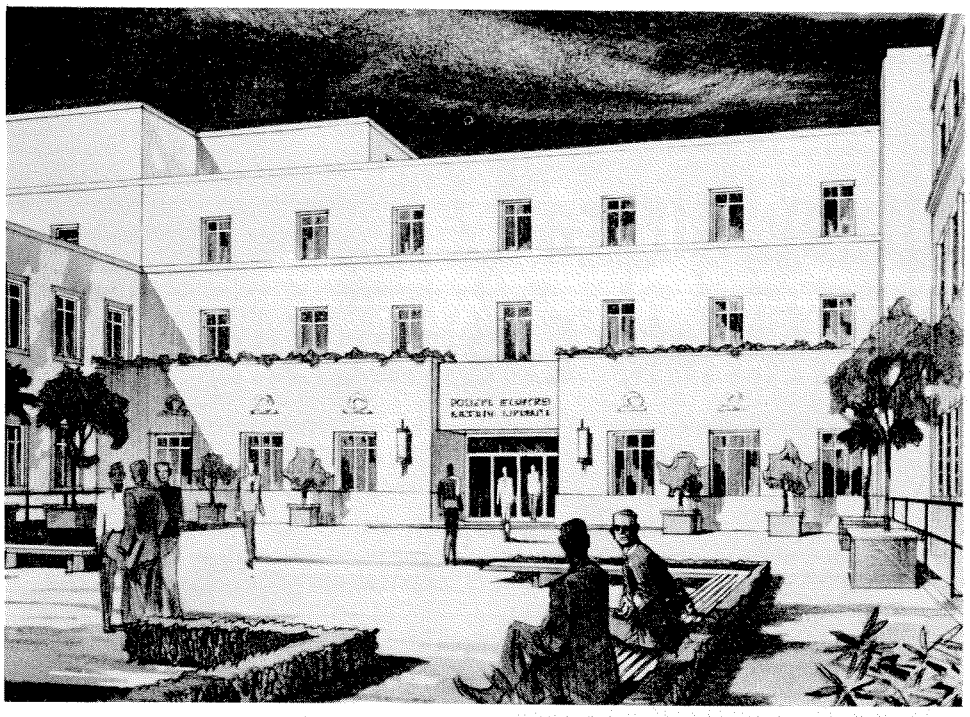
Pratt & Whitney Aircraft operates a completely self-contained engineering facility in East Hartford, Connecticut, and is now building a similar facility in Palm Beach County, Florida. For further information about engineering careers at Pratt & Whitney Aircraft, write to Mr. F. W. Powers, Engineering Department.

World's foremost designer and builder of aircraft engines

PRATT & WHITNEY AIRCRAFT

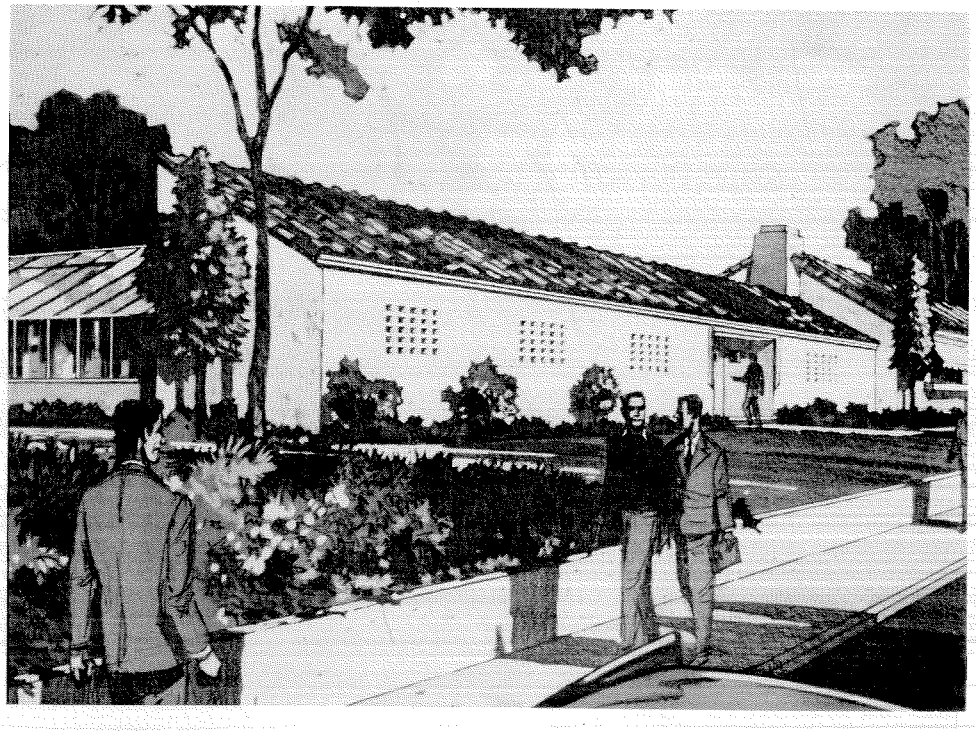
Division of United Aircraft Corporation

EAST HARTFORD 8, CONNECTICUT



BIOLOGY LABORATORY
$900,000

This new biology laboratory will connect the existing Kerckhoff and Church Laboratories and will provide space for laboratories for research in virology, psychobiology, immunology, biochemistry and biophysics.

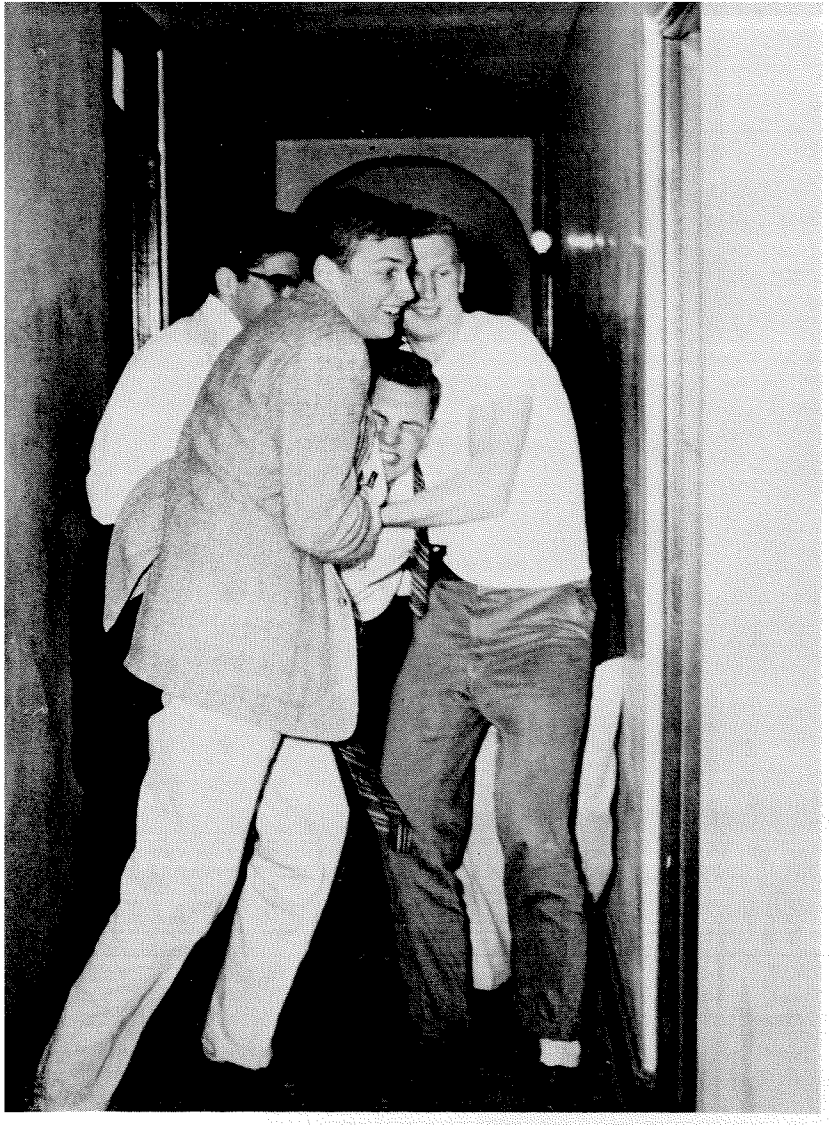


PLANT RESEARCH LABORATORY
$100,000

This addition to the existing Earhart Laboratory, where different climates can be reproduced in separate, sealed rooms, will make possible precise studies of the effects of viruses on plants.

PHYSICAL PLANT BUILDING
$600,000

Caltech's physical plant department now operates from scattered buildings around the campus. Most of these structures must come down to make way for new student houses and laboratories. A new, central physical plant building must therefore be built.



Voters and Visitors

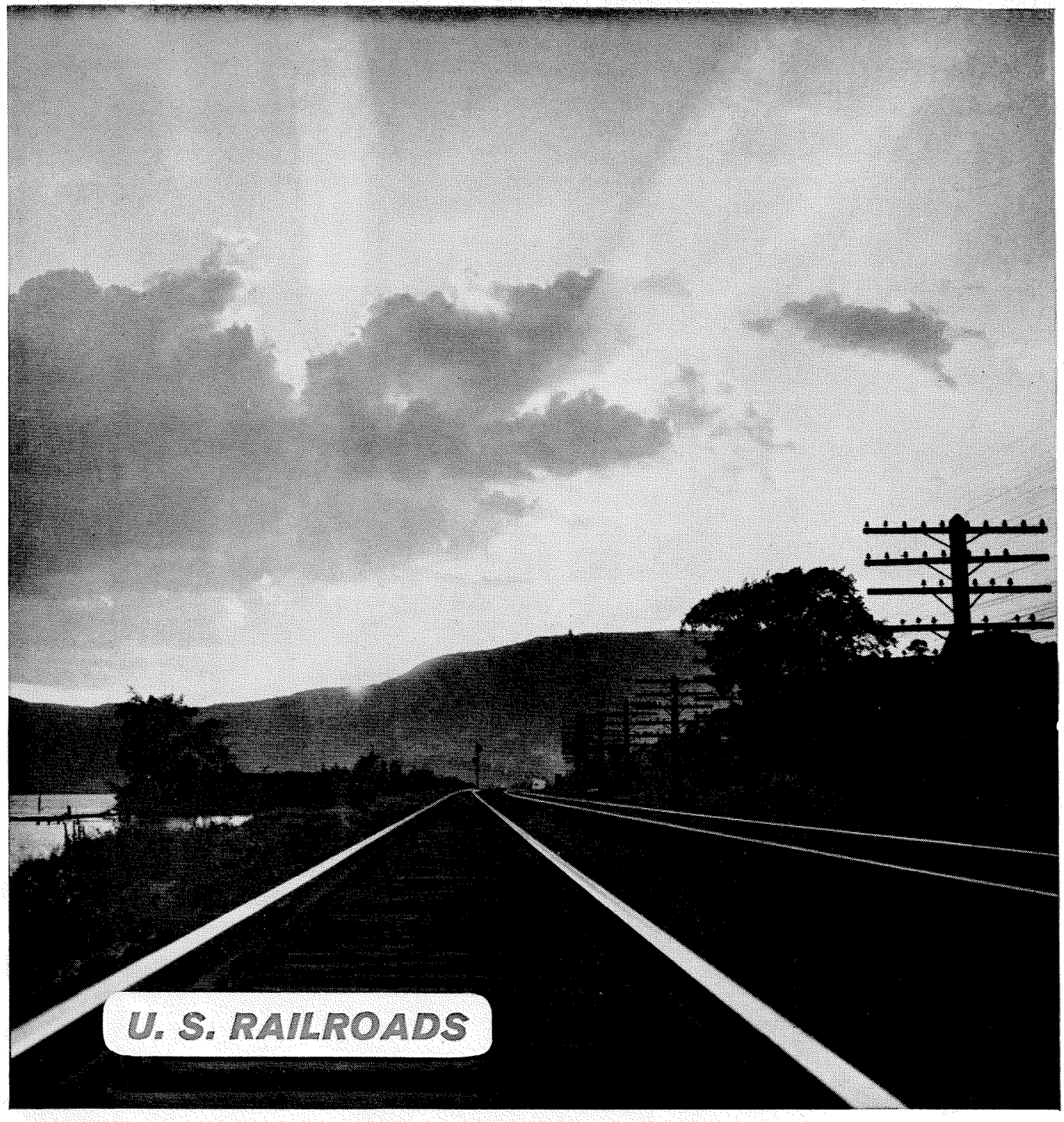
This is the time of year for student body elections at Caltech, and this was a reasonably quiet election year on the campus—though it was attended by the usual noisy rites, in which the victors (like the two samples shown on this page) were effectively escorted to the showers.

This seems to be the time of year, too, for distinguished visitors to come to the campus. Some recent callers are shown on the page opposite.

Clarence B. Randall, special consultant to President Eisenhower on foreign economic policy, talks with students while visiting the campus on the Caltech YMCA's Leaders of America program.

The Rev. Martin Luther King, another of the Caltech Y's Leaders of America, meets with students and their dates. Dr. King, president of the Montgomery, Alabama, Improvement Association, and a leader in the segregation movement, was on campus for three days.

Vice President Richard M. Nixon, with Caltech President DuBridge, after giving a speech for Caltech students and faculty in Tournament Park. Mr. Nixon visited the Institute while on a five-day tour of California last month.

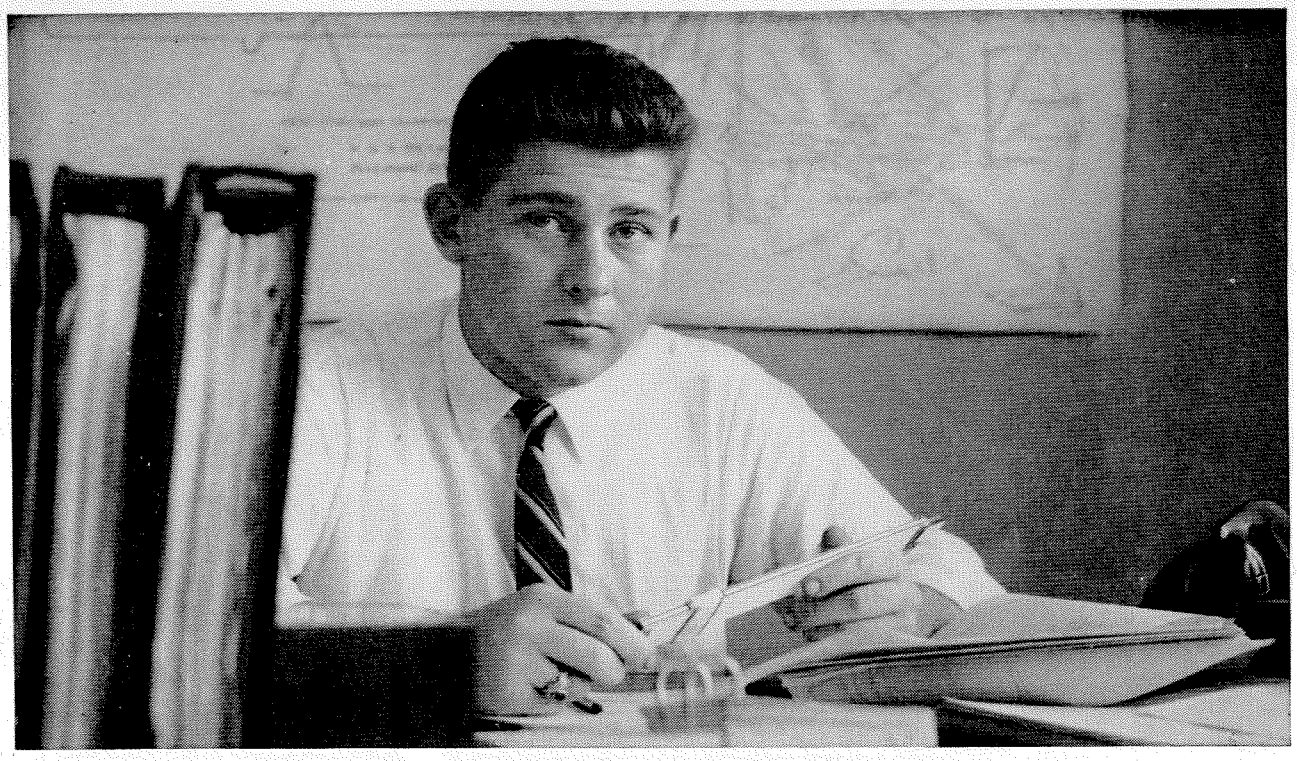


Where Engineers Can Move Ahead Faster

America's Railroads offer young engineers a particularly fast track to an interesting and challenging future. The reasons are clear. Our railroads are putting through an enormous program of automation and modernization. They are vital to America's economy and defense. And their need for you is very great. Their present management teams are looking forward to future successors. Retirement rates are currently high; and replacements are brought up from within. If you'd like to consider the unusual opportunities and rewards open to engineers of all types in railroading, see your placement officer or write us at 30 Church Street, New York 7, N. Y. We know you will like working with America's railroads. We've been doing it ourselves for many years—in supplying this great industry with Kerite quality insulated wire and cable.

KERITE CABLE

it's the **KERITE** *that makes the difference*



John Lawlor, B.S. in E.E., Brown, '52, answers some questions about

An engineering career with the Bell Telephone Companies

John Lawlor is a Transmission Engineer with New England Telephone and Telegraph Company in Boston. His answers reflect his experiences during five years in the telephone business.

Q ***How did you begin as an engineer in the Bell Telephone Companies?***

A My first fifteen months were spent in "on-the-job" training—changing assignments every three months or so. These assignments gave me a broad, over-all background in telephone engineering. And they were accompanied by plenty of responsibility. They progressed in importance with my ability to handle them.

Q ***What is the attitude of older engineers and supervisors toward young men?***

A I've found a strong team spirit in the telephone company. You're encouraged to contribute your ideas, and they're received with an open mind. Young men and new ideas are regarded as vital to the continuing growth of the company.

Q ***How about opportunities for advancement?***

A I'd say they depend on the man. Opportunities to demonstrate your ability come with each new job you're given. The size and importance of your assignments grow with your ability to handle them. All promotions are made from within, and the growth of the business is creating new openings all the time. One more thing. Most telephone engineering locations are convenient to colleges. You can aid your advancement by keeping on with your studies.

Q ***How does the telephone company stack up where pay is concerned?***

A Starting salaries are competitive with those offered by most large companies. Raises are based on merit, with several increases during your first two years with the company. What's more, your performance is reviewed regularly to make sure that your pay keeps up with your progress. All things considered, I think a Bell Telephone career is second to none in rewards and opportunities.

. . . .

Find out about career opportunities for *you* in the Bell Telephone Companies. Talk with the Bell interviewer when he visits your campus. And read the Bell Telephone booklet on file in your Placement Office, or write for "Challenge and Opportunity" to: College Employment Supervisor, American Telephone and Telegraph Company, 195 Broadway, New York 7, N. Y.

BELL TELEPHONE COMPANIES

Personals

1918

Gene B. Heywood writes from Chicago: "My former firm of Harris, Hall & Co. (investment banking), of which I was executive vice president and director, merged in 1953 with Dean Witter & Co., and I took charge of the corporate buying department of that firm in the Midwest. Subsequently I became a limited partner. I have been a director of the McGraw-Edison Company for some years and recently became a director of the Southern Nevada Telephone Company."

1923

Douglas A. Stromsoe, manager of the Southern Pipe & Casing Company in Azusa, has now been named president and general manager of the company.

1924

Vladimir A. Kalichevsky died on February 5 from a self-inflicted gunshot wound. He had been a consulting engineer for the Magnolia Petroleum Company in Beaumont, Texas, since 1944.

Loys Griswold writes that he's still manager of the central district in General Electric's apparatus sales division — and that *Ed Thayer* '25 (who is vice president and advertising director of The Oil Daily) now lives in his town, Wilmette, Illinois.

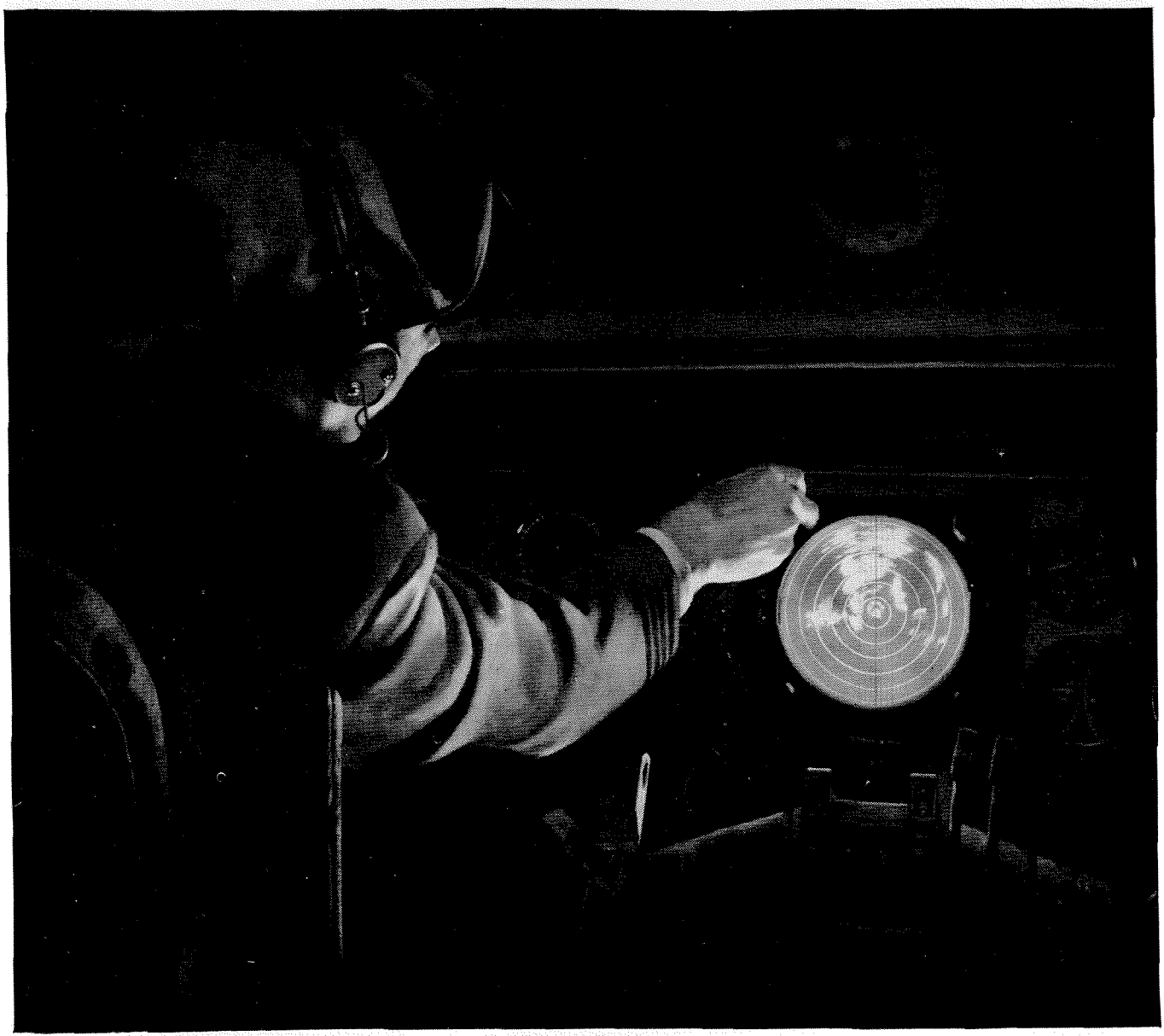
1929

James W. Dunham, after four years with the Ralph M. Parsons Company, is now back in the civil service—this time with the State of California in the harbor engineering field. All of the Dunhams have moved to Sacramento except son Doug, who is now a sophomore at Caltech.

1930

David W. Scharf, MS '32, wrote *Larry Bolles*, '31, the following news which Larry has transmitted to E&S: "We came to Italy in 1955 after six months in Morocco, where I was party-chief of a seismograph crew for Ind. Exploration Company. We spent several interesting months in the interior among the Arabs. Here in Italy I am party-chief of a seismograph crew for the Western Geophysical Company. (Their main office is in L.A.) They have several crews here, but the only American personnel are the party-chiefs. All the others are Italian. We have just moved to Pescara, a city of about 100,000 population on the east coast of Italy (between the calf and spur of the boot) after spending two years in Vasto, a small town on the coast about 50 miles south of Pescara. This region is called the Abruzzi. In a small

continued on page 36



RCA ELECTRONICS KEEPS A RADAR "WEATHER EYE" ON YOUR COMFORT ON THE GREAT AIRLINES

Flying into a starless night, the pilot's vision may reach a mere 50 yards. Yet he sees a storm brewing 150 miles ahead.

Within minutes he plots a slight change in course and flies a smooth, safe corridor *through* the weather. His passengers complete their trip in comfort and on schedule.

Credit RCA Electronics for the "Weather Eye" radar that makes all this possible. And United Air Lines' all-radar fleet for being the first (among 24 leading airlines) to use this important development.

RCA pioneering also produced radar that guides ships at sea and tracks man-made satellites through space. RCA pioneered color television, produced the world's largest electronic computer, peanut-sized transistors and much, much more.

Progress like this helps explain why RCA *means* electronics – and why electronics *means* a happier, healthier, more secure future for you.

RADIO CORPORATION OF AMERICA

WHERE TO, MR. ENGINEER?

RCA offers careers in TV and allied fields – in research, development, design and manufacturing–for engineers with Bachelor or advanced degrees in E.E., M.E. or Physics. Join the RCA family.

For full information write to: Mr. Robert Haklisch, Manager, College Relations, Radio Corporation of America, Camden 2, New Jersey.

s'Gravesande's Stoomwagen

s'Gravesande's Steam Reaction Car

In 1721 Jacob Willem s'Gravesande of Delft, stimulated by the recently enunciated Third Law of Motion, astounded the Royal Society by constructing a practical steam reaction car. The vehicle actually moved several times its own length, a distance of about two meters.

In 1958 the goal is no longer meters, but hundreds, and even thousands, of miles. Aerojet-General Corporation, leader in American rocket power for more than a decade, is proud to be a pioneer in these new vistas of the propulsion sciences.

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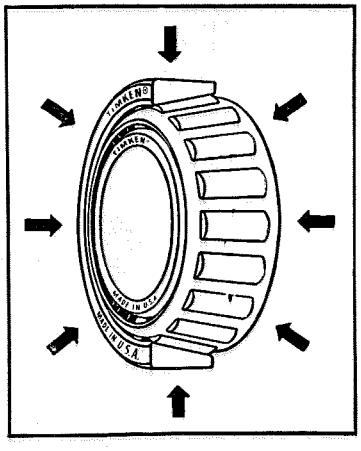
Chemists
Physicists
Mathematicians

An Aerojet-General representative will be on campus shortly. Contact your Placement Office for details.

Tear out this page for **YOUR BEARING NOTEBOOK...**

How to make a good grade with a scraper

Huge 518 hp. scrapers like this often have to maneuver giant loads on hills—up, down and sideways. Engineers who design these mammoth earth movers have to provide for the terrific, combination radial and thrust loads, plus shock loads. To take the loads and assure dependable scraper performance engineers mount wheels, pinions and differentials on Timken® tapered roller bearings.



Tapered design lets Timken® bearings take both radial and thrust loads

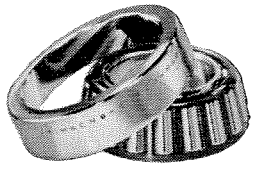
Not all bearings can take loads from the sides, as well as from above. The tapered design of Timken bearings lets them take *both* radial and thrust loads in any combination. And because Timken bearings roll the load on a full line of contact between their rollers and races, they have extra load-carrying capacity.

Want to learn more about job opportunities?

Timken bearings help make better machines. And better machines make our lives richer, give us more leisure time. We call it Better-ness. Why not find out more about Better-ness and how you can help create it. Write for: "BETTER-ness and Your Career at the Timken Company". The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂⊃ BEARING TAKES RADIAL ↓ AND THRUST →◎← LOADS OR ANY COMBINATION

town like Vasto we sort of rough it, by American standards, but living conditions are somewhat better here in Pescara."

1933

Louis A. Pipes, MS '34, PhD '35, professor of engineering at UCLA, has been elected a Fellow in the Institute of Radio Engineers.

John R. Pierce, director in research of electrical communications for the Bell Telephone Laboratories, had an article on "Telephones, People and Machines" in the Jubilee issue of *The Atlantic* in December.

1935

William B. McLean, MS '37, PhD '39, technical director of the China Lake Naval Ordnance Test Station, received a special gold medal Presidential award for "exceptionally meritorious civil service to the Government" in ceremonies at the White House in Washington, D.C. recently. In 1946, he conceived the basic idea and directed the development of "The Sidewinder," an air-to-air guided missile which is said to have saved the Defense Department $46,000,000 over other similar-use missiles in the first year of its production.

1936

Alexander Kossiakoff, assistant director of technical operations for the applied physics laboratory at the Johns Hopkins University, received the Navy Distinguished Public Service Award in December for the predominant part he played in the development by the laboratory of the Terrier guided missile.

Frank W. Davis was named "Engineer of the Year" for 1957 by the Fort Worth Chapter of the Texas Society of Professional Engineers last month. Frank is chief engineer of Convair's Fort Worth division which built the supersonic B-58 bomber.

1939

George W. Sinclair died of a heart attack on February 11 at his home in Tucson, Arizona. He was 42. With the Hughes Aircraft Company since 1949, George had been manager of the Tucson plant since 1952. He leaves his widow and three children—George, Jr., 13, Zerilda, 11, and Rowena, 13 months.

Regarding George's death, John W. Black, '39, writes: "George left rather a large hole in the community, as a result of his personal activities as well as his position here at the plant. As a matter of much less interest, I will be taking his place as manager here."

1944

Robert J. Parks was named chief of the Jet Propulsion Laboratory's guidance department in January. He's been working at JPL since 1947 and is director of the Sergeant project. The Sergeant is a new missile developed by JPL for the Army Field Forces.

Thomas L. Gilbert, MS '49, writes that "it's been ten years since I last saw the Caltech campus. In that time, I've accumulated three kids, a PhD, and a new job. I have a research appointment at Argonne National Laboratory in Illinois, which expires in August. Perhaps I'll be back on the coast to see some of you sometime this spring."

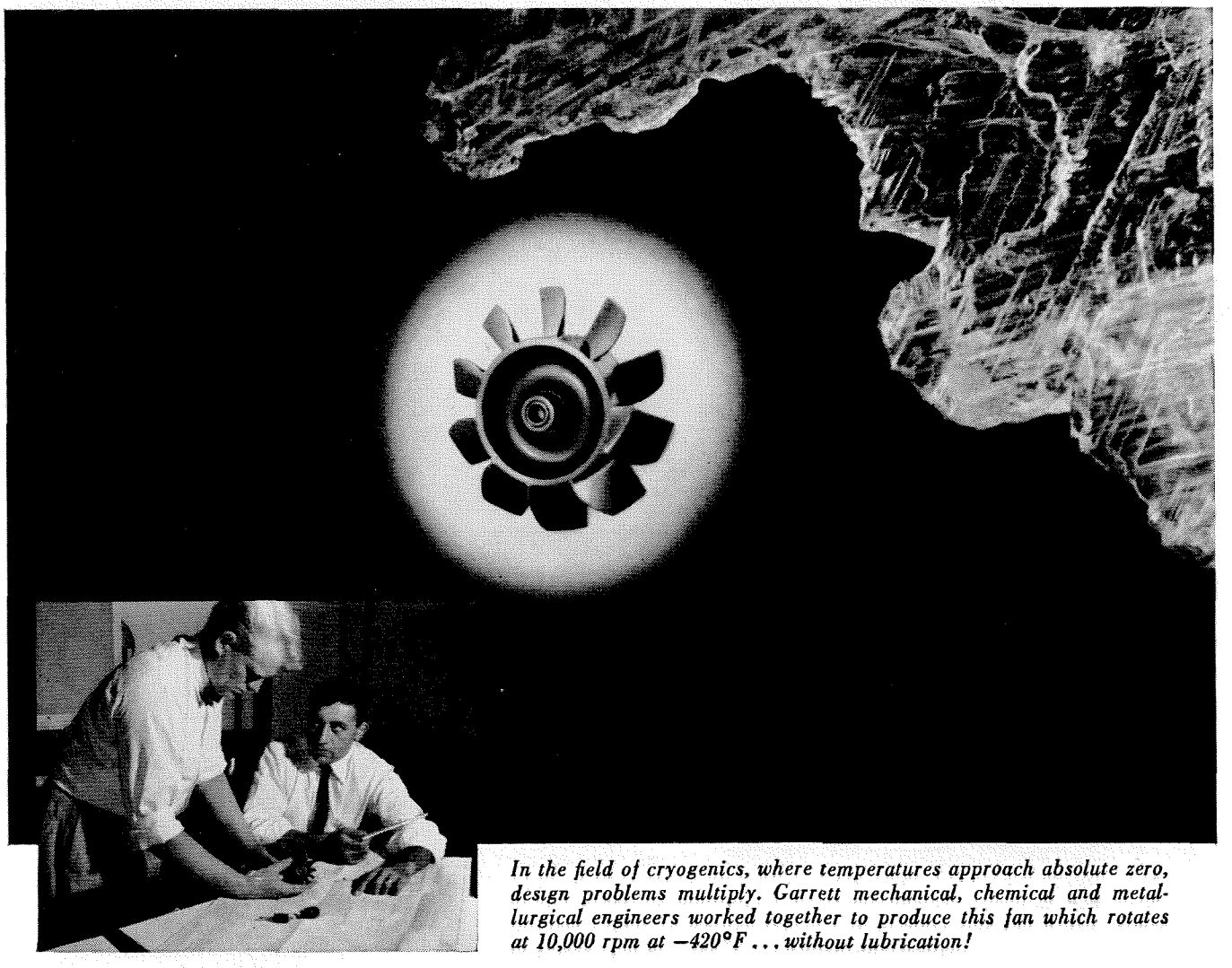
F. Miles Day, assistant trainmaster for the Pennsylvania Railroad in Dayton, Ohio, has been transferred to the position of supervisor of transportation engineering for the company in Indianapolis.

William L. Collins is now city clerk-manager in Zion, Illinois. The Collins' have three sons, one 5, one 4 and one 9 months old.

Richard N. Jasper writes from Alhambra: "So far as I know, *Francis E. McDonald, Jr.* '44, and I are the only CE's of our class who have our own engineering offices going. Mac got started in about 1949 in San Gabriel and I have been on

continued on page 40

Maximum results from a college education...



In the field of cryogenics, where temperatures approach absolute zero, design problems multiply. Garrett mechanical, chemical and metallurgical engineers worked together to produce this fan which rotates at 10,000 rpm at −420°F . . . without lubrication!

Education is the springboard for your future. Couple it with the proper engineering experience, such as you receive at Garrett, and you have the ingredients for a successful career in engineering fields which will be expanding for years.

At Garrett, specific opportunities in aircraft, missile and technological fields include: system electronics; computers and flight instruments; gas turbine engines and turbine motors; prime engine development; cryogenic and nuclear systems; pneumatic valves; servo control units and air motors; industrial turbochargers; air conditioning and pressurization and heat transfer.

In addition to direct assignments, a 9-month orientation program is available to aid you in selecting your field of interest. This permits you to survey project, laboratory and administrative aspects of engineering at Garrett. With company financial assistance you can continue your education at outstanding universities located nearby.

Project work is conducted by small groups where the effort of each individual is more quickly recognized and where opportunities for learning and advancement are greatly enhanced. For complete information, write to Mr. G. D. Bradley.

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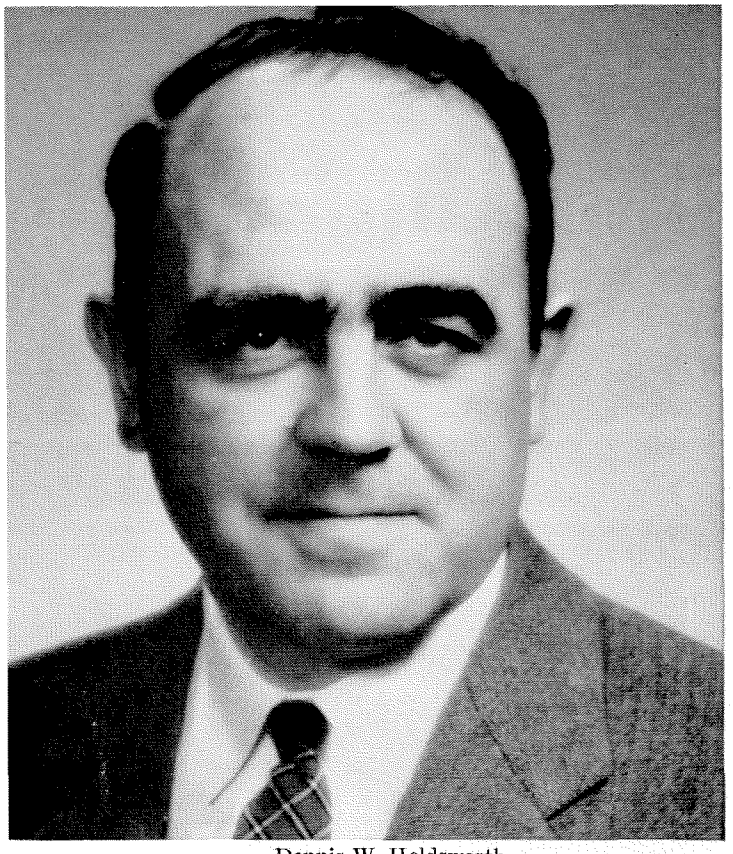
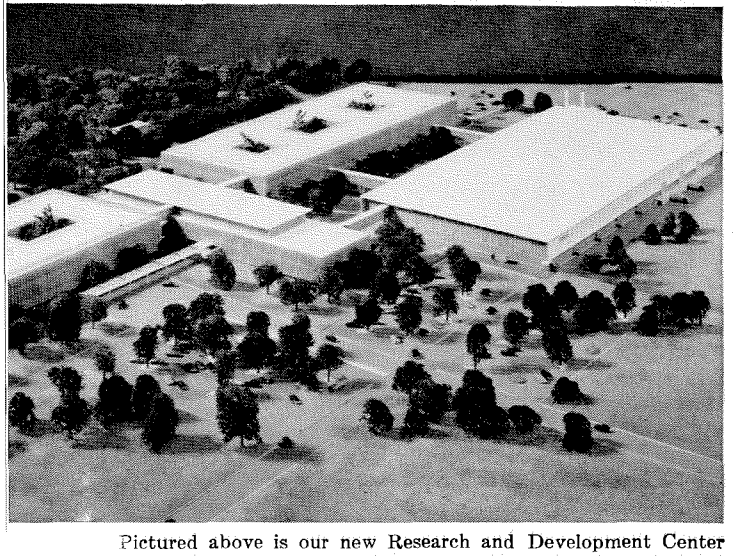


Dennis W. Holdsworth



Pictured above is our new Research and Development Center now under construction in Wilmington, Massachusetts. Scheduled for completion this year, the ultramodern laboratory will house the scientific and technical staff of the Avco Research and Advanced Development Division.

Avco's new research division now offers unusual and exciting career opportunities for exceptionally qualified and forward-looking scientists and engineers.

Write to Dr. R. W. Johnston, Scientific and Technical Relations,
Avco Research and Advanced Development Division,
20 South Union Street, Lawrence, Massachusetts.

IDEALS AND PRACTICALITY

"Science and Philosophy mutually criticize each other and provide imaginative material for each other."... Alfred North Whitehead.

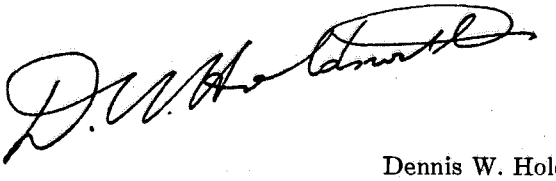
In the increasing preoccupation of science with material things and progress, the truth of this statement by one of our greatest philosophers is often overlooked and forgotten. The scientific philosopher is a rare being and is becoming rarer still, nor can he be adequately replaced by the group technique or the 'brainstorm' session.

It should be one of the noblest aspirations of all our sciences to provide for the true contemplation of the inner meaning of facts and to stimulate that interplay of mind on mind by which alone we may progress.

In all these things, however, we cannot forget the problems peculiar to research and development in private industry. The obligation to work to otherwise-determined time-scales poses a nice problem in balancing ideals against the practicalities of everyday life.

It is in this field that the test of management comes. Its success at meeting such continuously conflicting requirements determines the character and ultimate success of the organization.

With such thoughts as these in mind, we here at Research and Advanced Development Division of AVCO are seeking unique people. We wish to foster the creative minds and fundamental thinkers, while preserving an atmosphere of self-discipline, free from a rigid hierarchy of command and organization.



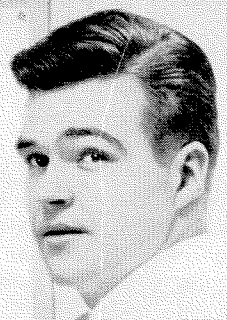
Dennis W. Holdsworth,

Manager, Computer and Electronic Systems Department

AVCO

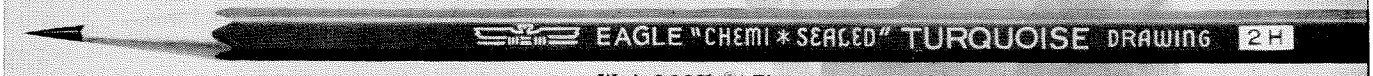
Research & Advanced Development

are your **plans** as precise as your **planning?**

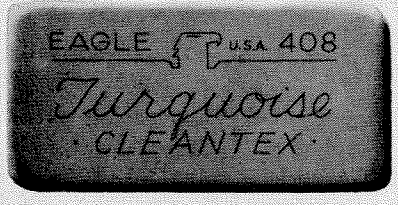


The proof of the planning is in the finished plans. That's why you're smart to use Eagle TURQUOISE—the pencil the professionals prefer. Look what it gives you: *Uniform grading* (17 scientific formulas guarantee exactly the blackness you want—from every pencil, every time!). A strong *non-crumbling needle point* that stays sharp for line after long line of unchanging width. *Inimitable smoothness*—thanks to Eagle's exclusive "Electronic" graphite. TURQUOISE makes your plans look sharp—and *you*, too!

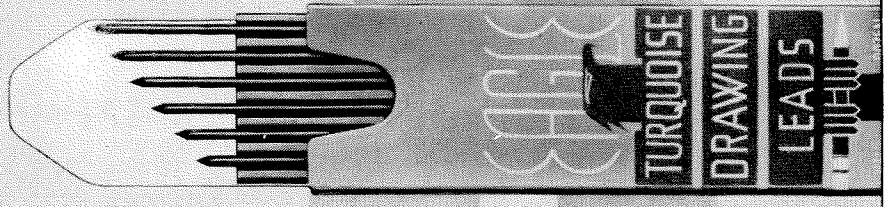
WRITE FOR FREE SAMPLE Turquoise wood pencil and Cleantex Eraser, naming this magazine —or buy any of these drawing instruments from your favorite dealer.



• **TURQUOISE DRAWING PENCILS:** With 100% ® "Electronic" graphite. 17 grades, **6B through 9H.**



• **TURQUOISE CLEANTEX ERASER:** Super-soft, non-abrasive rubber.



• **TURQUOISE DRAWING LEADS:** Fit any standard holder. Grades 5B through 9H.

• **TURQUOISE LEAD HOLDERS:** Hold any grade of Turquoise lead—so firmly that lead cannot be pressed back.

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my own since 1954 in L.A. Floyd (Bobo) Weaver, '44, is in the same spot in Santa Ana—opened up on January 1, 1957. At last report, business was good in all 3 offices, despite the recession. Mac and I have been cutting our teeth on supermarkets lately—Bobo has been doing some thin shell design for an architect."

1947

Charoen Vadhanapanich, MS '48, returned to Bangkok last month to resume his duty as Lt. Commander in the Meteorological Department of the Royal Thai Navy. For the past three and a half years he has been doing graduate study in meteorology at the Florida State University and he received his PhD there in February.

Richard A. Boettcher, MS, has been busy moving and changing jobs. He writes: "My new job is with J. H. Pomeroy & Co., Inc., as a member of the staff concerned with business development and project engineering. We live in Altadena and have 2½ acres and a 40-50-year-old house with 13 rooms, 4 baths and a guest apartment. This place will tax my 'do-it-yourself' enthusiasm to the very fullest."

1949

John A. McPhate, staff member at the Sandia Corporation in Albuquerque, died of a brain tumor on January 19, 1957 after an illness of only a few weeks, according to information just received.

Burton B. Rutkin, MS '50, is now an engineer in the mechanical and electrical engineering department of the Shell Development Company's Emeryville Research Center in California.

Milton B. Carus writes that: "We now have two children: Andre, 4½, and Christine, 5 months. It's fun to watch Andre growing up bilingually and to note the ease with which a child is able to learn two languages at once. (My wife is from Germany.)" Blouke is a development engineer with the Carus Chemical Company in La Salle, Ill., currently working on the process for potassium permanganate.

1950

Nathan H. Koenig, PhD, a chemist with the Agricultural Research Service of the U.S. Department of Agriculture, was recently transferred from the Eastern Regional Laboratory in Philadelphia to the Western Laboratory in Albany, California. Nate is engaged in research on wool proteins.

1953

James R. Kliegel was married to Margaret Meaney on February 2 in Berkeley. Jim received his MS from UC in Berkeley last October and expects to receive his PhD in Science of Engineering this year.

Kim Hamberger is studying for his PhD at UC in Berkeley and writes that *Donald O. Emerson*, '53, is teaching in Davis; *Howard Shugart* '53 is teaching at Berkeley; and that *Thomas R. Slodowski*, '53, is now with American Overseas Petroleum, Ltd., in Tripoli, Libya. Tom's wife and daughter are with him in Libya.

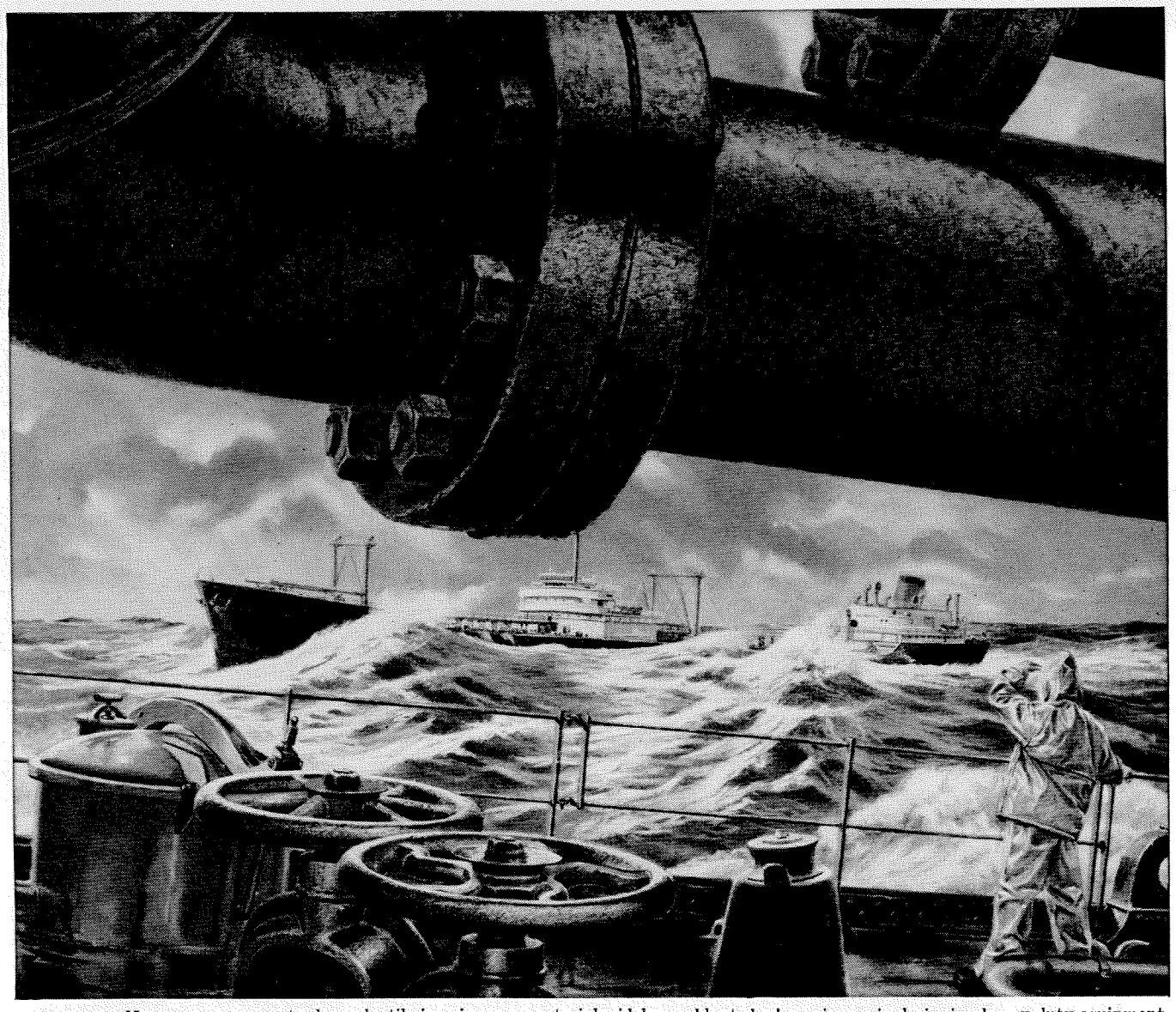
1956

Byron Johnson, Jr., civil engineering assistant and planning commission secretary for the city of Azusa, has a son, Douglas Forbes, born last May.

Peter O. Lauritzen is now a graduate student at Stanford working for an MS in EE. In 1956-57 he was an associate evaluation engineer for the Minneapolis-Honeywell Regulator Company in Rock Island, Illinois.

1957

Viktor Evtuhov, MS, of Pasadena, has received an RCA fellowship which includes full tuition costs, $2100 toward his living expenses and $750 as an unrestricted gift to Caltech.



Now on many supertankers, ductile iron is a new material widely used by today's engineers in designing heavy-duty equipment.

Ductile Iron...another Inco Research first

Over five miles of ductile iron pipe going into many of today's supertankers

A deep sea tanker takes many a heavy beating when waves are rough.

With each pitch and roll, she has to *weave*. And her five or more miles of piping have to weave with her.

If it is ductile iron piping, every pipe length *gives* without break or leak.

Bends without breaking

Ductile iron is not only ductile, but also tough. And resistant to the corrosive action of sea water and sulfur laden crude oil.

In some tankers, gray cast iron pipe resists corrosion for ten years or more. Sometimes, though, it's cracked and broken by the pounding of heavy seas that overtax its strength.

In other tankers, steel pipe outrides such storms without damage. But it corrodes so badly it may have to be replaced every three or four years when handling sour crudes.

Ductile iron pipe, tanker owners find, combines the low cost and demonstrated corrosion resistance of cast iron with the tough strength of carbon steel.

So today, many of the newest tankers carry pipe and fittings of ductile iron.

Ductile Iron also under city streets

The properties that prove ductile iron pipe suitable for tankers also commend it to municipal and utility engineers. So this shock-and-corrosion resisting pipe is used for water and gas mains. It may soon be under the streets in your town.

Ductile iron has many uses—from plowshares to jet plane parts. And cost-conscious industry is constantly finding new ways to use this versatile money-saving, Inco-developed material.

For free booklet, "Engineering Properties and Applications of Ductile Irons," write: Dept. 232G, Educational Service, Development and Research Div.,

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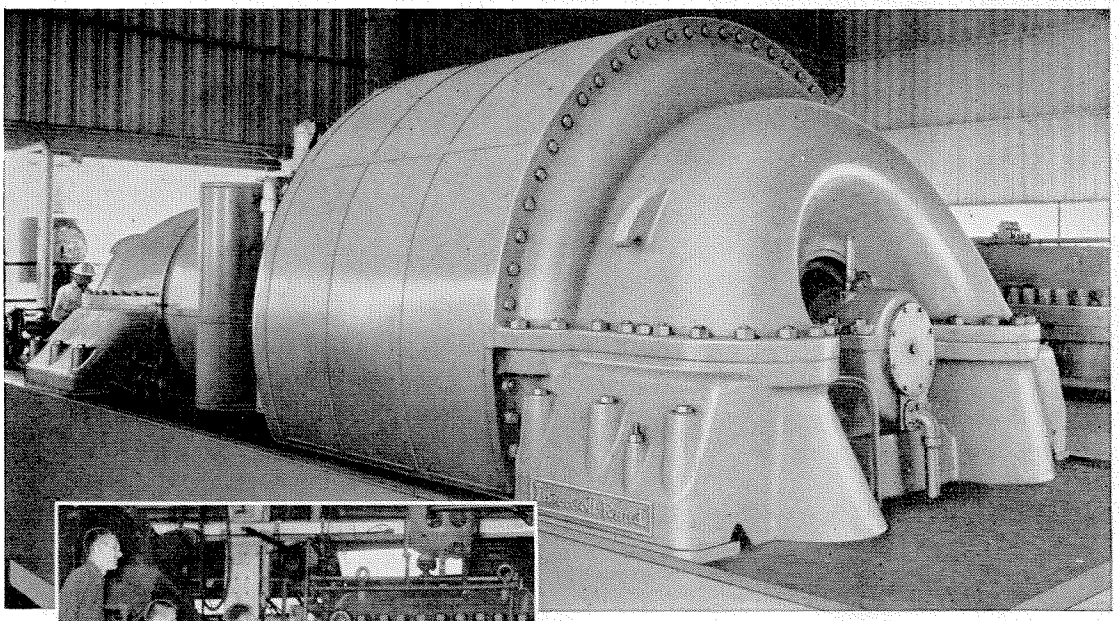
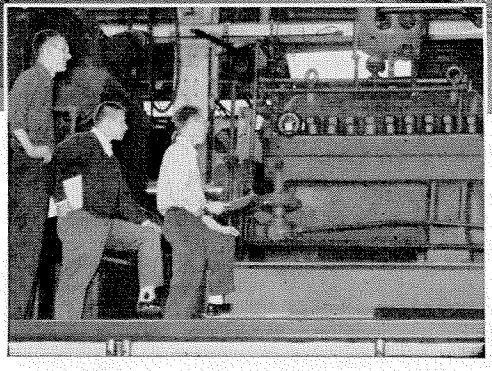
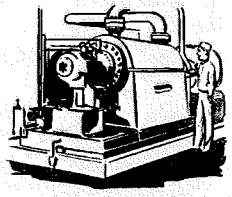




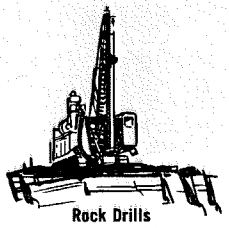
ABOVE: This huge I-R Turbo-Blower is the largest cat-cracking air blower ever built. It delivers 161, 500 cfm of 30 psi air at Tidewater Oil Company's new Delaware refinery, and is driven by an 11,250 hp I-R steam turbine.

LEFT: Engineering trainees at Ingersoll-Rand's Phillipsburg, N. J., plant check final performance tests on another blower of smaller size and higher pressure.

also means LEADERSHIP in

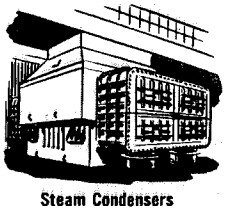


Centrifugal Pumps

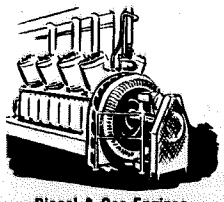


Rock Drills

Air & Electric Tools



Steam Condensers



Diesel & Gas Engines

Here's What Blower Engineering at Ingersoll-Rand can mean to you...

WHEREVER industry needs large volumes of compressed air or gases – for steel mill blast furnaces, refinery catalytic cracking units and other petroleum and chemical processes–you'll find Ingersoll-Rand centrifugal blowers on the job. These huge units, delivering thousands of cubic feet per minute, 24 hours a day, are the very heart of our vital process industries.

This means that blower engineering offers you challenging opportunities in a field of major importance. There is a need for every type of creative engineering ability in the design, development and application of such specialized industrial machinery.

Ingersoll-Rand also manufactures the industrial equipment shown at the right. All require a high order of engineering in their design, manufacture and sale.

If you are looking for a leadership career with excellent opportunities for advancement, you'll find it at Ingersoll-Rand. For further details, contact your Placement Office, or write to Ingersoll-Rand, 11 Broadway, New York 4.

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Alumni News

Board Nominations

The Board of Directors of the Alumni Association met as a nominating committee on February 25, 1958, in accordance with Section 5.01 of the By-Laws. Five vacancies will occur on the Board at the end of the fiscal year, one vacancy to be filled from the present Board and four members to be elected by the Association. The present members of the Board and the years in which their terms of office expire are:

W. R. Donahue, Jr. '34	1958	Edward P. Fleischer '43	1958
Frank C. Bumb '51	1959	John E. Fleming '46	1959
L. Fort Etter '34	1959	Chester W. Lindsay '35	1958
John R. Fee '51	1958	John E. Osborn '39	1958
		Nick T. Ugrin '34	1959

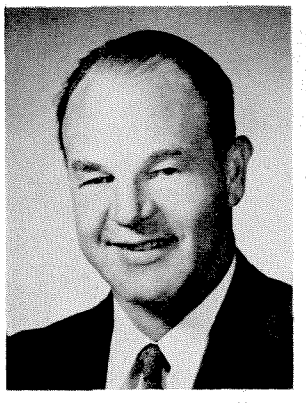
The following nominations have been made by the committee:

President—Edward P. Fleischer '43	(1 year)
Vice President—Frank C. Bumb '51	(1 year)
Secretary—Donald S. Clark '29	(1 year)
Treasurer—George B. Holmes '38	(1 year)
Director—Frank E. Alderman '30	(2 years)
Director—William W. Haefliger '50	(2 years)
Director—Ralph W. Jones '38	(2 years)
Director—Francis E. Odell '44	(2 years)

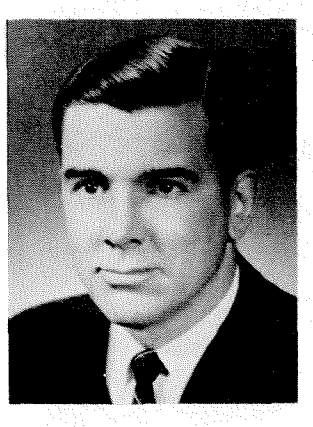
Section 5.01 of the By-Laws provides that the membership may make additional nominations for the four (4) Directors by petition signed by at least twenty-five (25) members in good standing, provided the petition is received by the Secretary not later than April 15. In accordance with Section 5.02 of the By-Laws, if further nominations are not received by April 15, the Secretary casts a unanimous ballot for the members nominated by the Board. Otherwise a letter ballot is required.

Statements about the four Directors who have been nominated are presented below.

—Donald S. Clark, Secretary



FRANK E. ALDERMAN received his BS in civil engineering in 1930 and began working for the Fluor Corporation in Los Angeles. From 1933 to 1938 he was an engineer for the Goodyear Tire & Rubber Company in Los Angeles, and in 1938 he became City Engineer for the City of South Gate. In 1945 he joined Holmes and Narver in Los Angeles as chief civil and sanitary engineer and since 1949 has had his own office as a consulting engineer. He served on the Alumni Seminar Program Committee in 1951 and was chairman of the Catering Committee for the Alumni Seminar in 1952.



WILLIAM W. HAEFLIGER received his BS in mechanical engineering in 1950 and went to work for the McCulloch Motors Corporation in Los Angeles as a patent engineer until 1954. He became associated with H. Calvin White, patent attorney, in 1954 and received his LLB from Loyola University's School of Law in 1955. He is now a partner in the firm of White and Haefliger, and a member of the Los Angeles and California State Bar Associations. He is chairman of the Caltech Alumni Association's Program Committee for 1957-58.

RALPH W. JONES received his BS in mechanical engineering in 1938 and then worked for the Byron Jackson Company in Los Angeles for two years as a design engineer. In 1940 he joined the St. Paul (Minnesota) Engineering and Manufacturing Company as chief engineer, becoming works manager in 1943. Early in 1945 he returned to Caltech to work on wartime projects, then served briefly with the Manhattan District Engineers in the Army, and worked for a year at NOTS. Since 1947 he has been with the management consulting firm of Booz, Allen & Hamilton in Los Angeles and was elected to a partnership in 1952. He is serving for the third time on the Alumni Seminar Committee and is this year's chairman.

FRANCIS ODELL received his BS in applied chemistry in 1944 and for the next six years was associated with Caltech—first as a research engineer for the chemical engineering division, then for five years at JPL as senior research engineer in the materials group. From 1950 to 1955 he worked for Surface Alloys, Inc., in Huntington Park and became general manager of plating operations in two plants. In 1954 he organized and became president of Metal Surfaces, Inc., a plating firm in Huntington Park. He is a life member of the Alumni Association and was in charge of the Annual Alumni Picnic at the San Diego Zoo in 1953.

1958 is a Vintage Year

For the CIT ALUMNI SEMINAR

Saturday, April 12, 1958

Nine Lectures
During the Morning
(50% more choices for you)

Eighteen Exhibits
and Demonstrations
during the afternoon, — including the last opportunity to witness the famous high voltage demonstrations.

Nationally Famous
Evening Speaker

H. Rowan Gaither

Chairman of Ford Foundation
Chairman of Rand Corporation
Chairman of "Gaither Committee"

Speaking on:
"Science and the National Welfare"

RESERVATIONS ARE REQUIRED. SEND IN THE BLANK BELOW — NOW!
(Wives and guests are invited)

Name.....**Class**.....

Address.....

.....**Phone**.....

Name of Guests.....

.....

.....

Number

.....**Registration for Daytime Program at $1.50 Each $**.....

.....**Luncheons at Student Houses at $1.60 Each $**.....

.....**Dinners and Speaker at Elks Club at $3.00 Each $**.....

Total Cost $.....

Please attach a check payable to Caltech Alumni Association and mail to the Alumni Office before April 4th.

Facilities limit dinner attendance to 400

Please indicate which of the optional programs will be your choice. This information is needed *to make seating arrangements.*

		Number Attending
9:30	Dr. Pickering .	.....
	Dr. Meselson .	.....
	Dr. Mead . .	.....
10:50	Dr. Feynman .	.....
	Dr. Martel . .	.....
	Dr. Silver . .	.....
11:55	Dr. Field . .	.....
	Dr. Lindvall .	.....
	Dr. Clark . .	.....

Twenty-first Annual Alumni Seminar

Saturday, April 12, 1958

8:30-9:15 A.M.—REGISTRATION

Dabney Lounge

9:30-10:30 A.M.—One of the Following:

A. MISSILES AND SATELLITES

William H. Pickering, Director, Jet Propulsion Laboratory.

The recent placing in orbit of the four satellites is having a profound effect on the people of the world, both scientifically and philosophically. The events leading up to the successful launching of the "Explorer Satellite" and the part which JPL played in the program will be discussed by Dr. Pickering. A summary of the scientific information which is being gained from the satellite experiment will be presented.

B. HOW GENES DUPLICATE THEMSELVES

Mathew Meselson, Research Fellow in Chemistry.

You don't have to be a biologist to enjoy and appreciate this fascinating insight into one of the most fundamental of life processes. Dr. Meselson will discuss very recent discoveries in which he has participated. These are helping unravel the mystery of how a unit of living matter can build accurate duplicates of itself.

C. YOU CAN'T ENGINEER A PIPE ORGAN

Hunter Mead, Professor of Philosophy and Psychology.

The modern pipe organ is a remarkable fusion of esthetics and technology. Engineers' efforts at improvement have been largely unfortunate, because they have tended to view it as a machine rather than a musical instrument. Professor Mead, a lifelong organ enthusiast, has built in his home one of the largest pipe organs in Pasadena. He will present a brief history of the organ, and will explain and demonstrate the means by which the rich tonal variety of the organ is produced. (Illustrated by slides.)

10:20-10:50 A.M.—COFFEE TIME

10:50-11:40—One of the Following:

A. NON-CONSERVATION OF PARITY

R. P. Feynman, Professor of Physics.

Many of our important scientific advances are the result of new laws of physics which result from the disproving of previously accepted laws. The law of the conservation of parity has long been accepted in quantum mechanics. Recent findings tend to disprove this accepted law. How these findings can influence our lives will be discussed by Dr. Feynman.

B. INFORMATION THEORY FOR THE LAYMAN

Hardy Martel, Assistant Professor of Electrical Engineering.

Subconsciously we apply this theory every time we make a decision. We consider how many data we have, the certainty with which we know them, and the various possibilities which accrue from them. The subject deals with the problem of knowing what kind of information one might obtain from a given amount of data. Dr. Martel will show the basis for this general problem and apply it to several examples.

C. THE NEW LOOK IN GEOLOGIC TIME

Leon T. Silver, Assistant Professor of Geology.

Great improvements in the application of radioactive timeclocks to geological problems have given us a new perspective on the earth's history. When correlated with the classical geological time scale, the precise dates obtained by the new techniques have provided information about the evolution of organisms, the rise and decline of mountains, and major invasions of the continents by the oceans. Timing these episodes long after they occur is done by a combination of mule-back exploration and sensitive isotope analysis. Professor Silver will show colored slides, and will describe the techniques, some of his field work, and recent results.

11:55-12:45 P.M.—One of the Following:

A. ELECTRICAL PLASMA DISCOVERIES

Lester Field, Professor of Electrical Engineering.

Electrical plasma is an ionized region of gas which characteristically glows. New explorations in this phenomenon are of great importance in connection with obtaining power from fusion, producing high temperature, electrical control devices, and perhaps ion propulsion. Dr. Field will describe a variety of new methods for determining plasma properties, including some based on newly discovered plasma waves which may permit more extensive probing of the regions with micro-waves.

B. WHAT'S HAPPENING TO ENGINEERING EDUCATION

Frederick C. Lindvall, Chairman, Division of Civil, Electrical, and Mechanical Engineering, and Aeronautics.

Facets of this broad topic will include the post-Sputnik "hysteria," the growing role of research outside the university, the trend toward teams of scientists and engineers, and the shortages of competent engineers and qualified teachers. Dr. Lindvall is active in education at the national level. He will discuss the general emphasis on quality rather than quantity, and Caltech's role in particular.

C. THE HEADACHES OF THE HISTORICAL NOVELIST

J. Kent Clark, Associate Professor of English.

How does a historical novelist decide what he is going to write about? How far can he stretch the truth—what liberties can he take with historical characters and historical events? How much sex do his readers demand? How can he make the past come alive to a modern audience? These and other problems that give novelists ulcers will be discussed by Professor Clark, who has just completed a historical novel for Scribner's.

1:00-2:00 P.M.—LUNCH—Student Houses

AFTERNOON PROGRAM

The following exhibits and demonstrations will be open from 2:00-5:00 P.M. Faculty members will be present in most instances. Coffee will be served at a central location from 3:00-4:00 P.M.

Documentary Film (22 minutes) — Culbertson. "X Minus 80 Days" — Story of the "Explorer" satellite launching. Showings at 2:00, 2:30, 3:00, and 3:30 P.M.

Thin Section Laboratory — Basement (062), Arms. Sections of rocks 30 microns thick are prepared here for analysis.

Spectrographic Laboratory — First Floor (106), Mudd. Emission spectroscopy, flame photometry, X-ray diffraction and X-ray spectroscopy.

Mass Spectrometer Laboratory — Basement (03), Mudd. Equipment for isotopic analysis of both heavy and light elements.

Public Affairs Room — First floor, Dabney Humanities. Exhibits concerning world events of current interest.

High Voltage Laboratory — Classic high voltage demonstrations to be given for the last time. Scheduled for 2:00, 2:30, 3:00 and 3:30 P.M.

Electronics Laboratories — Spalding. Tour of computer lab, vacuum tube facilities, solid state lab and microwave demonstration.

Chemical Engineering Laboratory — Spalding. Laboratory tours.

Earthquake Studies — Room 310, Engineering. Instrumentation for recording and analyzing strong motion earthquakes and response of structures to ground motion.

Shock Tubes — Room 214, Engineering. High temperature gases and shock tube behavior.

Hypersonic Research Facilities — Guggenheim. Wind tunnel and Schleiren photographs with flows up to Mach 9.

Nuclear Magnetic Resonance — Room 301, Church. Spectroscopy demonstrations (20 minutes).

Organic Molecular Structure — Third floor, Church. Model display and discussion.

Shock Tube Chemistry — Room 102, Gates. Equipment exhibit and demonstration.

Solar Furnace — Roof, Astrophysics. Tours of the facility, 2:00 to 3:00 P.M.

Cosmic Rays — Room 202, Bridge. Cloud chamber demonstrations.

Synchrotron Laboratory — (formerly Optical Bldg.) Tours of the facility.

Van de Graaff Generator — 2nd floor, Kellogg. Demonstrations, scheduled for 2:00, 2:30, 3:00 and 3:30 P.M.

EVENING PROGRAM

Elks Club, 400 W. Colorado Street, Pasadena.

Dress—Informal.

Dinner hour: 6:30 P.M. (Bar opens 5:30)

After dinner:

Introductions by Ralph W. Jones, '38, General Chairman, Alumni Seminar Day.

Remarks by Dr. Lee A. DuBridge, President, California Institute of Technology.

Guest Speaker—
MR. H. ROWAN GAITHER

His Subject—
"SCIENCE AND THE NATIONAL WELFARE"

Mr. Gaither is Chairman of the Board for the Ford Foundation and Chairman of the Board for the Rand Corporation. In addition to various other interests in the fields of law and banking, he has been much in the public eye recently as Chairman of the Security Resources panel of President Eisenhower's Science Advisory Committee, which prepared the celebrated Gaither report.

CALTECH CALENDAR

Alumni Events

February 22	Dinner-Dance
April 12	Annual Seminar
June 11	Annual Meeting
June 28	Annual Picnic

Athletic Schedule

BASEBALL

March 26
San Diego Navy
at San Diego

March 28
San Diego University
at San Diego

March 29
El Toro Marines at El Toro

March 31
Caltech at Pomona

April 2
Caltech at Pomona

April 5
San Diego University
at Caltech

April 9
Whittier at Caltech

April 11
Cal Western at Caltech

April 12
Whittier at Caltech

GOLF

April 2
Pomona at Caltech

April 11
Whittier at Caltech

TENNIS

April 5
Caltech at Cal Poly

April 12
Occidental at Caltech

TRACK

April 12
Whittier at Caltech

SWIMMING

April 11
University of Arizona
at Caltech

April 12
Caltech at Santa Barbara

Friday Evening Demonstration Lectures

LECTURE HALL
201 BRIDGE, 7:30 P.M.

March 21
Granites—Their Origin and Usefulness—
by Dr. Leon Silver

April 4
Waves, Radio and Light—
by Dr. Robert S. MacMillan

April 11
Soap Films and Minimal Surfaces—
by Dr. Charles S. DePrima

April 18
Geologic Time Table—
by Dr. Gerald Wasserburg

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SECRETARY
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Meetings: Informal luncheons every Thursday
Fraternity Club, 345 Bush St., San Francisco

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University Club, 1319 "K" St., Sacramento

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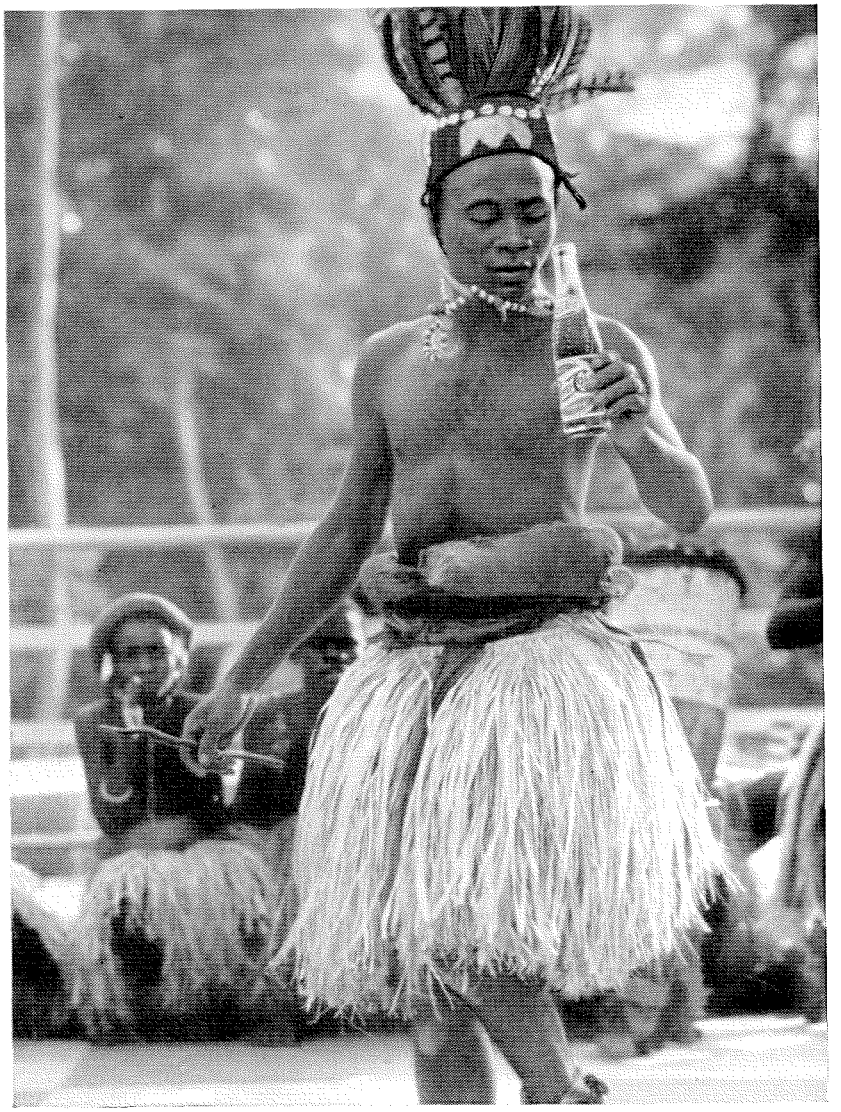
PHOTOGRAPHY AT WORK
No. 30 in a Kodak Series

Pepsi-Cola International Panorama, a magazine of places and people, reaches people around the world, builds recognition for Pepsi-Cola as a product associated with the better, happier side of life.

Photography speaks in every language



What better way to say people take naturally to "Pepsi" whether in Leopoldville or Lichtenstein?

This picture leaves no doubt that Netherlanders are neighborly.

To tell its story in 75 countries, Pepsi-Cola puts pictures to work to add meaning to the product's global billing as "the refreshment of friendship."

To build up an atmosphere of friendliness and understanding in markets around the world, Pepsi-Cola International publishes "Panorama"—and gives the brunt of the job to photography.

Photography knows no language barrier. It is clear to young and old alike—appeals to everyone. With photography, people are real; situations authentic, convincing. This is what makes photography such a powerful salesman.

Large businesses and small can use this powerful salesmanship—can also use photography to cut costs and save time in many other ways. It can help with problems of product design—can watch quality in production. It trains. It cuts office routine. You'll find that it can work for you, too.

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With photography and photographic processes becoming increasingly important in the business and industry of tomorrow, there are new and challenging opportunities at Kodak in research, engineering, electronics, design and production.

If you are looking for such an interesting opportunity, write for information about careers with Kodak. Address: Business and Technical Personnel Dept., Eastman Kodak Company, Rochester 4, N. Y.

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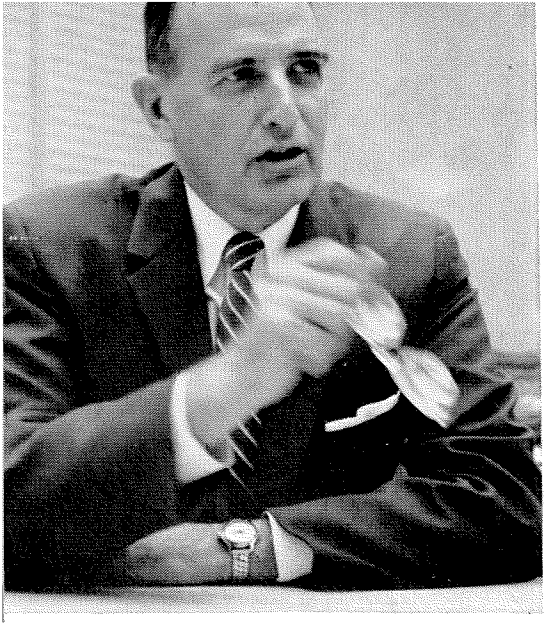

One of a series*

Interview with General Electric's W. Scott Hill Manager—Engineering Recruiting

Qualities I Look For When Recruiting Engineers

Q. Mr. Hill, what can I do to get the most out of my job interviews?

A. You know, we have the same question. I would recommend that you have some information on what the company does and why you believe you have a contribution to make. Looking over company information in your placement office is helpful. Have in mind some of the things you would like to ask and try to anticipate questions that may refer to your specific interests.

Q. What information do you try to get during your interviews?

A. This is where we must fill in between the lines of the personnel forms. I try to find out why particular study programs have been followed, in order to learn basic motivations. I also try to find particular abilities in fields of science, or mathematics, or alternatively in the more practical courses, since these might not be apparent from personnel records. Throughout the interview we try to judge clarity of thinking since this also gives us some indication of ability and ultimate progress. One good way to judge a person, I find, is to ask myself: Would he be easy to work with and would I like to have him as my close associate?

Q. What part do first impressions play in your evaluation of people?

A. I think we all form a first impression when we meet anyone. Therefore, if a generally neat appearance is presented, I think it helps. It would indicate that you considered this important to yourself and had some pride in the way the interviewer might size you up.

Q. With only academic training as a background, how long will it be before I'll be handling responsible work?

A. Not long at all. If a man joins a training program, or is placed directly on an operating job, he gets assignments which let him work up to more responsible jobs. We are hiring people with definite consideration for their potential in either technical work or the management field, but their initial jobs will be important and responsible.

Q. How will the fact that I've had to work hard in my engineering studies, with no time for a lot of outside activities, affect my employment possibilities?

A. You're concerned, I'd guess, with all the talk of the quest for "well-rounded men." We do look for this characteristic, but being president of the student council isn't the only indication of this trait. Through talking with your professors, for example, we can determine who takes the active role in group projects and gets along well with other students in the class. This can be equally important in our judgment.

Q. How important are high scholastic grades in your decision to hire a man?

A. At G.E. we must have men who are technically competent. Your grades give us a pretty good indication of this and are also a measure of the way you have applied yourself. When we find someone whose grades are lower than might be expected from his other characteristics, we look into it to find out if there are circumstances which may have contributed.

Q. What consideration do you give work experience gained prior to graduation?

A. Often a man with summer work experience in his chosen academic field has a much better idea of what he wants to do. This helps us decide where he would be most likely to succeed or where he should start his career. Many students have had to work hard during college or summers, to support themselves. These men obviously have a motivating desire to become engineers that we find highly desirable.

Q. Do you feel that a man must know exactly what he wants to do when he is being interviewed?

A. No, I don't. It is helpful if he has thought enough about his interests to be able to discuss some general directions he is considering. For example, he might know whether he wants product engineering work, or the marketing of technical products, or the engineering associated with manufacturing. On G-E training programs, rotating assignments are designed to help men find out more about their true interests before they make their final choice.

Q. How do military commitments affect your recruiting?

A. Many young men today have military commitments when they graduate. We feel it is to their advantage and ours to accept employment after graduation and then fulfill their obligations. *We have a limited number of copies of a Department of Defense booklet describing, in detail, the many ways in which the latter can be done. Just write to Engineering Personnel, Bldg. 36, 5th Floor, General Electric Company, Schenectady 5, N. Y.* 959-8

***LOOK FOR other interviews discussing: • Advancement in Large Companies • Salary • Personal Development.**

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