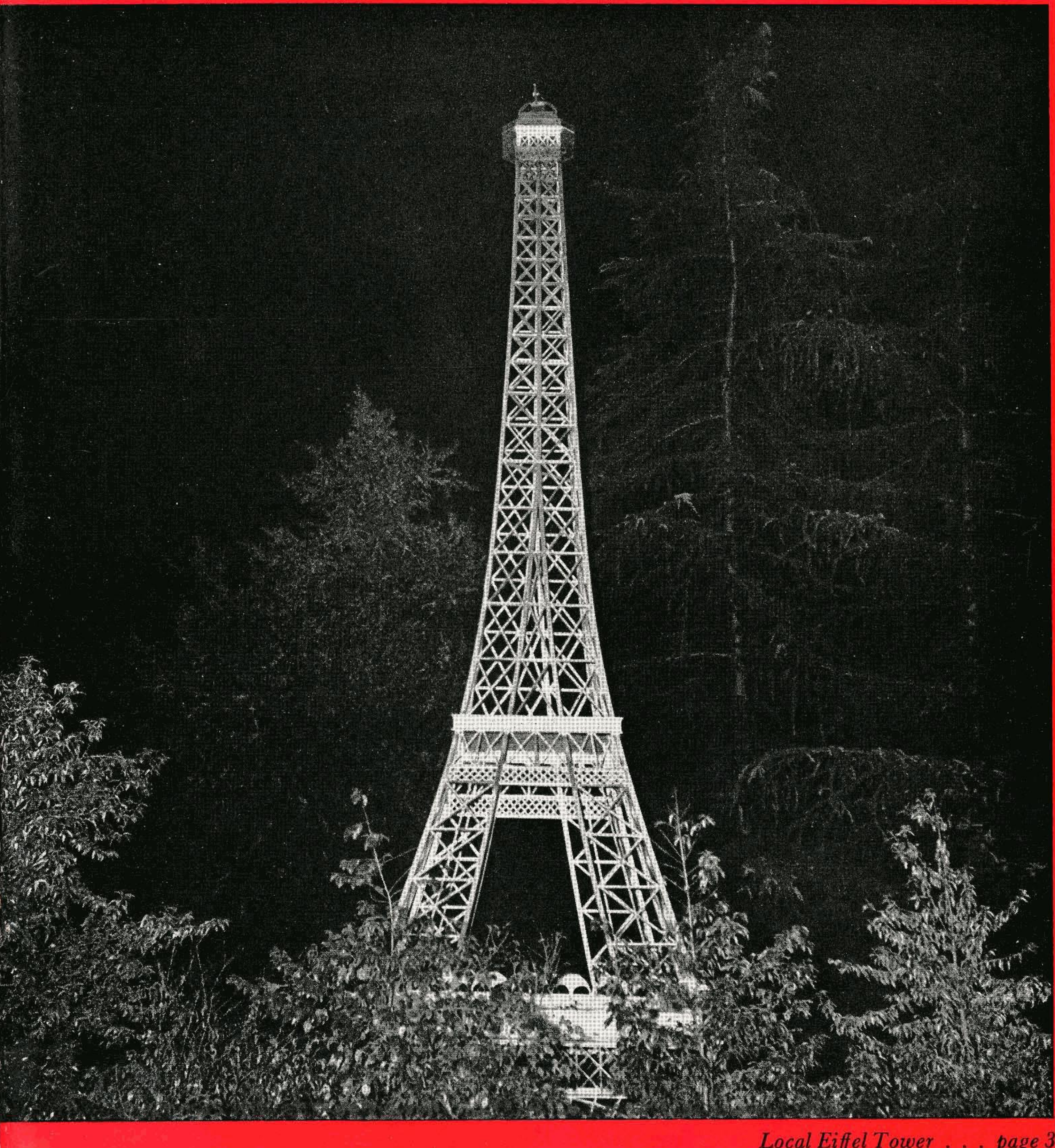
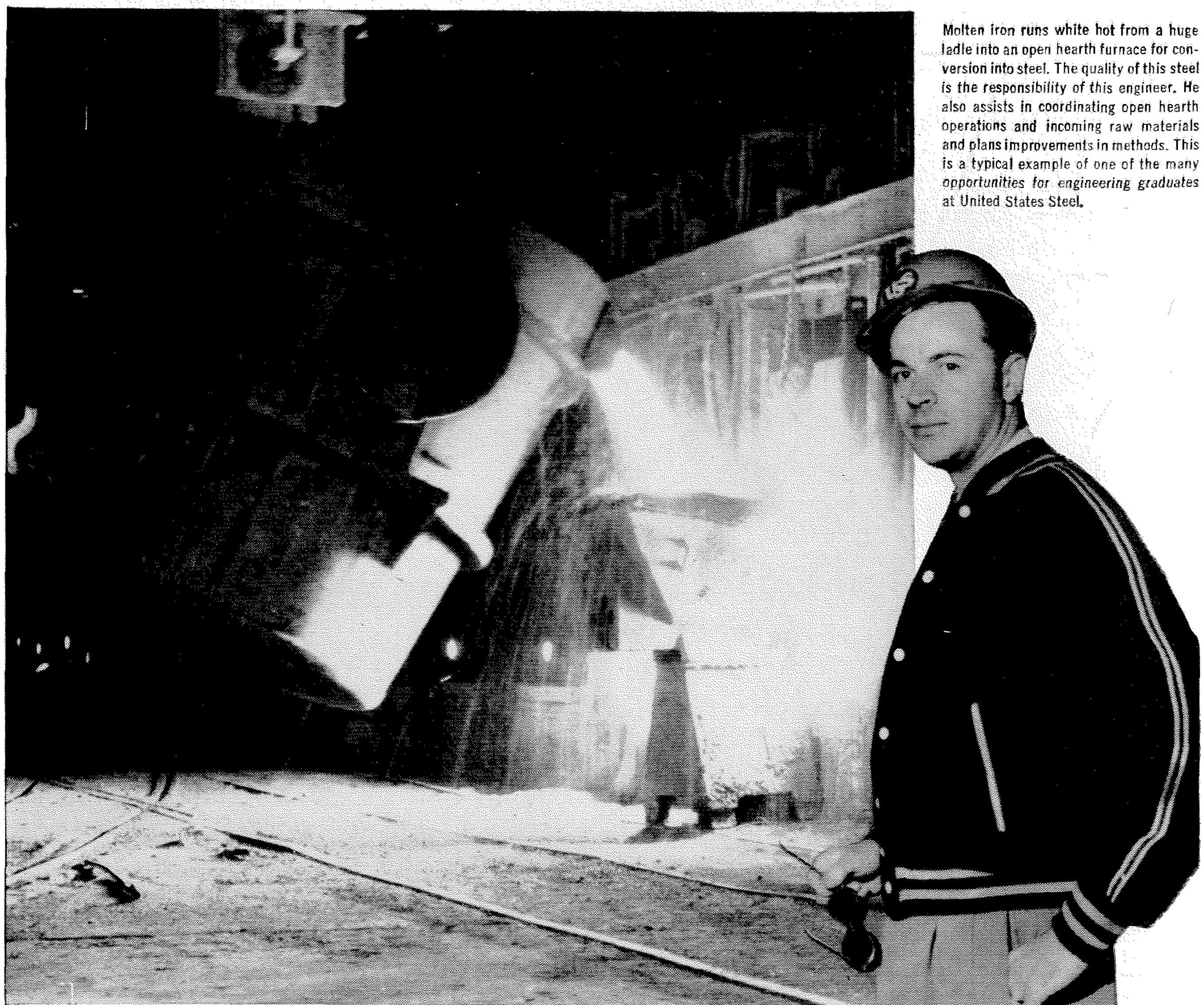
ENGINEERING AND SCIENCE

DECEMBER/1957



Local Eiffel Tower . . . page 3

PUBLISHED AT THE CALIFORNIA INSTITUTE OF TECHNOLOGY



Molten iron runs white hot from a huge ladle into an open hearth furnace for conversion into steel. The quality of this steel is the responsibility of this engineer. He also assists in coordinating open hearth operations and incoming raw materials and plans improvements in methods. This is a typical example of one of the many *opportunities for engineering graduates* at United States Steel.

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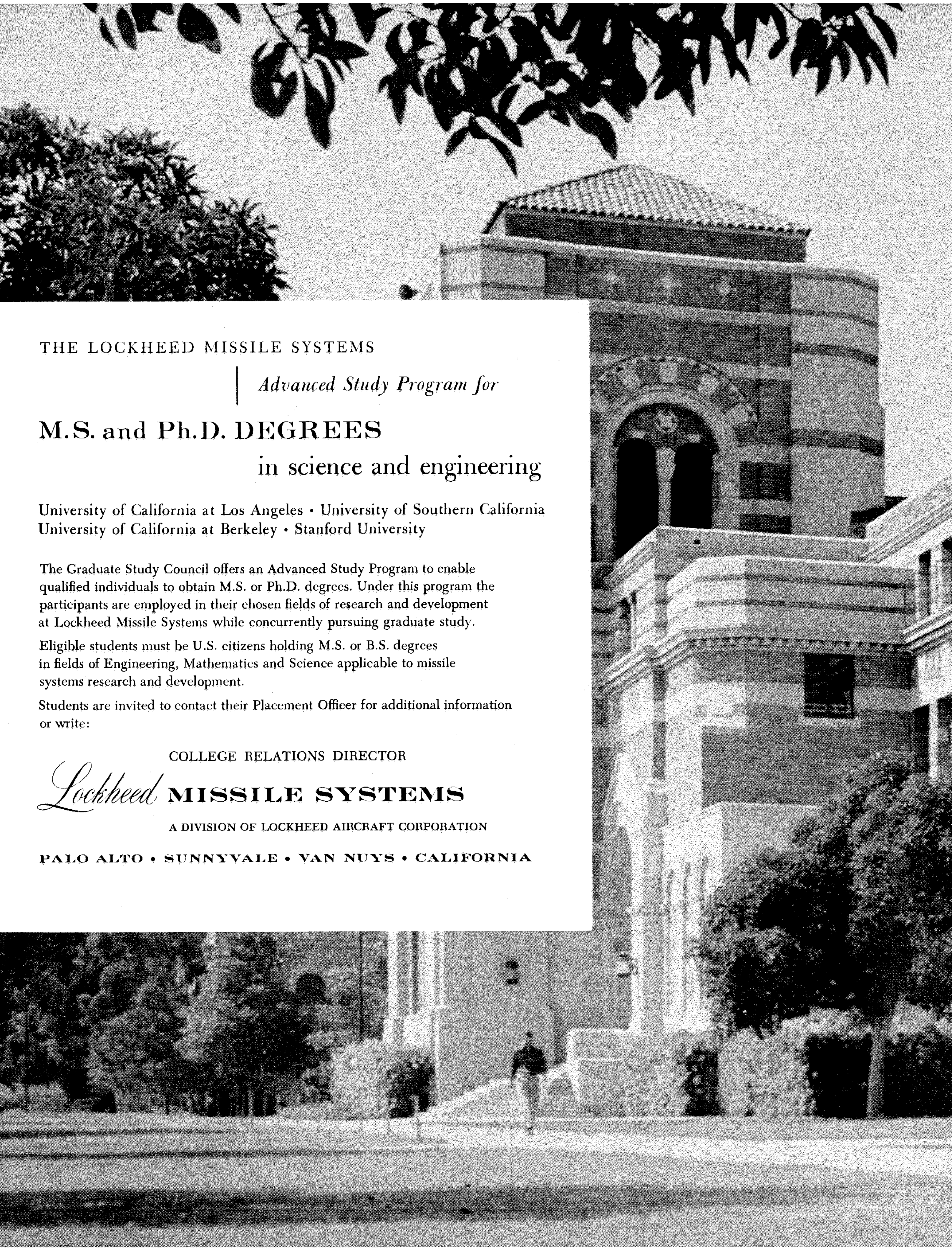
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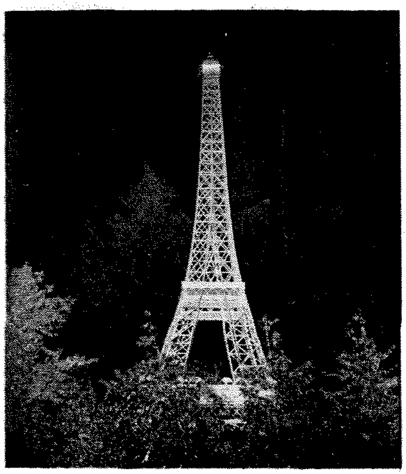
ENGINEERING AND SCIENCE

IN THIS ISSUE



ON OUR COVER this month is the Throop Club Eiffel Tower, built for this year's Interhouse Dance. The tower stayed up, a graceful addition to the campus, until it was finally sold this month to the Moulin Rouge nightclub in Hollywood.

The silver tower was 36 ft. high (and would have been even higher if the Pasadena Building Department didn't have a height limit for this area). It took about 600 man-hours of labor, cost $350, and was built to scale—from an old *Life* photograph.

The Eiffel Tower was the most memorable thing about the Interhouse Dance this fall, and there is another view of it on page 39—where you will find pictures of some of the other memorable student events of the First Term, 1957-58.

"AN AMERICAN GENETICIST in the USSR," on page 27 of this issue, has been adapted from a Friday Evening Demonstration Lecture given by Norman H. Horowitz, professor of biology, on November 1.

PICTURE CREDITS

Cover	ASCIT Photo
p. 19	Elton Sewell, Independent Star-News
pps. 20-26	Harvey
p. 27	Norman H. Horowitz
p. 38	ASCIT Photos
p. 39	Bill Bartos Elton Sewell ASCIT Photos

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PUBLISHED AT THE CALIFORNIA INSTITUTE OF TECHNOLOGY

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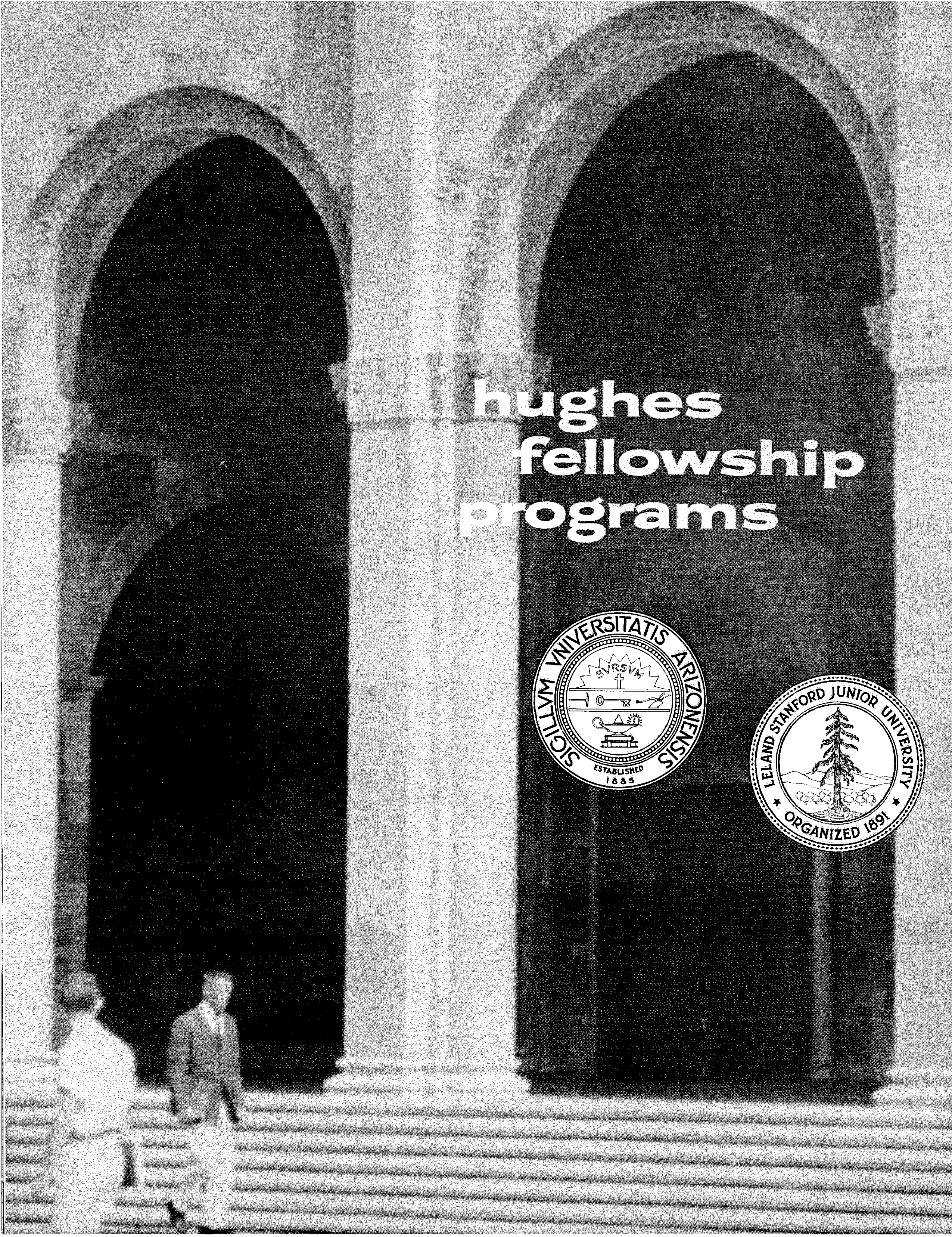
hughes fellowship programs



BOOKS

AIR POLLUTION HANDBOOK

Edited by Paul L. Magill,
Francis R. Holden, and
Charles Ackley

McGraw-Hill, N. Y. $15

Reviewed by A. J. Haagen-Smit
Professor of Bio-organic Chemistry

THIS HANDBOOK discusses different phases of air pollution in 15 separate sections. The engineering and control sections contain a review of sources of emission, processes and equipment for control, sampling and test methods, and legal aspects of air pollution. The more research-minded can find in the chapters devoted to chemistry, physics and meteorology a useful guide to the literature. The objectionable features of air pollution are described in the sections on epidemiology, animals, plants, and visibility. The last section consists of a table of conversion factors badly needed in a field dominated by grains, barrels, and mesalliances of decimal and duodecimal systems.

Diverse disciplines

It is a difficult task for the editors to assemble a group of papers from such widely diverse disciplines in one book and still keep a balanced treatment of the many aspects of air pollution. Faced with such a problem, contributors should be aware of why a book like this is bought, and by whom. The air pollution scientist is hardly expected to turn to a general compilation of a handbook to learn about his specialty.

Prospective readers

I believe that a book of this kind is most useful to workers in areas where no extensive library is available. Especially useful to them would be detailed descriptions of a number of key air pollution methods which can be followed in the laboratory or in the field.

Following this reasoning, we come to the conclusion that the engineer-

CONTINUED ON PAGE 12

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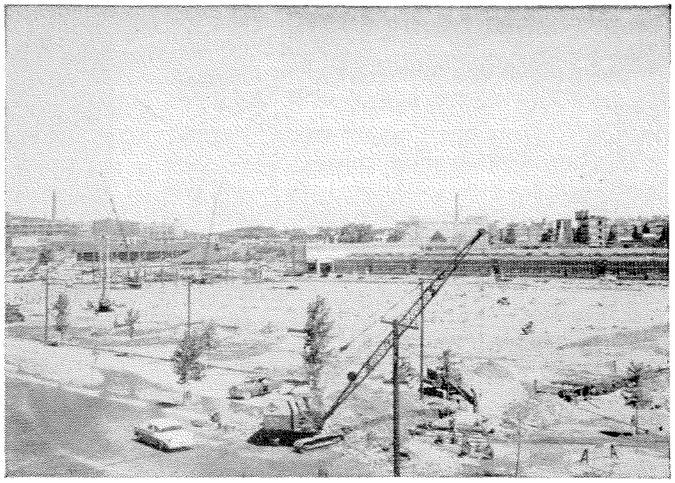
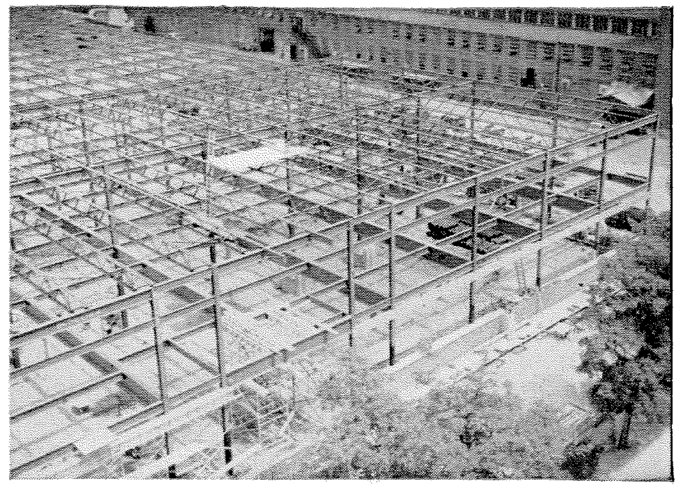
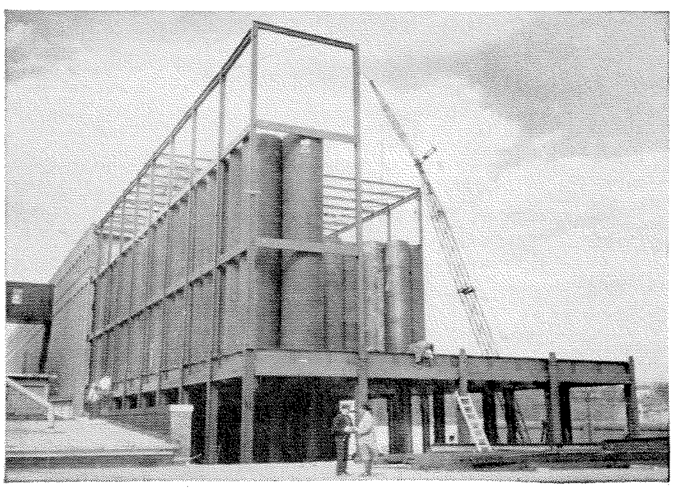


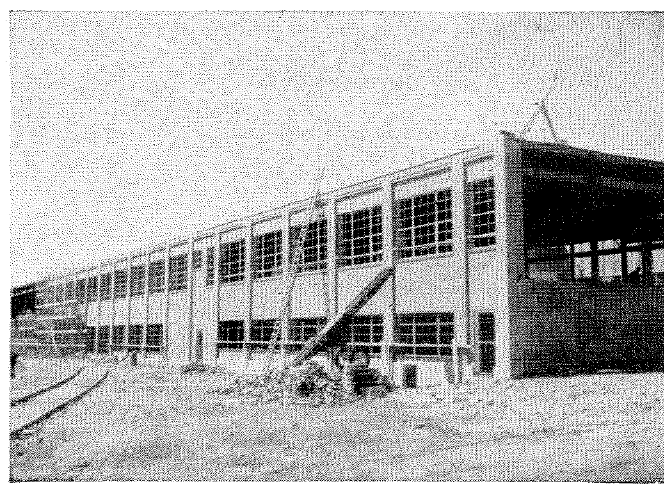
Preparing the Ground for a New Norton Grinding Wheel Plant, No. 8



Going Up — the Steel Structure for the New Engineering and Service Building



Building More Space for Abrasive Storage



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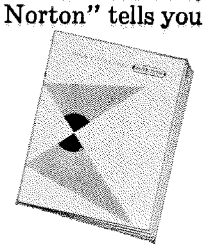

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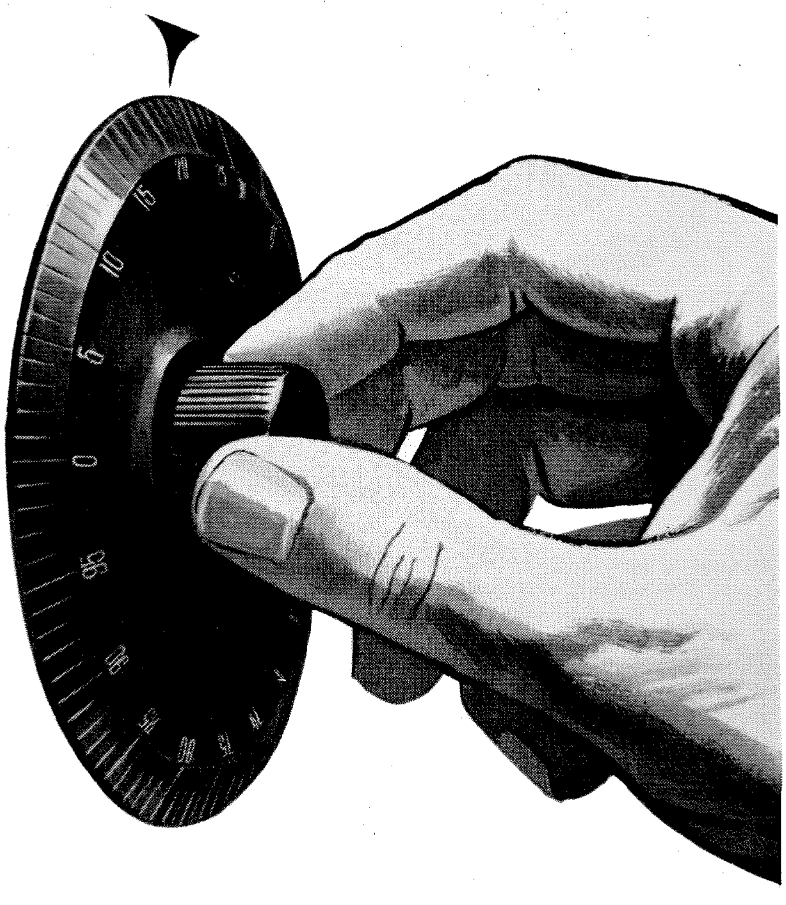

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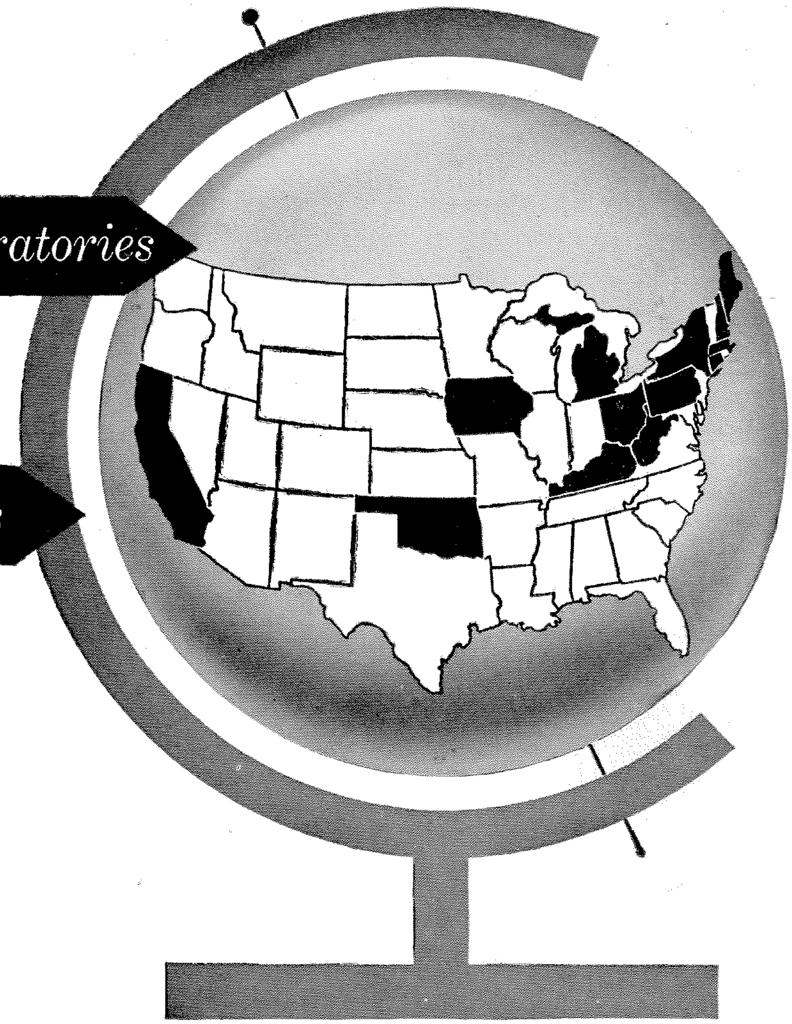

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ing or control side could have received more than the 106 pages, or one-sixth of the total, and that theoretical matters discussed—especially the sections on physics and chemistry of the atmosphere—could have been cut by reference to the available literature. For example, the chapter on chemistry goes to great length to show the importance of oxides of nitrogen in modern air pollution. The information about the testing procedures in the analytical section is so meager that most readers may even remember that much from their college days.

Dealing with specialists

However, in general the editors have done a commendable job, and where they sometimes failed, they deserve more of our sympathy than criticism in dealing with some 35 specialist contributors.

THE BLUE CHIPS
by Jay Deiss
Simon & Schuster $4.50

THE BLUE CHIPS is a novel about big business, and it comes fully equipped with all the stock items we have come to expect in this kind of book. One difference this time is that the man in the gray flannel suit is a scientist—Dr. Howell Winslow, a brilliant young researcher with the great pharmaceutical firm of Faber-King.

Dr. Winslow is the very model of a modern scientist. He has "lean, strong hands" and "the muscular discipline of a one-time practiced athlete." He has "careless blond hair," and "eager, idealistic, broadly-placed gray eyes," along with a "small, straight nose" and a "determined mouth (which was nevertheless unsure)."

The unsure, determined mouth is the tip-off on Dr. Winslow. Will he pursue his "inner dream" and stick with scientific research, or will he take the administrative opportunity that is offered him and go out after the big money?

Dr. Winslow's choice might be of more concern to the reader if the doctor—and most of the other characters in the book—were human beings, instead of carbon copies of other fictional characters.

In the course of telling the story of Dr. Winslow's downfall, *The Blue Chips* dispenses a good deal of factual information about both the laboratory and the financial operations of a big pharmaceutical corporation—and this has a certain documentary interest. But *The Blue Chips* is far from being that good novel about science that so many people keep waiting for.

"They all agree..."

"Since the day we decided to get married, I've been doing a lot of thinking about our future. It's time I made a choice on a career. I've talked to the Dean of Engineering, most of my professors, and to some of the fellows who have graduated, and you know, they all said the same thing.

"They all agree that the aircraft and missile industry holds the best opportunities and the brightest future for an engineer these days. What they said makes sense, too, because developments in this field today really give a fellow an opportunity to make important contributions on vital projects.

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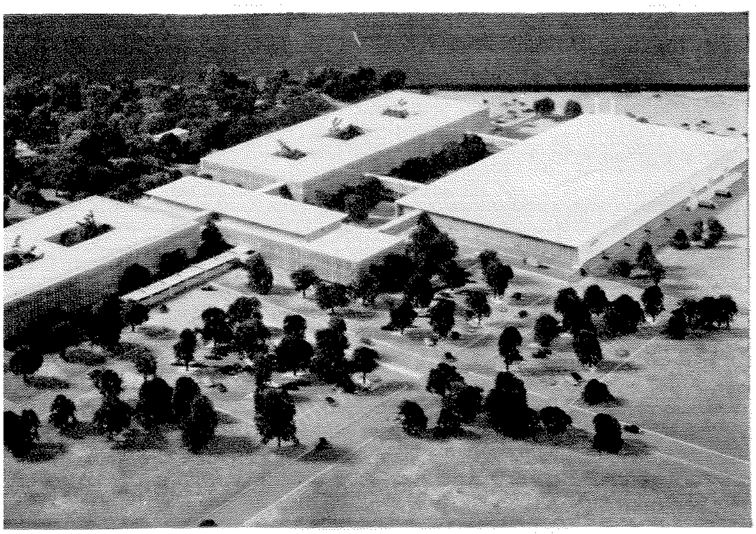
Dr. Arne Wikstrom



Pictured above is our new Research and Development Center now under construction in Wilmington, Massachusetts. Scheduled for completion in early 1958, this ultramodern laboratory will house the scientific and technical staff of the Avco Research and Advanced Development Division.

A SCIENTIST-ENGINEER SPEAKS ABOUT AVCO

MORE AND MORE it is being appreciated that no sharp borderline between science and engineering should exist. These two fields must strongly overlap to bring into being the fullest creativity of both.

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

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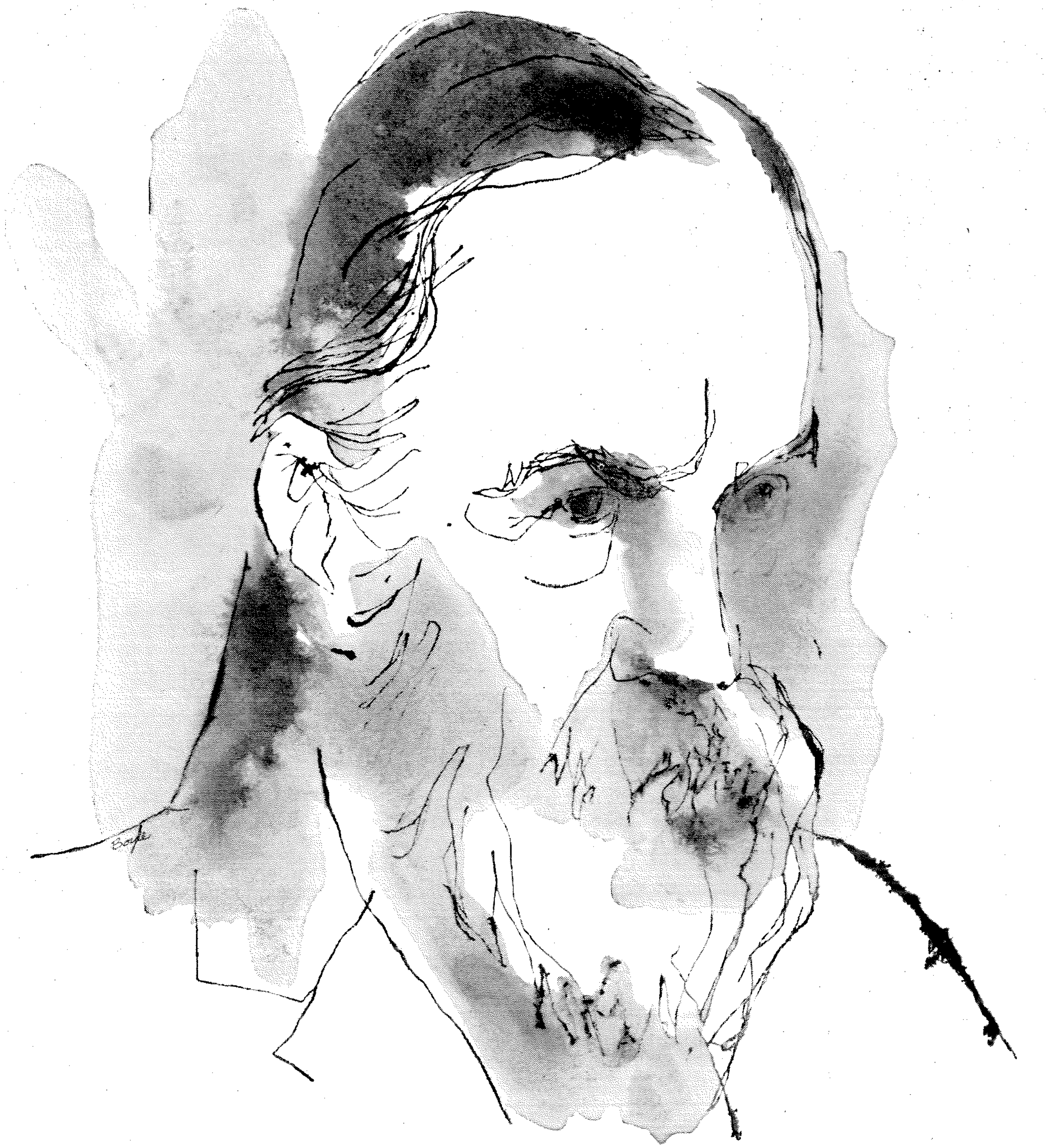


SATELLITES

Let's face up to the obvious fact that the Russians are ahead of us. So what do we do about it?

by W. H. Pickering

THE SATELLITE PROGRAM has, of course, had a tremendous amount of publicity in the last few months, and has become a significant factor in politics, not only in this country, but in international politics as well.

Let me summarize some of the facts about the IGY satellite projects. Early in 1955 the International IGY group, the CSAGI (Comité Spécial de L'Année Géophysique Internationale) committee, recommended to the various national committees that a satellite project would be of scientific value as a part of the IGY.

In the summer of 1955 the President of the United States announced that this country would accept the challenge and fly a satellite during the IGY period. A few weeks later the Russians announced that they would also establish a satellite program.

In the United States, the President announced that the program would be established with the assistance of the Department of Defense and also with the assistance of the U.S. National Committee for the IGY. The Department of Defense was given the task of providing the vehicle for the satellite, the proving ground for firing the rocket, and support for the observing stations.

The U.S. National Committee was given the responsibility of deciding on the scientific experiments to go in the satellite, and of seeing that the experiments were built and ready to fly in the satellite. The Department of Defense, in turn, assigned the Naval Research Laboratory the overall responsibility of the so-called Vanguard project; they were to build the vehicle, accept the scientific experiments from the U.S. National Committee, and fly these experiments with the help of various other agencies in the Department of Defense.

(As far as the Russian program is concerned, I am afraid that we don't know much about how it is organized. We had some more or less casual conversation with the Russian delegates to the International Astronautical Federation in Barcelona in October, and at that time the Russians merely emphasized that their scientific program was integrated with their rocket program so as to make a sensible overall program.)

At various international meetings of the IGY groups, the U.S. and U.S.S.R. described the scientific experiments they proposed to do—and ended up with the same general classes of experiments. The U.S. provided some more information about its general program; the U.S.S.R. was rather vague about the details of its rocketry—and, in fact, of its program in general. In speaking with some Russians about this vagueness, I heard the comment that, in Russia, they don't feel you should talk about a complex experiment until you've got it under your belt. They took this stand on the details of the satellite experiment.

"Satellites" has been adapted from a talk given by Dr. Pickering at Caltech's YMCA Forum on November 20, 1957.

The CSAGI requested both countries to provide the expected firing dates for the satellite program, because observing stations all over the world would want to be ready for observations. But neither the U.S. nor U.S.S.R. ever provided any dates to the CSAGI.

This brings us to the fall of this year, when the Russians put up two satellites. These satellites—to reiterate what we all know—were fired on October 4 and November 2, from a point somewhere around the Caspian Sea, and in a general northeasterly direction. They established orbits about 65 degrees inclined to the equator. These orbits were of such a nature that all parts of the world lying between 65 degrees latitude north and 65 degrees latitude south at some time or other would be passed over by the orbit. Therefore, people living between these latitudes—essentially all of the civilized world—have a chance to observe or listen to the satellites at some time or other.

A series of Sputniks

Right after the firing of the first Russian satellite, Professor A. A. Blagonravov (who was a U.S.S.R. delegate of the CSAGI Conference on Rockets and Satellites in Washington, D.C., at the time) stated that there were two satellites ready to go. The two which have been fired are presumably these two. However, the Russians expect to fire a series during the IGY period, so we can look for Sputniks from time to time during the next year. Professor Blagonravov said that they would be more or less evenly spaced during the IGY period but would contain different experiments and would be different sizes and shapes.

Of the two objects which have been fired already, the Russians stated that the first was a satellite which was separated from its final-stage rocket and which weighed about 180 pounds. The second object was apparently left attached to its final-stage rocket, and its weight was given at about 1,100 pounds. It is probable that both satellites used the same final-stage rocket; the difference between them is just the matter of separating the instrument compartment in one case and leaving it attached in the other.

The U.S. has gone through a lot of self-examination since the Russian satellites were fired. The President has stated that the U.S. would attempt to fly a small satellite in December and the Vanguard satellite in March. The Army has been asked to modify its Jupiter-C research vehicle to launch a satellite in a manner first proposed by the Army in its "Project Orbitor" design in 1955. The Army has stated that this satellite will be launched sometime after the first of the year.

Like the Vanguard project, the Army program relies on the cooperation of several agencies. The two principal agencies are the Army Ballistic Missile Agency at Huntsville, Alabama, and the Caltech Jet Propulsion Laboratory in Pasadena. The Army Ballistic Missile Agency is responsible for the construction and launching of the first, or booster, stage.

The final stage is a single solid-propellant rocket approximately six inches in diameter and four feet long. To the front end of this rocket is attached the payload which has the shape of a cylinder with a conical nose. The final satellite object will consist of the empty rocket, weighing about 10 pounds, attached to the payload which weighs about 20 pounds.

The scientific package consists of the cosmic ray experiment package developed by the State University of Iowa for the earth satellite program. Adaptation of this design to fit the Army launching vehicle is being carried out at the Jet Propulsion Laboratory.

There has been a great deal of speculation of one sort or another as to what all of this satellite activity means. I think the first thing that we have to agree on is the significance of the Russian success in getting these two objects up. First of all, it probably implies that they were able to do this with two shots out of two. Of course, we don't know this for sure, but they stated ahead of time that there were two objects ready, and there are two up there. We can therefore conclude that the Russians are well advanced in the technology of large rockets.

Furthermore, I would conclude that the Russians are well advanced in the guidance of large rockets, because if you are going to put up an object into an orbit, you don't just go up there and throw it; you have to throw it in the right direction. And throwing in the right direction requires a very precise guidance system.

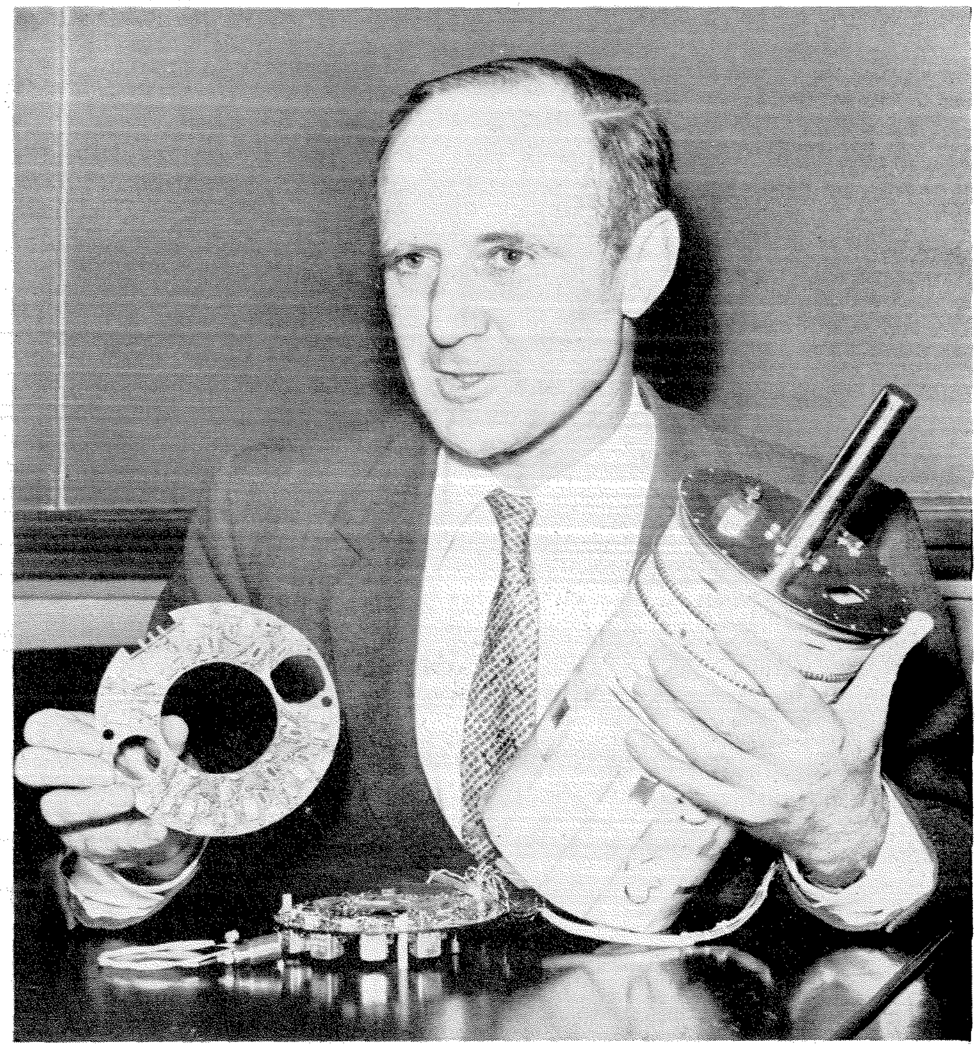
So, the Russians have obviously solved the problem of firing large rockets and of guiding large rockets. As far as their weapon technology is concerned, they are well ahead of us, because we have not demonstrated any comparable competence in this country.

I will also make the point that this accomplishment should dispel any remaining doubts in the minds of people in this country that the Russians are a bunch of peasants. The Russians have advanced technological and scientific personnel to draw upon for this kind of program, and there is no doubt whatever about it.

Could we have done any better?

Of course, we ask ourselves: Could we have done any better in this country? Could we have had a satellite up there? One hears all sorts of speculations, but some things stand out—for example, that the U.S. satellite program was proceeding at a rate that might not have been as rapid as one would have liked, but neverthless was (and is) capable of meeting its objective: to get up at least one satellite in the IGY period which extends through 1958.

One can question the wisdom of just letting the program amble along at this rate, and of course one can ask: Was it really ambling along—or was it doing the best it could? We know that the Vanguard program has cost increasing amounts of money as time went on, so the total funds now authorized for the program are something over $100,000,000. With this finding, it is not fair to say that the program is ambling along; if it hasn't



W. H. Pickering, director of Caltech's Jet Propulsion Laboratory, holding a prototype of the cosmic ray instrumentation package to be flown in the Army satellite which is being built jointly by the Jet Propulsion Laboratory and the Army Ballistic Missile Agency.

succeeded in getting satellites up yet, it would appear to mean that the wrong decision was made when the program was started.

This program was started with the decision to build a special Vanguard rocket. The technology of large rockets is a complicated thing, but, of course, the Naval Research Laboratory has had a lot of experience; it has built the Viking, which is a successful research rocket. Nevertheless, I think one must ask: Was it right to start two years ago to build what was essentially a new rocket? Or should one have gone to some of the military programs and said: Is there, anywhere in the military program, a rocket or potential rocket which could be used in this situation?

I think one can also comment that it is pretty obvious that very few people in this country had any appreciation of the political significance of the Russian satellite. I am sure that there were people who wanted the U.S. to have a satellite up there first. On the face of it, however, it does not appear that the people who are in a position to make decisions had a real appreciation of the significance of this accomplishment.

I think we have to remember that the proposed U.S. satellite program was never as ambitious as the Russian one. We are talking about a satellite that weighs 20 pounds, while the Russians had an instrument compartment of more than 150 pounds. So, this means that the Russian rocket which was used for launching their satellite must obviously be considerably larger than the rockets being proposed for the Vanguard, or, for that matter, for the Army satellite program which will likewise launch a 20-pound satellite.

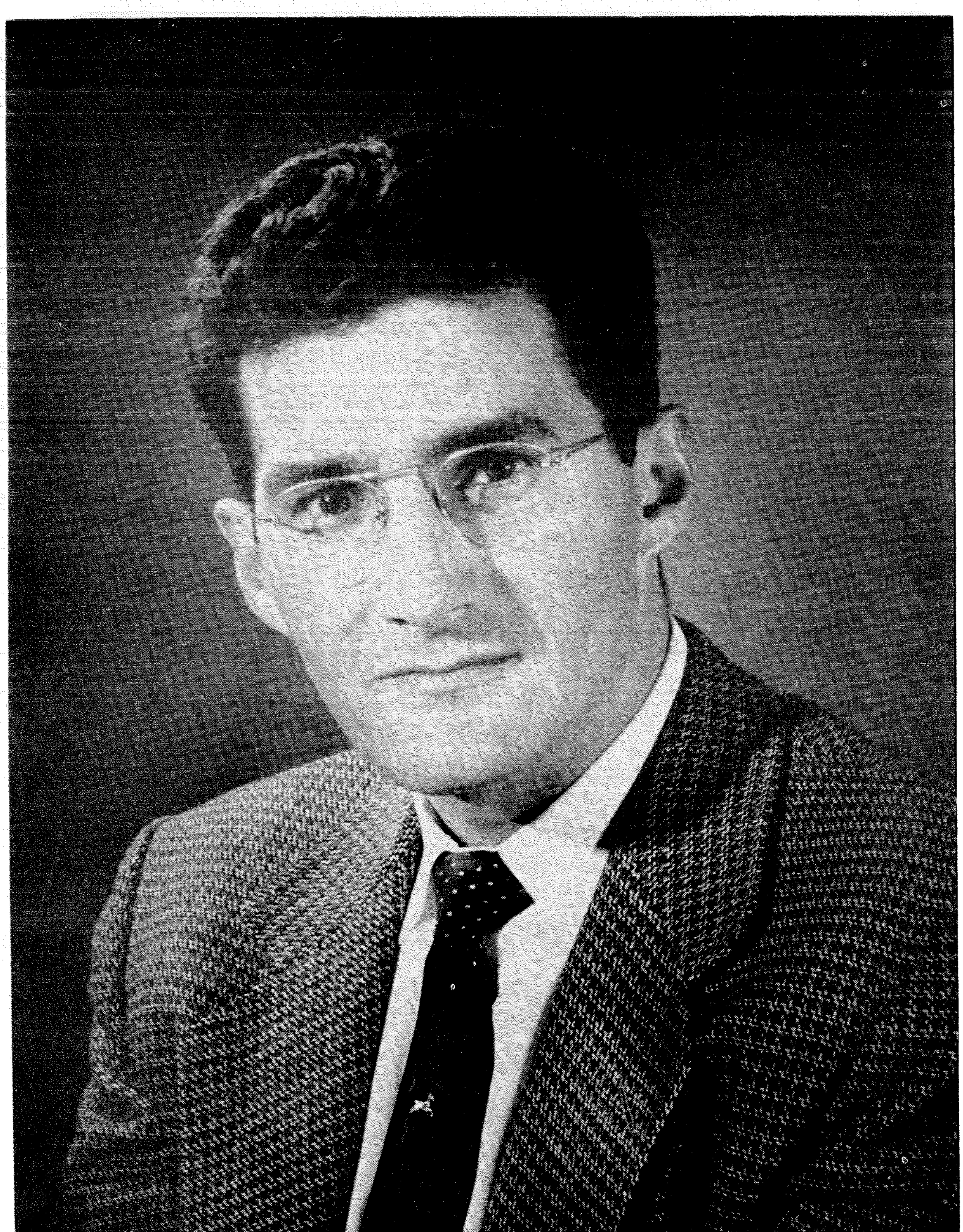
It seems to me that what we have seen in recent weeks in this country is rather a sorry spectacle. There has been a lot of criticism of the missile programs, of the inter-service rivalry, of the various political factors which have affected technical decisions. But, are we getting out of the mess, or are we getting into it even worse?

There seems to be an unwillingness to face up to the obvious fact that the Russians are ahead of us. Let's admit this. They *are* ahead of us, so what do we do about it? What we need is strong leadership, good engineering, good management. We are not asking for a lot of scientific break-throughs. We are asking for good management and good engineering on programs which already exist and are slowly coming to fruition. We must demand an end of the petty inter-service squabbling which seems to be still going on, and an end to the petty politics which, even now, still seems to be plaguing the entire missile program.

III. A Portfolio of Faculty Portraits

by Harvey

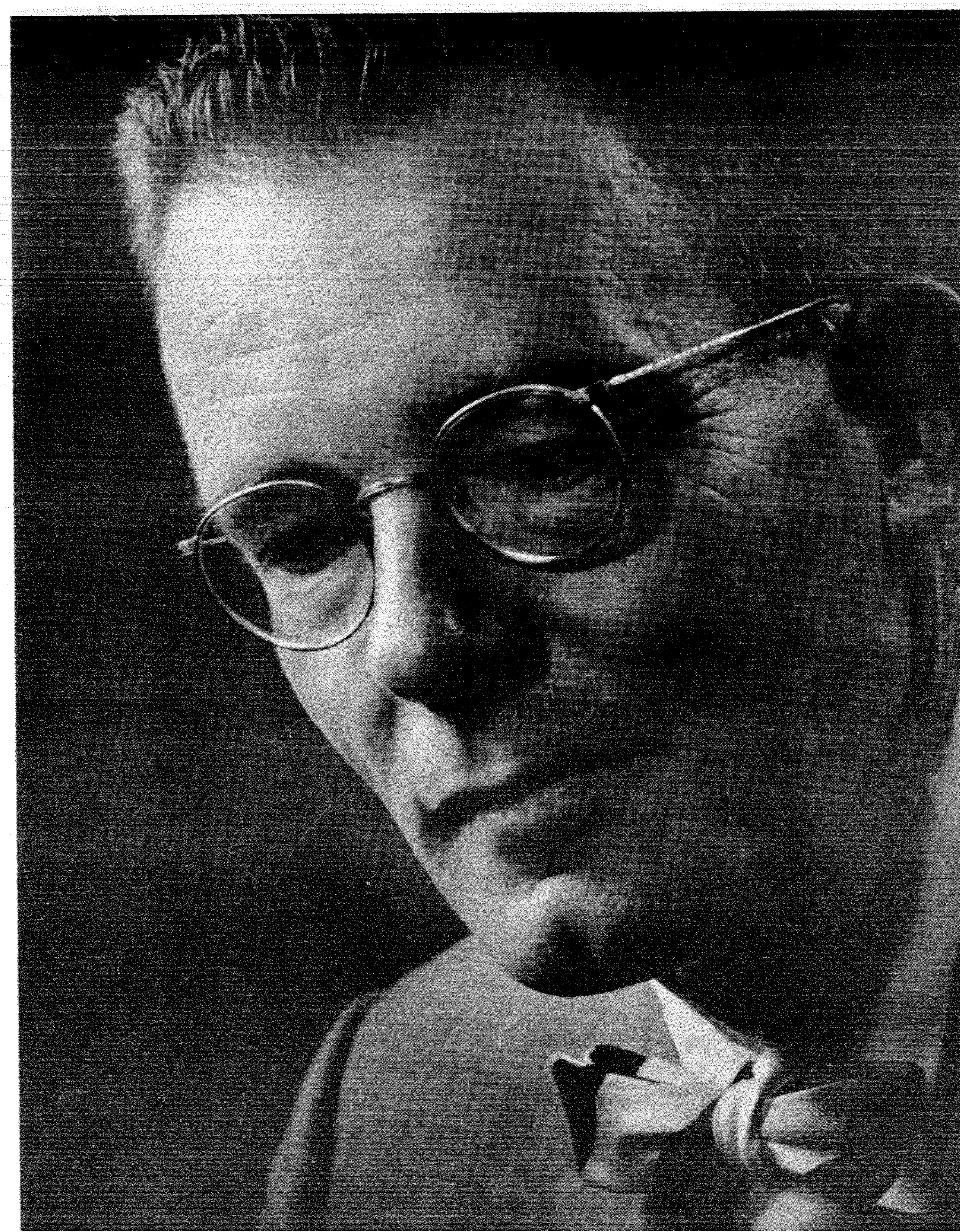
Earnest C. Watson, professor of physics and dean of the faculty.

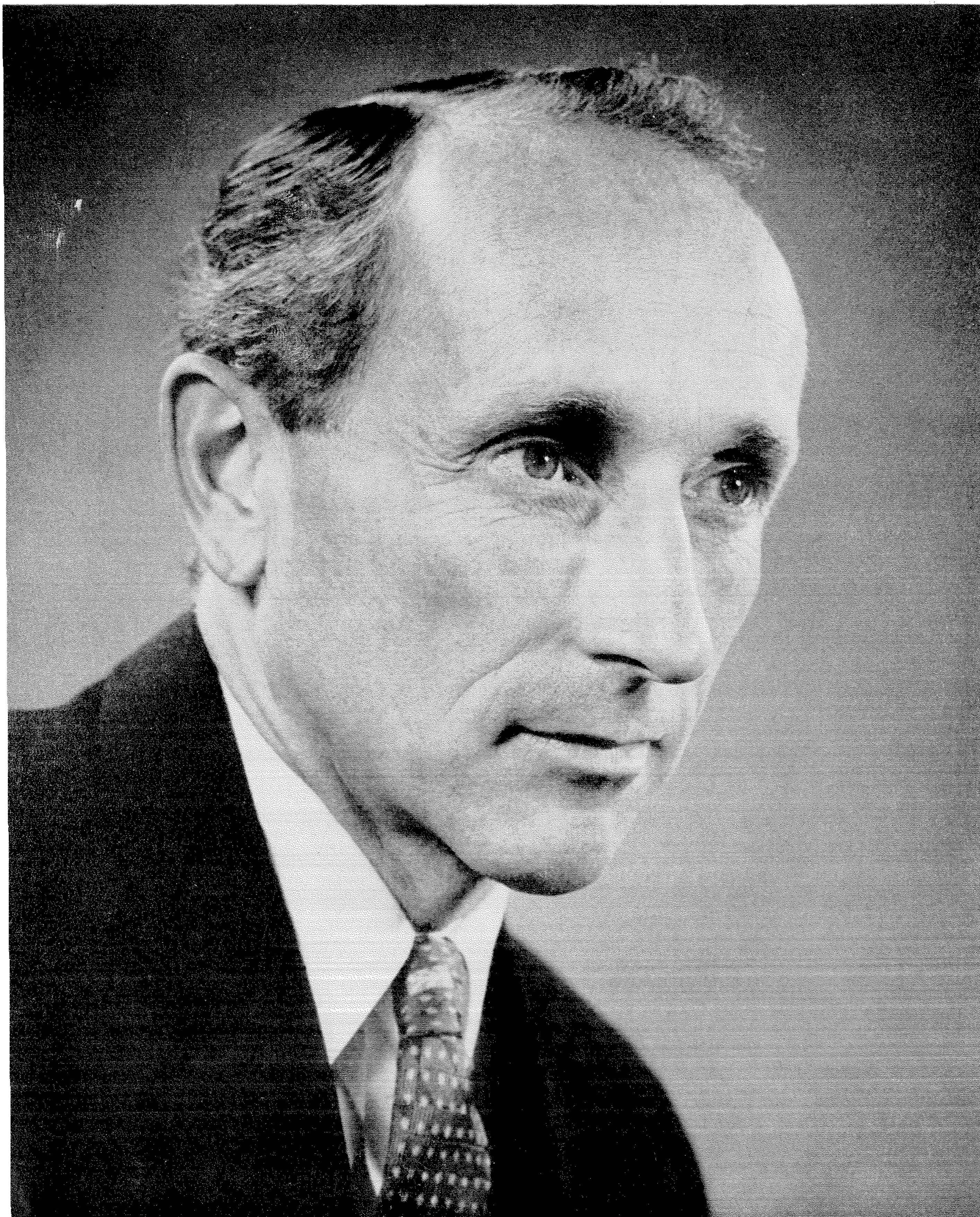


Tom Apostol, associate professor of mathematics

John Bolton, senior research fellow in physics and astronomy

James Bonner, professor of biology

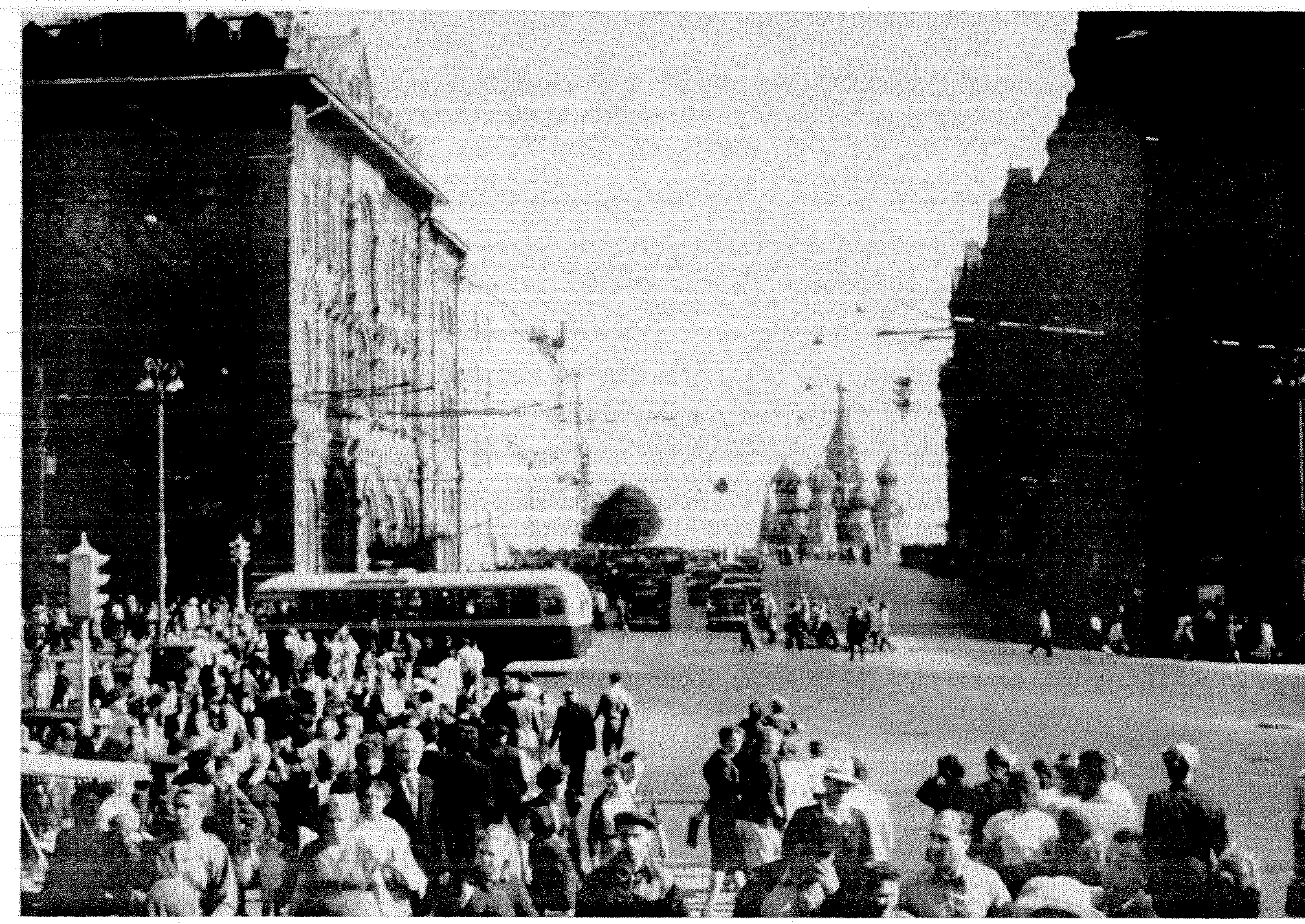




John Weir, associate professor of psychology

Donald S. Clark, professor of mechanical engineering

Carl Anderson, professor of physics



Moscow street scene at quitting time. During working hours, streets are almost deserted.

An American Geneticist in the USSR

by Norman H. Horowitz

LAST AUGUST I had the opportunity, along with eight other Americans, to visit the Soviet Union as a guest of the Academy of Sciences of the USSR. The occasion of this visit was a symposium on the origin of life, organized by the Russian Academy. The meeting was sponsored by the International Union of Biochemistry, of which the American Society of Biological Chemists is a member organization.

Perhaps related to the fact that our State Department is currently interested in furthering cultural exchanges with the Russians, the National Science Foundation granted a sum of money for the travel of American participants to the conference. After we arrived in Moscow we were guests of the Academy, with all of our expenses paid. The Russians were most generous hosts, and the friendliness of the Russian people was evident wherever we went. I spent 10 days there—7 days in Moscow and 3 in Leningrad—and even the souvenirs I bought and the long distance call I made to my wife from Leningrad were paid for by the Academy.

One reason I was interested in going to the Soviet Union was to find out what I could about the status of genetics there. Genetics is my special field of interest, and genetics has been under fire in Russia for some time. Starting in the middle thirties, there began a series of more or less officially sponsored attacks on the science of genetics. In particular, the chromosomal theory of heredity, the backbone of genetics, was attacked. This theory is associated with the names of such men as Mendel, who made the first basic discoveries in genetics, and T. H. Morgan, who founded the biology department at Caltech. Morgan's students are still teaching at the Institute—Prof. Alfred H. Sturtevant, for example—so we have more than a casual interest in the fate of the chromosome theory.

Genetics was criticized in public meetings in Russia in the thirties as being a foreign "bourgeois" science, and it was also criticized for being "objective." Its critics invented a sort of native kind of biology that had Marxian roots and was "subjective."

The man who emerged as the leader of this movement was one T. D. Lysenko, an agriculturist who had made a reputation in practical farming. He knew little or nothing about the science of genetics. This was revealed quite clearly in his speeches and in his writings. In place of what he termed "Western genetics," he recommended the adoption of "Michurinism." Michurin was a well-known Russian plant breeder, like our Burbank, who apparently held unscientific views about heredity.

Michurinism, as outlined by Lysenko, is a form of Lamarckism. Lamarck was a French biologist of the 18th century who proposed as the underlying mechanism of evolution the theory that characteristics which the organism acquires in its lifetime are transmitted directly to its offspring. Now, this is a plausible view; if one wants to explain how evolution takes place, then this idea is almost the first one that springs to mind. It is an appealing notion, it is simple, and at one time it was very respectable. Darwin, for example, was a Lamarckian. The only thing wrong with Lamarckism is that no convincing evidence has ever been found in its favor. Modern genetics provides no mechanism by means of which the heredity of a plant or animal can be changed in an adaptive or a directed way by use or disuse, or by crude changes in the environment.

As an example of the sort of evidence that Lysenko put forward for this idea, I can cite his claim to have changed a species of wheat with 28 chromosomes into one with 42 chromosomes by the simple expedient of planting it in the autumn instead of the spring. This result is so unlikely as to immediately raise doubts as to the genetic purity of Lysenko's starting material.

It is not generally realized that a number of careful attempts to confirm Lysenko's results have been made in laboratories in Western Europe and in America. Little or nothing has come of these.

The climax of the Lysenkoist movement in the Soviet Union came in 1948 at a meeting of the Lenin Academy of Agricultural Sciences, where Lysenko made a full-scale attack on genetics. The Mendelian position was defended by various Soviet geneticists (and there were some very good ones in the Soviet Union) but Lysenko then revealed that his views had the approval of the Central Committee of the Communist Party—and this ended the meeting.

The shocking thing about this to Western scientists was not so much the views that Lysenko espoused; we have plenty of ignorance in our own country, and it is not hard to find people who ought to know better supporting views which are scientifically unsupportable. I have heard of teachers of science in high school, for example, who don't accept evolution. The shocking thing was that Lysenko's view was adopted as the official point of view by the government. Eventually, appropriate action was taken—consisting, among other things, of the dismissal of geneticists from their posts and the abolition of the teaching of genetics in Russian schools.

During the past year there have been suggestions in the press that Lysenko has lost favor, and that genetics is coming back in the USSR. I was interested in finding out whether or not this is true. I can sum up my impressions by saying that the state of genetics in the Soviet Union is still not good, although it is not so bad as it was six or seven years ago. Lysenko is still director of the Institute of Genetics of the Academy of Sciences in Moscow. The chair of genetics in the University of Moscow is still vacant. On the other hand, the workers in Lysenko's institute (I did not meet Lysenko himself) now accept the basic facts of Mendelian genetics, and they use Mendelian terminology and concepts in their papers and discussions. But they deny the exceptional importance of these concepts; they believe that

Three participants in the international symposium in Moscow: Prof. M. Florkin of Liege, Belgium, president of the International Union of Biochemistry; H. C. Yin (who got his PhD at Caltech in 1937), director of the Institute of Plant Physiology of the Academia Sinica, Shanghai; and Norman Horowitz, Caltech professor of biology.

A Campus-to-Career Case History

"The future looks unlimited"

"I wanted a career that offered variety, opportunity and a chance to work with people," says Lewis William Post, C.E., Michigan State, 1950. "So I chose the telephone company.

"My *initial training—two full years of it—* probed every phase of company operations and acquainted me with all of the jobs in the Plant Department, where I was starting.

"Today, as Plant Engineer, I'm responsible for preventive maintenance of all field equipment, installation of new facilities for wire and cable, and I work with architects and builders on telephone needs in new buildings.

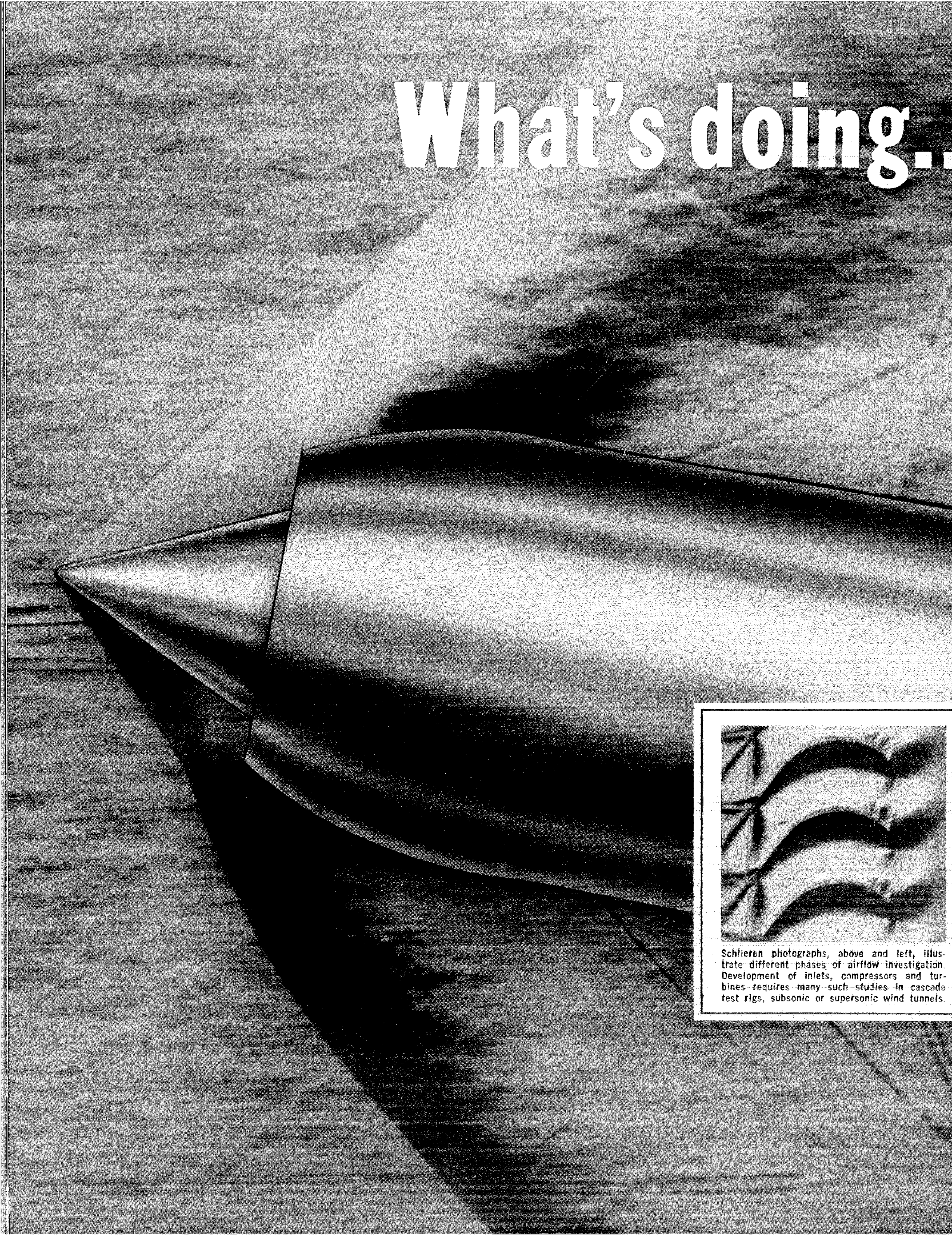
"Selling's part of my job, too. I sell ideas —like the wisdom of planning for telephone service when you're building. Recently I advised an architect and an owner on telephone wiring and outlets in a new $160,000 medical center. I enjoy getting in on the ground floor of such projects and making contributions both as a civil and a telephone engineer.

"In my area of Chicago there are 80,000 telephones, home and business. More are being added every day. There's expansion everywhere in the telephone business—all across the country. To me, the future looks unlimited."

Lew Post's career is with Illinois Bell Telephone Company. Many interesting career opportunities exist in other Bell Telephone Companies, Bell Telephone Laboratories, Western Electric and Sandia Corporation. Your placement officer can give you more information about them.

Bell Telephone System

What's doing...



Schlieren photographs, above and left, illustrate different phases of airflow investigation. Development of inlets, compressors and turbines requires many such studies in cascade test rigs, subsonic or supersonic wind tunnels.

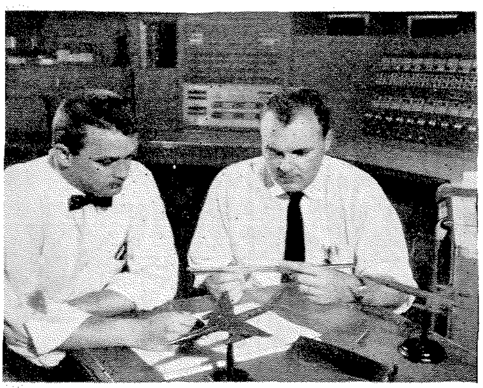
. . at Pratt & Whitney Aircraft in the field of Aerodynamics

Although each successive chapter in the history of aircraft engines has assigned new and greater importance to the problems of aerodynamics, perhaps the most significant developments came with the dawn of the jet age. Today, aerodynamics is one of the primary factors influencing design and performance of an aircraft powerplant. It follows, then, that Pratt & Whitney Aircraft — world's foremost designer and builder of aircraft engines — is as active in the broad field of aerodynamics as any such company *could* be.

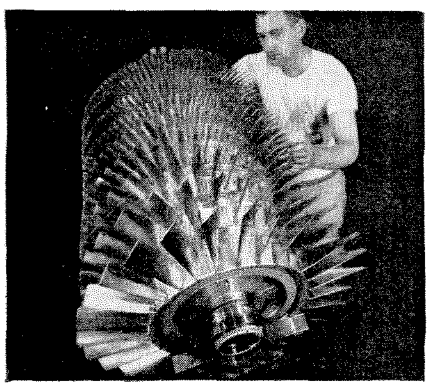
Although the work is demanding, by its very nature it offers virtually unlimited opportunity for the aerodynamicist at P & W A. He deals with airflow conditions in the engine inlet, compressor, burner, turbine and afterburner. From both the theoretical and applied viewpoints, he is engrossed in the problems of perfect, viscous and compressible flow. Problems concerning boundary layers, diffusion, transonic flow, shock waves, jet and wake phenomena, airfoil theory, flutter and stall propagation — all must be attacked through profound theoretical and detailed experimental processes. Adding further to the challenge and complexity of these assignments at P & W A is this fact: the engines developed must ultimately perform in varieties of aircraft ranging from supersonic fighters to intercontinental bombers and transports, functioning throughout a wide range of operational conditions for each type.

Moreover, since every aircraft is literally designed around a powerplant, the aerodynamicist must continually project his thinking in such a way as to anticipate the timely application of tomorrow's engines to tomorrow's airframes. At his service are one of industry's foremost computing laboratories and the finest experimental facilities.

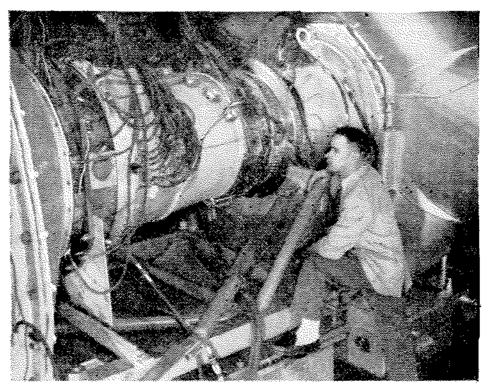
Aerodynamics, of course, is only one part of a broadly diversified engineering program at Pratt & Whitney Aircraft. That program — with other far-reaching activities in the fields of instrumentation, combustion, materials problems and mechanical design — spells out a gratifying future for many of today's engineering students.



dern electronic computers accelerate both the analy- and the solution of aerodynamic problems. Some of se problems include studies of airplane performance ich permit evaluation of engine-to-airframe applications.



Design of a multi-stage, axial-flow compressor involves some of the most complex problems in the entire field of aerodynamics. The work of aerodynamicists ultimately determines those aspects of blade and total rotor design that are crucial.



Mounting a compressor in a special high-altitude test chamber in P & W A's Willgoos Turbine Laboratory permits study of a variety of performance problems that may be encountered during later development stages.

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

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there is much more to heredity in plants and animals than is compassed by classical genetic theory, and they are attempting to prove this.

In principle, one cannot object to this attitude; certainly there are large areas of uncertainty in our knowledge of heredity phenomena, and it would be rash indeed to think that there are no surprises left in this field.

Some workers in Lysenko's institute are beginning to identify their findings with a phenomenon that has been recognized in bacteria since 1928—namely, genetic transformation. It is possible to change the heredity of certain bacteria in a directed way by exposing them to the nucleic acid obtained from bacteria of a different strain. Nucleic acid is the material that constitutes the genes; it can be dissolved out of the bacterial cell by chemical extraction. When intact bacterial cells of the same species are exposed to this material they can take it up and incorporate it into their own genetic makeup. In this way, they come to resemble the donor strain in various hereditary characteristics.

It is conceivable that even in higher organisms it may be possible to effect transformations. Several people, including some at Caltech, have attempted to bring about transformations of higher animals by methods analogous to that described above. So far, this has not been successful; the only successes have been in bacteria. But, in principle, we have no reason at the present time to think that this cannot be done if the right conditions are found. The Russians think they may have accomplished transformations in birds, but these claims are being made by the same group of people who just a few years ago were making nonsensical statements about genetics. For this reason, they will have to be confirmed in other laboratories before they are accepted.

From genetics to atoms

With regard to the geneticists who lost their jobs when Lysenko came to power, I learned that some of them are back at work in laboratories of radio-biology, presumably studying the genetic effects of high-energy radiations. I got the impression that these geneticists are welcome to work in nuclear research laboratories. They do not work in the Institute of Genetics. Unfortunately, none of those I would have liked to see were in Moscow at the time of the conference.

It thus appears possible that genetics may be able to gain a foothold in the Soviet Union again. This will require the resumption of teaching of modern genetics in the universities, even more than it requires the resumption of research. Soviet biology is already so far behind in this respect that it will be difficult for it to catch up.

An amusing incident that occurred at the meeting was the arrival of a cablegram from India, which said, "This is to inform you that living matter has just been synthesized in our laboratory. Best wishes for the success of the symposium."

Everybody in the audience realized that this was a joke except the newspaper reporters. One of the news service men sent the story out, and it was published in the United States. The next day, all of the other American reporters in Moscow were being chewed out by their editors for not having sent the story.

On later occasions I had a chance to talk to these reporters, and I was astonished to discover that none of those I met spoke Russian. One of the important impressions I gained on this trip is that the Russians have a tremendous advantage over us; they know our language, but we don't know theirs. Most of the Russian scientists at the meeting spoke English fluently, and read English scientific papers with ease. Even the children on the street in Moscow and Leningrad often speak English fluently. They learn it in school, starting in the fifth grade, and by the time they are 13 or 14 years old many of them speak English very well. Not only do we not teach Russian very much in this country, but even the reporters we send to Russia apparently get the news through translators.

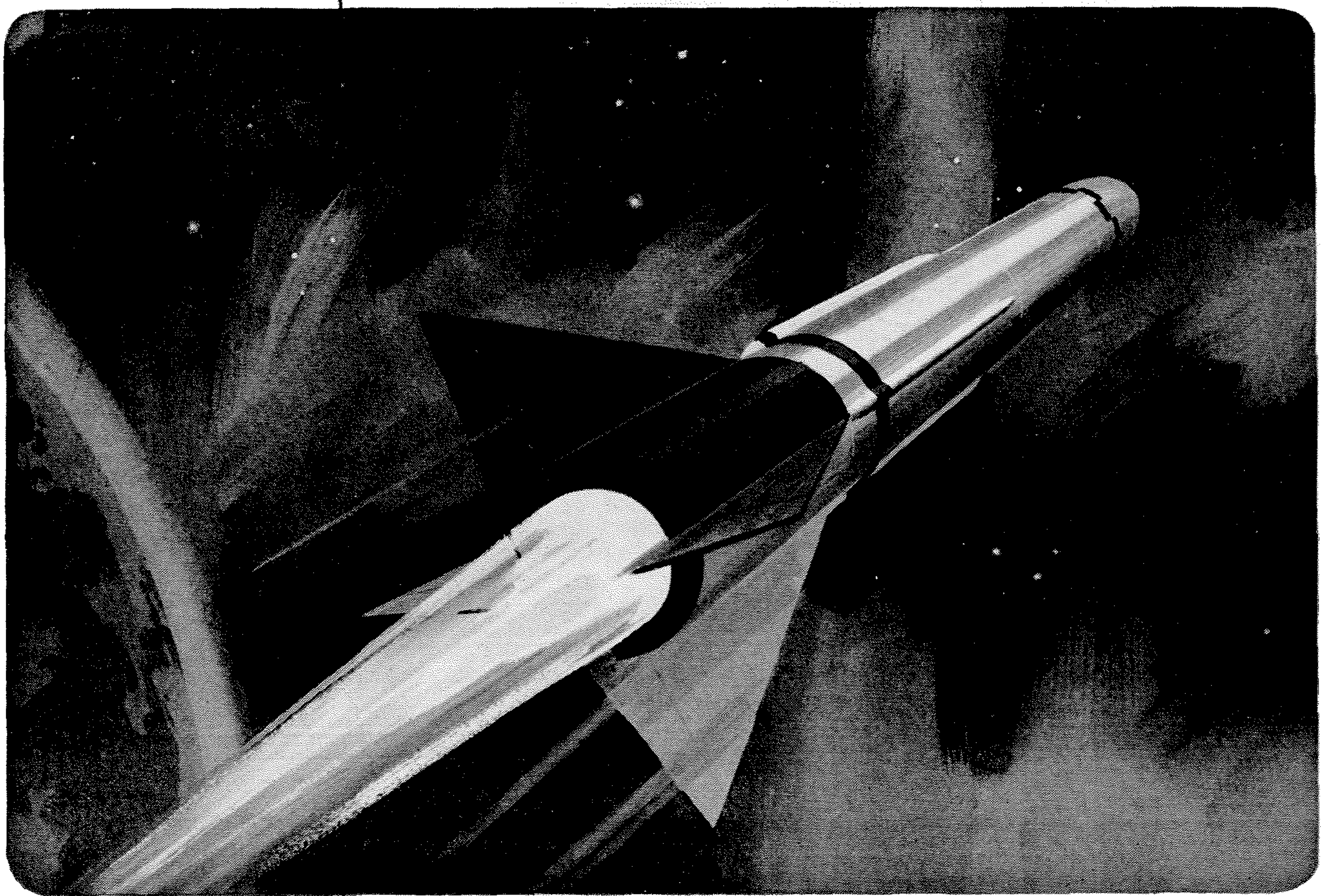
Our friends in Russia

The night before I left Leningrad I went outside the hotel, and there were a few boys waiting around on the sidewalk. One of them stepped up and asked, "Do you speak English?" "Yes," I said, "I certainly do." It turned out that he was 13 years old, was studying English in school, and had heard there were foreigners in town. He wanted to know what I was doing in the Soviet Union and where I came from.

I happened to have a folder of pictures of Pasadena in my pocket that I had bought at the Los Angeles airport just before leaving. I took it out and showed him what Pasadena looked like. By this time a number of boys had gathered around, and he circulated through the crowd and showed them the pictures of Pasadena.

When he came back and handed me the folder I told him he could keep it. He put it inside his shirt and said, "I want to give you a coin." I thought he was trying to give me money, because I had discovered that you can't out-gift a Russian: if you give him something, he immediately gives you something back. I started to refuse, but one of the interpreters came up and said, "You ought to take that; it is an interesting coin." So I did; it was a 50-kopeck piece that hasn't been minted for some time.

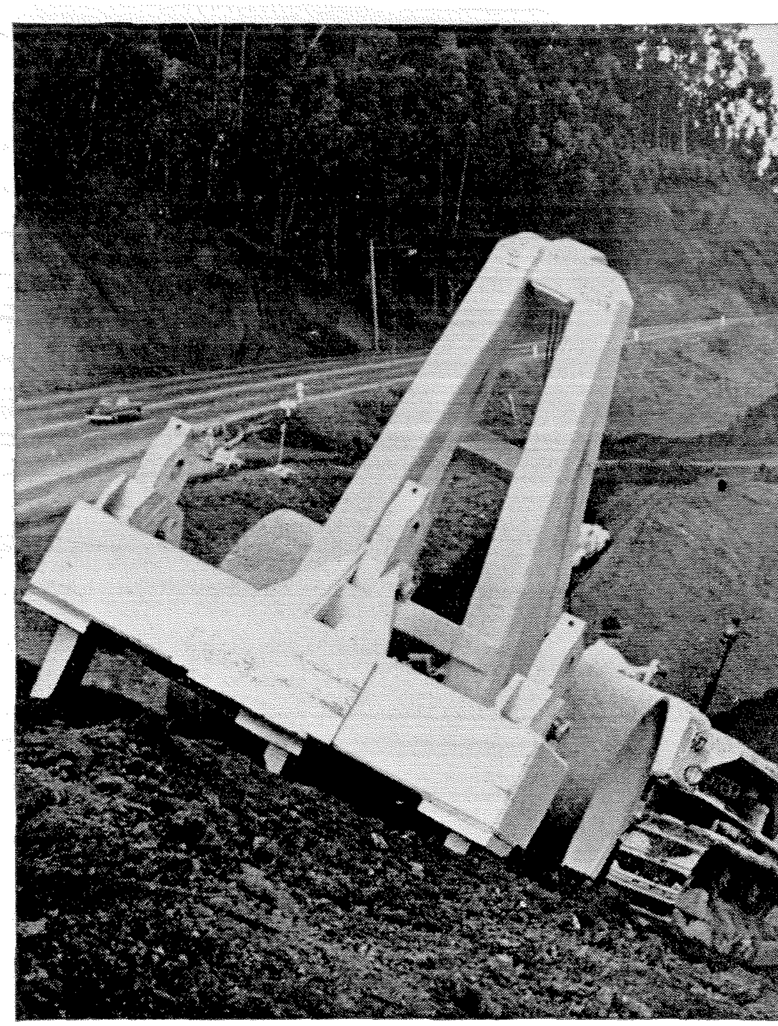
The next day I was leaving for the airport to go to Helsinki. The cab was late, and I was dashing out of the hotel when one of the boys from the night before stepped up to me and handed me a postcard. I didn't get a chance to look at it until I got into the taxi. It was a flowery-looking Russian greeting card. I turned it over to see what was on the other side, and he had written a message on it, in English. It said, MAY OUR FRIENDSHIP PROSPER!

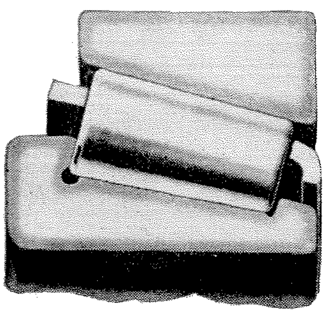


Tear out this page for **YOUR BEARING NOTEBOOK . . .**

How to keep the world's biggest ripper ripping

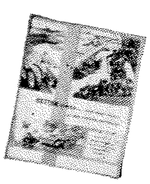
The machine at right does a job that dynamite used to. Weighing 17½ tons, it's the world's biggest ripper. In designing this monster, engineers faced a load problem. The axles of the steel drum wheels had to take tremendous shock loads as the machine ripped five foot furrows in solid rock strata. And they had to take the heavy radial and thrust loads of cross-country travel. To handle *all* the loads, the engineers mounted the wheels on Timken® tapered roller bearings.





Slice a Timken bearing in half and see why it takes shock loads

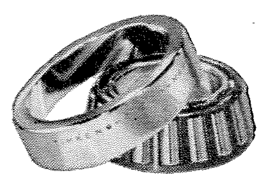
We case carburize Timken bearing races and rollers to make them hard on the outside to resist wear, tough on the inside to resist shock. And the taper lets Timken bearings take radial and thrust loads in any combination.



Want to learn more about job opportunities?

Timken bearings make better machines. Better machines enrich our lives, give us more spare time. It's what the Timken Company calls Better-ness. If you'd like to know more about Better-ness and what it can mean to you, write for: "Better-ness and your career at the Timken Company". The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN TAPERED ROLLER BEARINGS



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

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

THE MONTH AT CALTECH

Health Center

CALTECH'S Archibald Young Health Center has its official opening on December 15. Located at 1239 Arden Road, the $200,000 unit is adjacent to Tournament Park, and just south of Arden House, the residence of the Master of Student Houses.

The T-shaped building is residential in character to blend in with the surrounding architecture. One section contains two four-bed wards and two isolation wards; another section contains two doctors' offices, a psychiatrist's office, three treatment rooms, and x-ray, physiotherapy and waiting rooms. There is also a convalescent room, a lounge and a kitchen.

Named in honor of the late Archibald Young, Pasadena attorney and philanthropist, the new building is a gift from Mrs. Young.

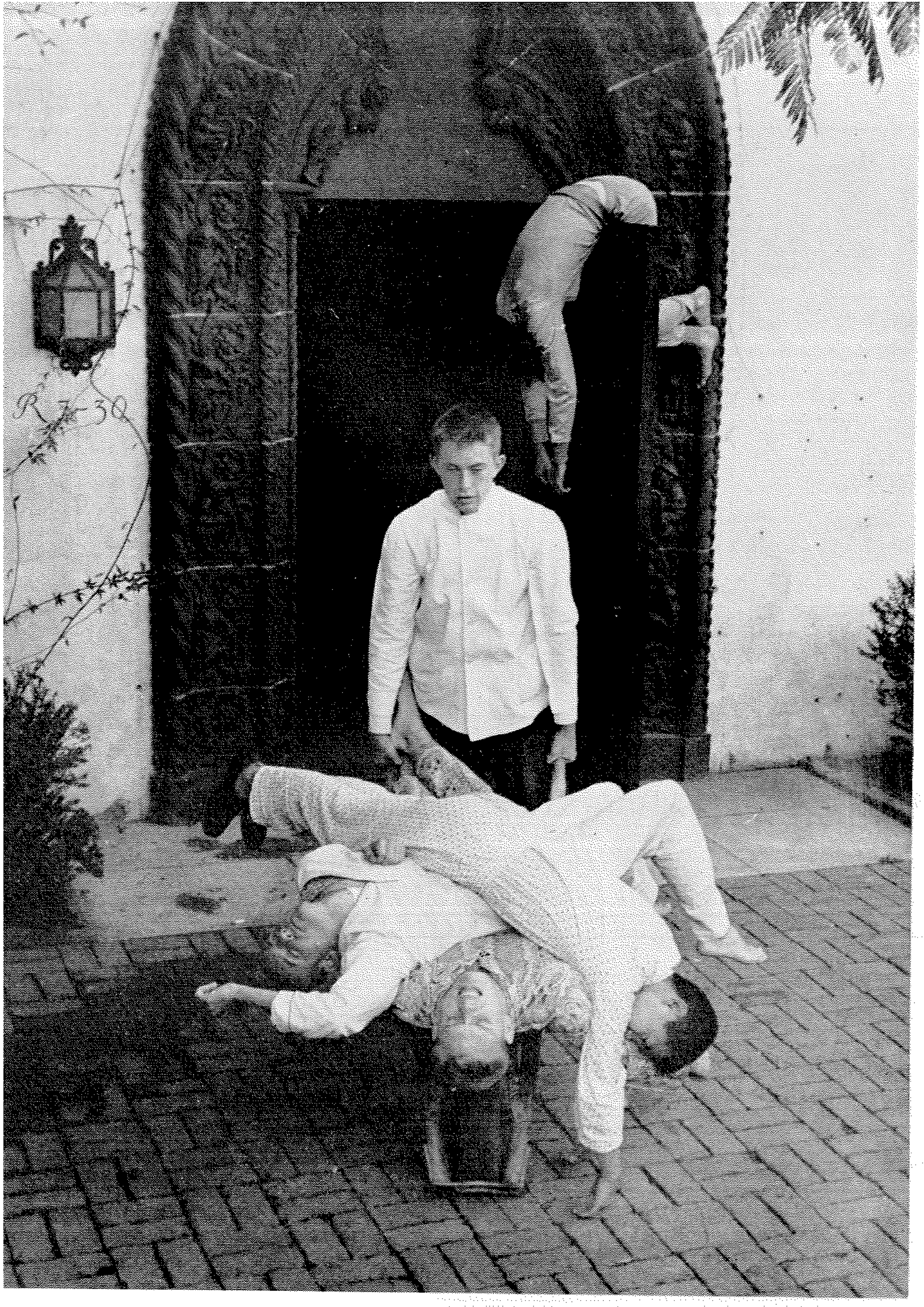
Honors and Awards

ROBERT F. BACHER, chairman of the division of physics, mathematics and astronomy, is one of 5 new members added to President Eisenhower's Science Advisory Committee. Headed by I. I. Rabi, professor of physics at Columbia University, the committee has now been moved from the Office of Defense Mobilization to the White House in order to bring it into a closer working relationship with the President and James R. Killian, Jr., his newly-appointed special assistant for science and technology.

Besides Dr. Bacher, the 17-man committee also includes H. P. Robertson, Caltech professor of physics.

HOMER J. STEWART, professor of aeronautics, is one of two scientific consultants appointed by the Senate Preparedness Subcommittee for its investigation of the U.S. missile and satellite programs. The second consultant, William Houston, a former Caltech professor, is president of Rice Institute in Texas.

WILLIAM H. PICKERING, director of Caltech's Jet Propulsion Laboratory, received the James H. Wyld Memorial Award for outstanding application of rocket power at the American Rocket Society's annual meeting in New York City on December 5.



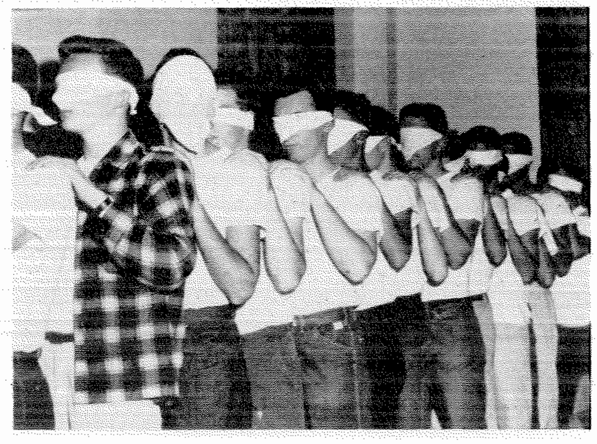
FIRST TERM

1957-58

Some pictorial highlights

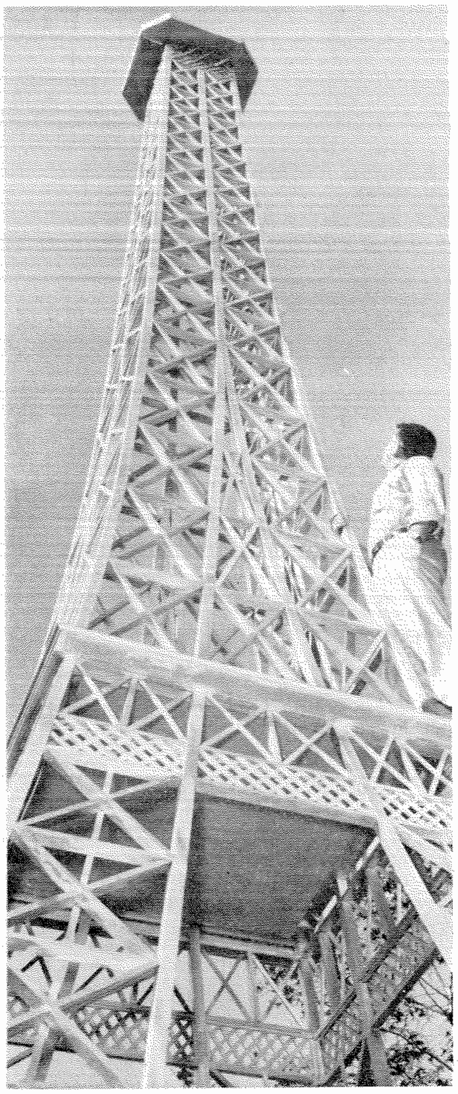
Asian flu invaded the campus in mid-October and laid the student body low. At the left, a typical scene in the student houses, recorded at the height of the plague by a daring student photographer.

The Pajamarino, a Caltech tradition that was abandoned in 1953 came back this year in all its old-fashioned glory, replete with pajamas, parading, bonfire, song-queens and yells.

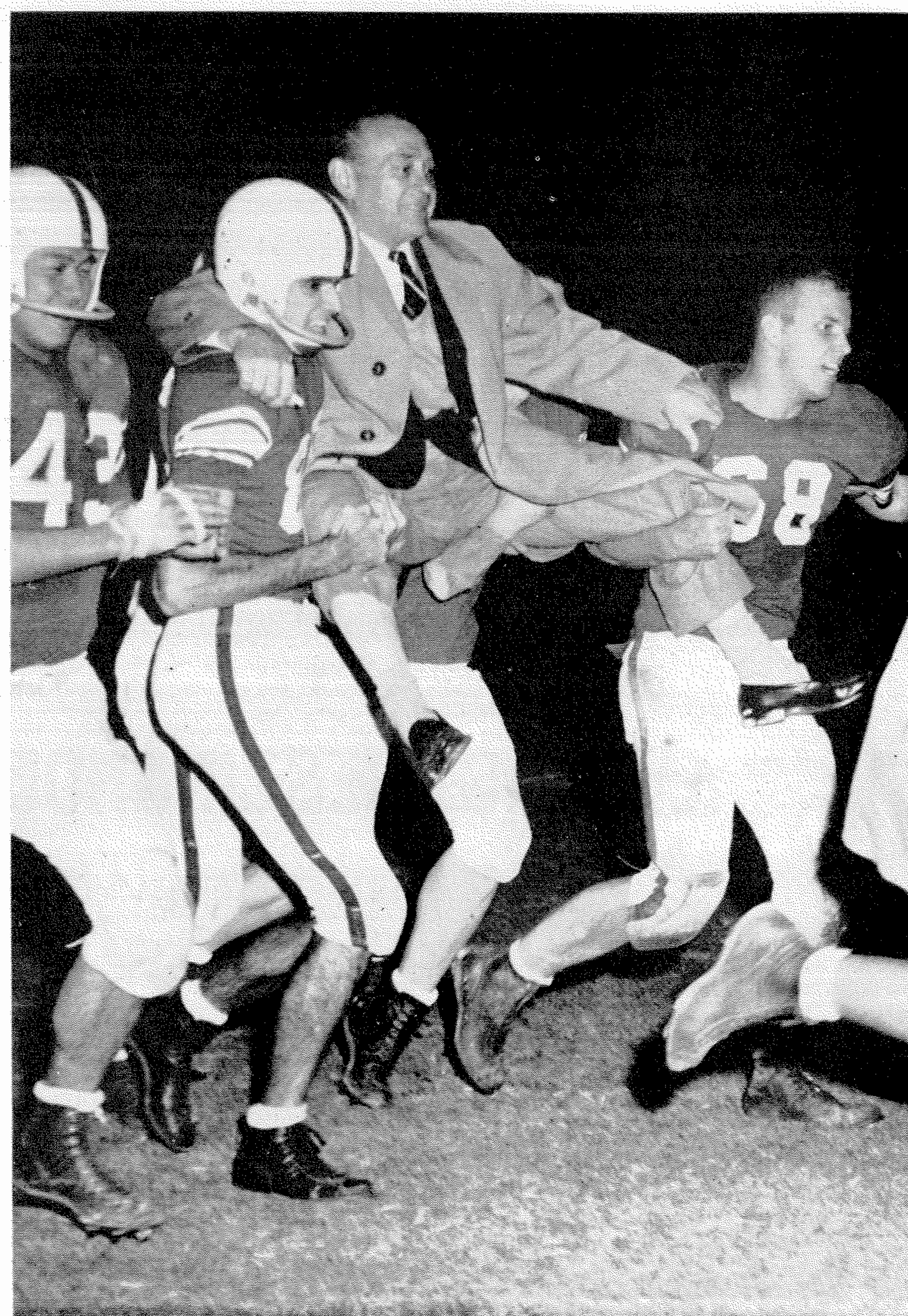


Freshmen grope through intricacies of initiation.

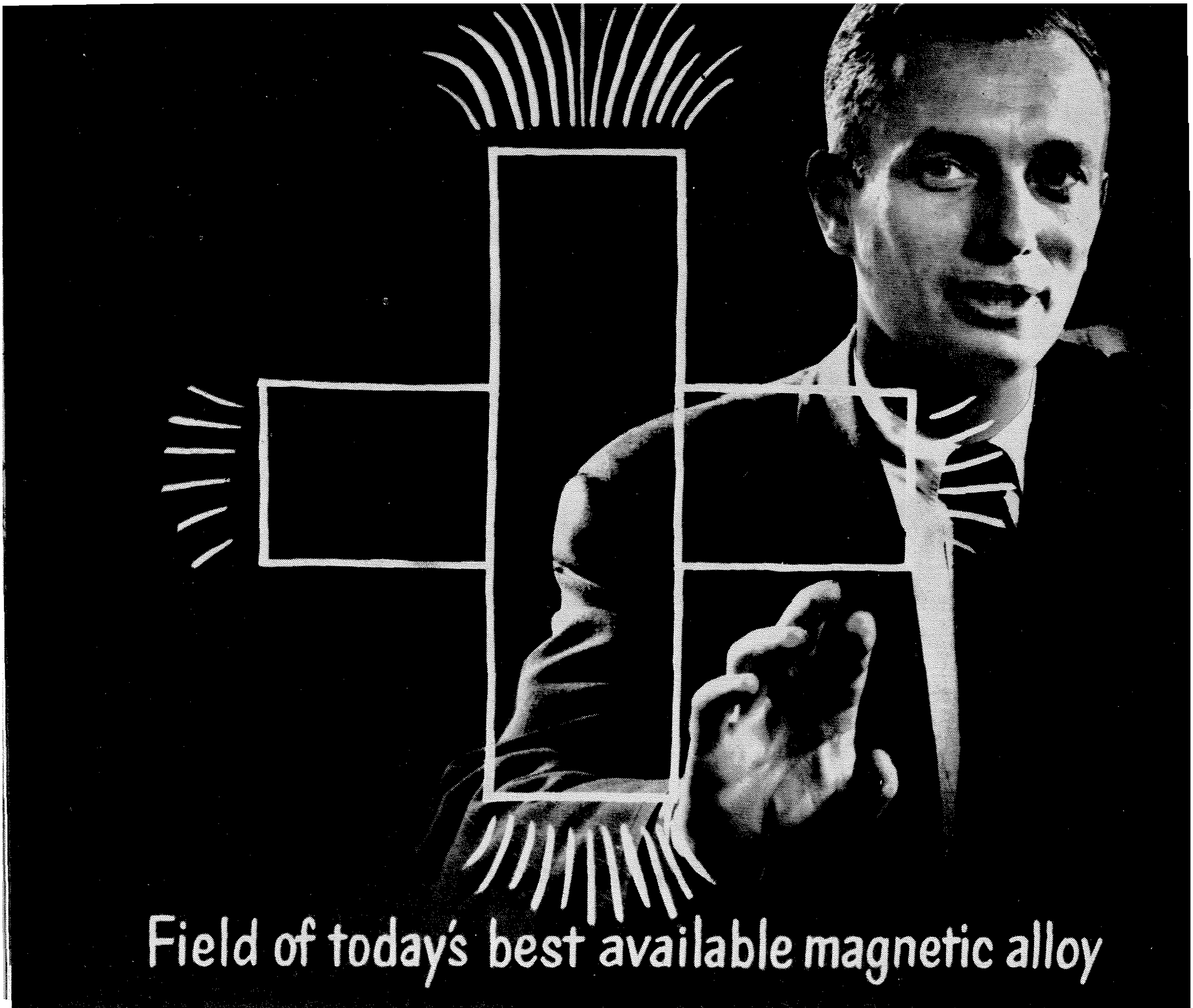
Sophomore goes through stately measures of Mudeo.



Biggest thing about this year's Interhouse Dance—Throop Club's 36-foot Eiffel Tower.



Coach LaBrucherie is carried away as Caltech beats Occidental (27-14) for the first time since 1946.



Difference between ordinary magnetic iron (left) and Cubex (right) is diagrammed on glass panel by Dr. George W. Wiener, who heads up research on soft magnetic materials at Westinghouse Research

YOUNG WESTINGHOUSE SCIENTISTS

open new design frontiers with

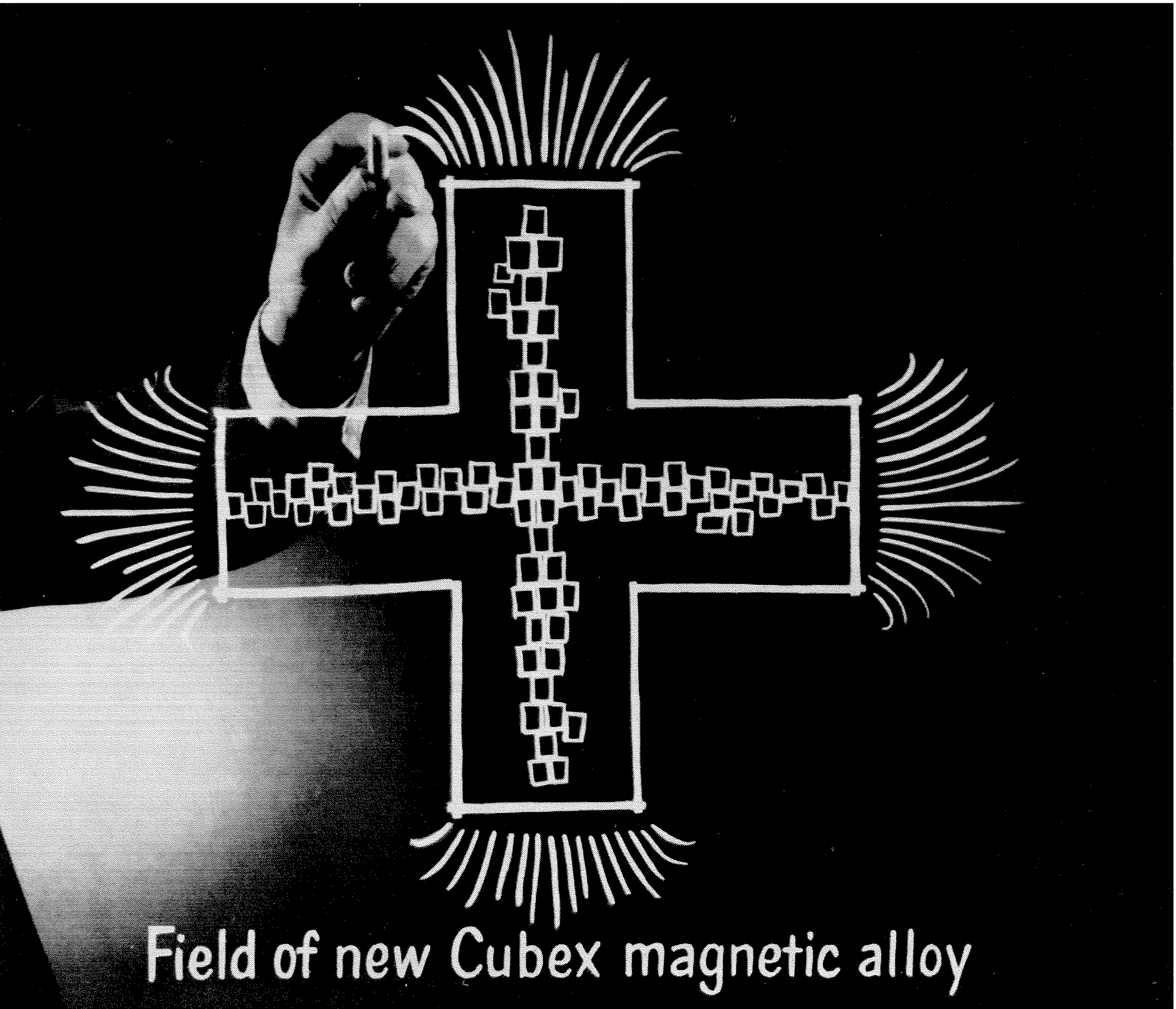
Westinghouse scientists have climaxed an intensive search that promises significant improvements in electrical equipment performance and operating costs. With this new alloy, Cubex,® metal crystals are aligned in ice-cube fashion so that magnetism flows readily in four directions instead of two . . . actually turns corners with markedly less resistance.

Now in the development stage, it will bring such important benefits as better performance, higher efficiency and smaller size to users of motors, transformers, and other electrical apparatus.

Developed in Westinghouse Research Laboratories, Cubex is the result of continuous programs of research and development since the 1920's.

This work on magnetism is only one of the many interesting jobs engineers and scientists at Westinghouse are engaged in all the time. Other fields include

ATOMIC POWER	SEMICONDUCTORS
AUTOMATION	ELECTRONICS
JET-AGE METALS	LARGE POWER EQUIPMENT
CHEMISTRY	GUIDED MISSILE CONTROLS
RADAR	and dozens of others.

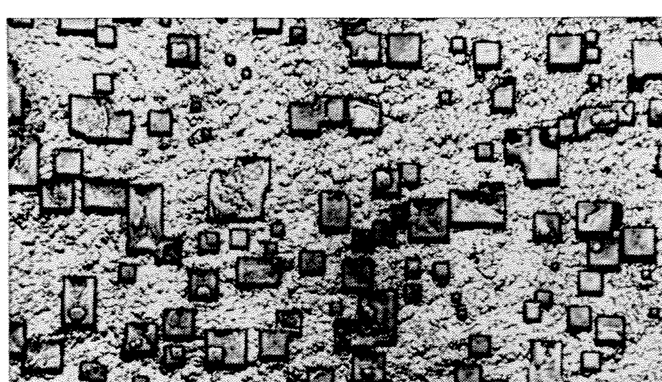


Laboratories. Dr. Wiener got his B.S. in 1943 from University of Wisconsin. In 1953 he earned his Ph.D. at University of Pittsburgh while working at Westinghouse and studying on tuition-free Graduate Study Program.

BREAK THROUGH MAGNETIC BARRIER:

cube-oriented alloy

For more information on Westinghouse research in the field of magnetism, or information on job opportunities, write to Mr. J. H. Savage, Westinghouse Electric Corporation, P.O. Box 2278, Pittsburgh 30, Pa.



Cube-orientation of crystals in Cubex is revealed by "etch pits" in this photomicrograph. Cubex is a silicon-steel alloy, easily magnetized in four directions instead of two.

Westinghouse

FIRST WITH THE FUTURE

ALUMNI NEWS

Howard B. Lewis

HOWARD B. LEWIS, one of the Institute's most active alumni, died of a heart attack at his home on Lido Isle on November 28. He was 57 years old.

Howard Lewis became a member of the Board of Directors of the Alumni Association in 1946. The same year he was appointed chairman of the Alumni Fund Study Committee, and in 1947 he played the leading part in launching the Caltech Alumni Fund. Under his guidance, the fund organization gave Caltech its Alumni Swimming Pool in 1953 and by 1957 had endowed four 4-year Alumni Scholarships. He was elected vice president of the Alumni Association in 1947-48, and president in 1948-49. He became chairman of the Alumni Fund Council in 1955, a position he held at the time of his death.

He was a loyal friend of the Institute, and had been a member of the California Institute Associates since 1947. Mrs. Lewis is also an Associate. He was a contributor to the Caltech Sailing Club and to the Clinton Judy Fund. He also established the John C. Lewis Memorial Fund for his older brother.

Howard Lewis was born in Riverside, California, on April 18, 1900. He entered Caltech in 1919 when it was still Throop College of Technology, and received his BS in 1923. He got his ME degree at Cornell University the following year, then spent a year as a teacher of physics in the Riverside, California, High School. In 1925 he went to work as an experimental engineer at the Hughes Tool Company, and in 1926 became manager of the Hughes Development Company, and general manager and assistant to the president of Multicolor, Ltd. (a laboratory which processed motion picture film).

In 1931 he joined the Thompson Manufacturing Company as chief engineer, then, from 1932 to 1938, worked as an independent consulting engineer. He was president of the Product Service Company from 1938 to 1940. Since 1941 he had been a partner in the Lewis-Larson Company of Los Angeles, which is a consulting engineering firm.

In 1949 he was elected a member of the Caltech chapter of Tau Beta Pi because of his outstanding achievement in engineering since graduation. He was a consultant to the Secretary of the Navy in 1953, and also served on the Navy's Plant Review Board.

Howard Lewis had for many years been active in yachting circles. He had been Staff Commodore of the Lido Isle Yacht Club, secretary of the Southern California Yachting Association, and a director of the Newport Ocean Sailing Association.

Besides his widow, Howard Lewis leaves three sons—John, Howard, Jr., who was graduated from Caltech in 1948, and Richard—and 5 grandchildren.

In a tribute to Howard Lewis, President DuBridge said, "His passing is a stunning blow to his friends and to Caltech. His devotion to the welfare of the Institute has endeared him to the faculty and administration. His counsel, encouragement and friendship will be sorely missed."

Dinner-Dance

THE ANNUAL ALUMNI DINNER-DANCE will be held this year at the Candlewood Country Club at 14000 Telegraph Road in Whittier on Saturday, February 22. This is an opportunity to relax in intimate nightclub surroundings while dining or chatting with friends over cocktails. You can take a spin on the dance floor both during dinner and after. Notices will be in the mail late in January—so be sure to save this date for a gala evening.

—*James C. Crosby, Chairman*

Jerry Geisler

JERRY GEISLER, who was the defense attorney in the White Flame murder case, the Pantages case, the Errol Flynn case, and many other outstanding trials, will be the speaker at the Alumni Dinner Meeting to be held at the Rodger Young Auditorium in Los Angeles on January 16. Mr. Geisler's talk—"The Chain of Life as Forged by Fate"—will be based on a full storehouse of colorful stories about famous trials in which he has been involved. Mr. Geisler's career since his graduation from the University of Southern California Law School, and his earlier association with Earl Rogers, well known criminal lawyer, has been one of distinction. He has been chairman of the California State Horse Racing Board, chairman of the California State Athletic Commission and a governor of the State Bar of California.

Dinner will be served at 7 p.m., preceded by cocktails at 6 p.m. Reservations should be made with the Alumni Office as soon as notices are received. The Program Committee firmly believes that the alumni, their wives and guests will enjoy this outstanding affair—so mark the date: January 16.

—*Donald D. Mon, Chairman*

PERSONALS

1926

Lawrence G. Maechtlen is now first vice president of the Square D Company in Los Angeles, manufacturers of electrical distribution and control equipment. Formerly western division manager, Larry has been with the company since 1926.

1927

David Z. Gardner, Jr., division engineer with the Santa Fe Railway for the past 30 years, died on October 13 at his home in San Gabriel, California.

1931

George E. Liedholm is now head of the oil process engineering department of the Shell Development Company's Emeryville Research Center. George has been with Shell since 1933.

1932

Guy Waddington, PhD, formerly with the Bureau of Mines Petroleum Experiment Station at Bartlesville, Oklahoma, is now director of the Office of Critical Tables in the National Academy of Sciences--National Research Council Division of Chemistry and Chemical Technology in Washington, D.C.

1933

Robert B. Grossman is now chief sales engineer of the industrial division of the Pacific Scientific Company in Bell Gardens, California. He was formerly director of sales for the Holly Manufacturing Company in Pasadena. The Grossmans, who live in La Canada, have an 18-year-old son.

Ernest H. Lyons, Jr., MS, recently joined with *Robert A. Cooley*, PhD '42, and others to form the Propellex Chemical Corporation in Edwardsville, Illinois. The company makes propellants, explosives, rocket fuels, cartridge-actuated devices and other similar products. A recent development is a cartridge-operated emergency actuator for aircraft landing gear which is expected to eliminate crash-landings which occur because of failure of the landing gear mechanisms. Ernest, who is manager of research at Propellex, also continues as head of the chemistry department at The Principia College in Elsah, Illinois.

Thomas S. Terrill is now assistant manager of the logistic planning department of the guided missiles range division of Pan American Airways at Patrick Air Force Base in Florida.

1934

William S. Everett is president and chief engineer of a newly-formed company, Pulsation Controls Corporation, in Santa Paula, California. The new company will manufacture and market—under license from Bill's consulting firm, Everett and Everett, Engineers — a complete line of Everett pulse traps, industrial mutes, shock traps, vibration absorbers, and dynamic ratio controllers.

1935

Daniel H. Miller is now western division manager of the Square D Company in Los Angeles. Dan has been with the company since 1935, and served as northwest regional manager for the past 5 years in the Seattle plant.

1937

George Yoshio Tsubota, MS '38, chief of the motor-cars designing section of the engineering department of the Nagoya Engineering Works in Japan, visited Caltech recently on his way to Europe, where he is studying the small automobile industry.

Joseph M. Smith is now chairman of the chemical engineering department at Northwestern University in Evanston, Illinois. He was formerly a member of the faculty and assistant to the director of the engineering experimental station at Purdue University in Lafayette, Indiana.

1939

Walter H. Munk, MS '40, professor of geophysics at the Scripps Institute of Oceanography in La Jolla, served as a guest lecturer at the National Autonomous University of Mexico in Mexico City in October.

1941

Alex E. Green, MS, is now a physicist in the theoretical division of the Los Alamos Scientific Laboratory in New Mexico. He was formerly professor of physics at Florida State University. The Greens have four children.

Carol K. Ikeda has been promoted to research associate in the research division of the Du Pont Company's fabric and finishes department at the experimental station in Wilmington, Delaware. He has been with the company since 1945.

1942

Robert A. Cooley, PhD, is now president of the Propellex Chemical Corporation in Edwardsville, Illinois. The firm develops and manufactures propellants, explosives and devices actuated by propellants.

1943

Peter Dehlinger, MS, PhD'50, is now professor of geophysics at Texas A & M College.

1944

Cornelius Steelink, who has been at the University of Liverpool as a research fellow, is now assistant professor of chemistry at the University of Arizona.

Floyd W. Preston received his PhD in petroleum and natural gas engineering from Pennsylvania State University this summer.

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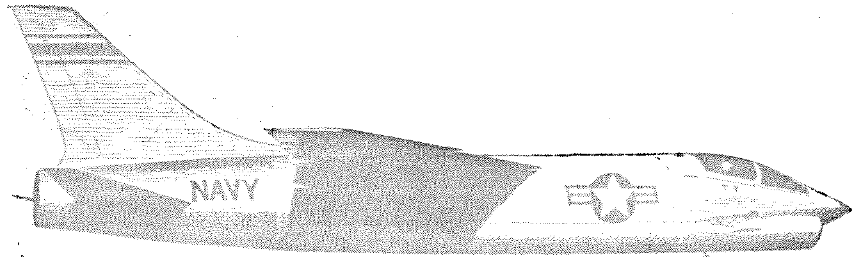


A Vought Vignette

ONE OF A SERIES

The Aerodynamicist Who Test-Hopped Equations

There'd never been a fighter that could barrel at more than 1,000 mph one minute and land on a carrier the next. And, as a result, there was unusually keen advance interest in the flying qualities of the airplane proposed by Chance Vought.

Jim Madden was more than curious. As an aerodynamic design specialist, he would help develop the Crusader's handling qualities. His job began with wind tunnel tests.

Jim converted tunnel information into a graphic picture of static and dynamic forces affecting Crusader stability. He used analog computers and equations of motion to predict the build-up of forces during maneuvers. Hinge moments, loads, and required rates of control motion were determined and released to Servomechanism and Product Design groups. Soon the Crusader's stabilization and power control packages began to take shape.

Jim's part in the project could have ended right there. But Vought's control system simulator helped him proceed to some thoroughgoing conclusions.

It duplicated the complete rod system and all servomechanisms that would control the speedy new fighter. In the simulator's cockpit, high above the Structures Lab floor, Jim previewed control responses that test pilots later would experience. Airplane responses to Jim's rudder kicks and aileron movements were recorded on analog computers. Any inability of the control system to position the aircraft during flight was easier to spot . . . and, with test and design engineers on hand . . . easier to correct.

"It was like a big schematic — only better," says Jim of the simulator.

"It gave me a chance to work with the whole system.

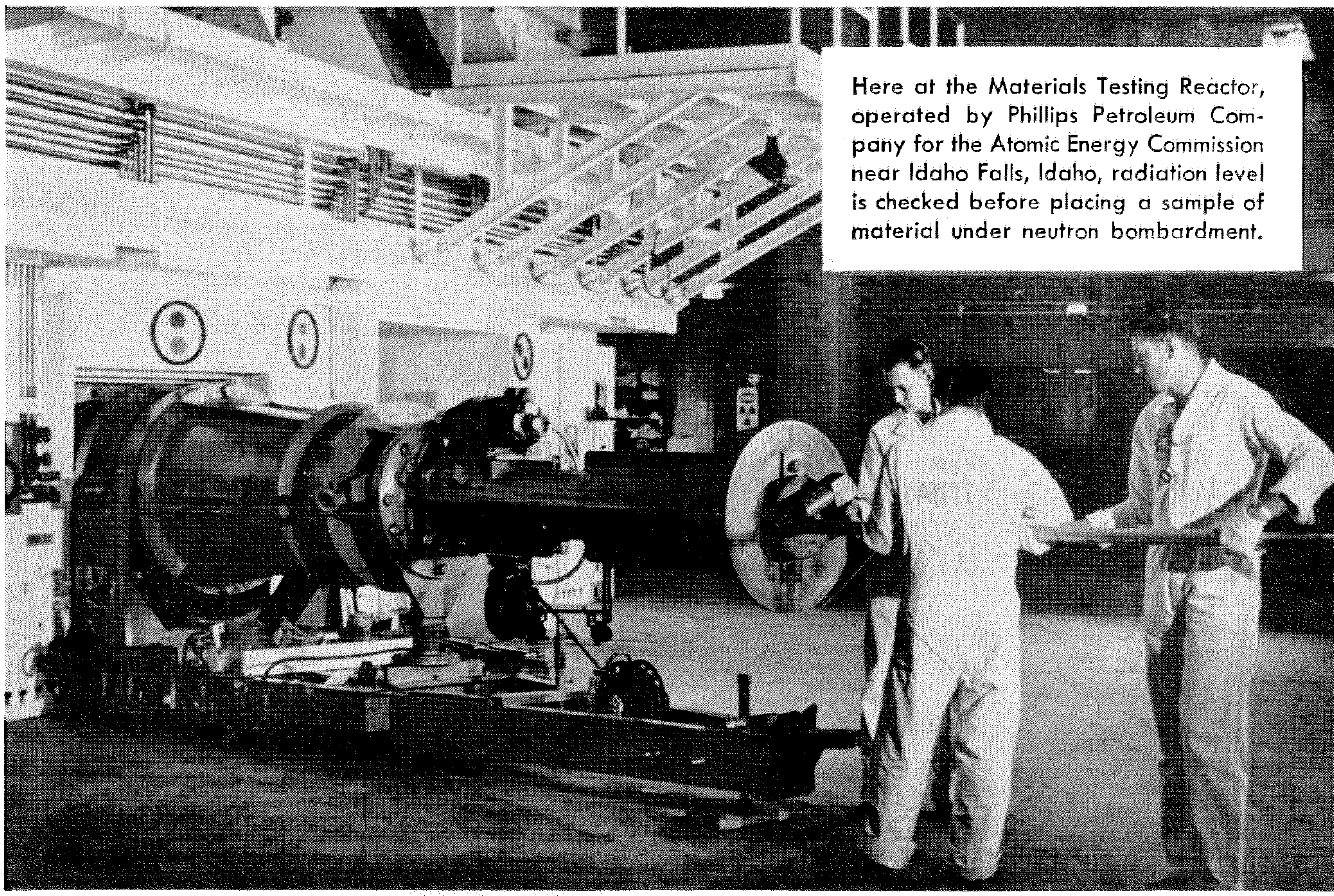
"And actually watching aircraft responses to the controls gave me a feeling for how fast they happen."

Another thing that moved fast was Crusader development. Vought's simulator and other facilities detected problems before they compounded. The fighter reached operational readiness in record time.

Research, design and test facilities at Chance Vought allow the engineer to do a thorough job in advanced problem areas . . . assure high reliability in Vought-developed weapon systems.

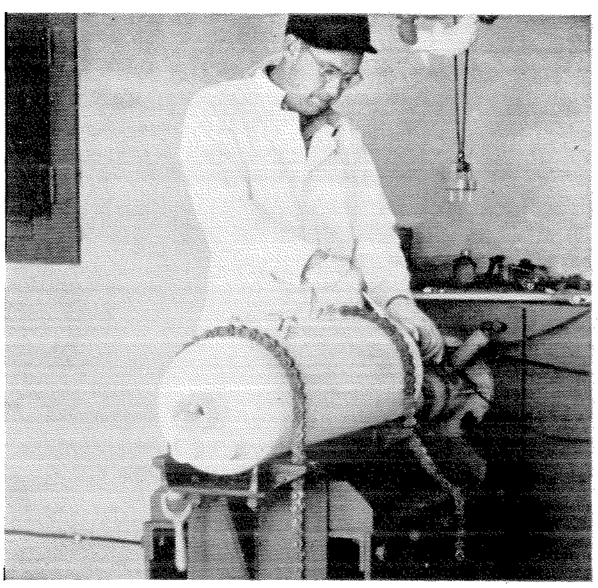
BUILDERS OF MILITARY AIRCRAFT 40th ANNIVERSARY 1917 TO 1957

CHANCE VOUGHT AIRCRAFT
INCORPORATED · DALLAS, TEXAS



Here at the Materials Testing Reactor, operated by Phillips Petroleum Company for the Atomic Energy Commission near Idaho Falls, Idaho, radiation level is checked before placing a sample of material under neutron bombardment.

OPPORTUNITIES FOR YOUNG MEN ON THE FRONTIERS OF SCIENCE AND ENGINEERING



In McGregor, Texas, Phillips Rocket Fuels Division operates Air Force Plant 66—an important installation with up-to-date facilities for development, test-firing and manufacture of solid propellants for missiles and rockets.

Careers in research are being offered to many technical graduates at Phillips Petroleum Company. For example, at the National Reactor Testing Station Phillips has over 1500 employees who operate the new Engineering Test Reactor, which develops the highest known radiation intensity . . . the Chemical Processing Plant (where spent fuel elements from nuclear reactors are processed for recovery of unconsumed uranium) . . . the Materials Testing Reactor . . . and other important facilities of the Atomic Energy Commission.

Other fine opportunities for technical graduates are available in the various Phillips plants manufacturing such diversified products as gasoline, motor oil, rubber, polyethylene plastics, carbon black, and fertilizer. Whether you are looking for a career in research, design, construction, operation, or any of a dozen other specialties, you have a wide selection of possibilities with Phillips.

If you want a career with a future, we invite you to write to our Technical Manpower Division for further information. And when the Phillips representative visits your campus, be sure to arrange for an interview.

Phillips 66

D. R. McKeithan, Director
Technical Manpower Division
PHILLIPS PETROLEUM COMPANY
Bartlesville, Oklahoma

Personals . . . CONTINUED

Ruben F. Mettler, MS'47, PhD'49, associate director of Ramo-Wooldridge's missile research division, has been named a vice president of the corporation.

1945

Major Gage H. Crocker, MS, assigned to the U.S. Air Force, is now studying for his PhD at the University of Michigan.

1946

Ali Bulent Cambel, MS, is now chairman of the mechanical engineering department at Northwestern University in Evanston, Illinois, and head of the university's gas dynamics program. The Cambels have four children, ranging from 1 to 10 years old.

1947

Irving Michelson, MS, PhD '51, is now professor and head of the department of aeronautical engineering at Pennsylvania State University. He had been president (and founder) of Odin Associates in Pasadena, an engineering research organization engaged in advanced studies for military agencies and missile developers.

L. Edward Klein, MS, is now assistant director of the development department of the Monsanto Chemical Company's organic chemicals division at St. Louis, Missouri. He has been with the division since 1947.

William F. Ballhaus, PhD, has been made head of a new division of Northrop Aircraft. Called Nortronics, the division will handle operations in the field of electronics, electro-mechanical and related opto-mechanical products.

George B. Melrose, Jr., MS, has been appointed chief of the aeromechanic section in the research division of the Bell Aircraft Corporation in Buffalo, N.Y. He's responsible for aerodynamics and propulsion on all guided missiles and space vehicle projects.

1948

Allen T. Puder, MS'49, is now president of the Ruckstell Corporation in Azusa. A subsidiary of the General Tire & Rubber Company, Ruckstell manufacturers permanent magnet alternates and auxiliary power units. Also employed there are *Ralph Marshall*, '44, *Lloyd Ott*, '44, MS'47, and *George A. Martinek*, '48, MS'49. The Puders, who live in Altadena, have twin daughters, Joyann and Janice, 7, and a son, Brent, 5.

1949

Donald R. Westervelt is now an associate group leader in the test division of the Los Alamos Scientific Laboratory in New Mexico.

Manuel N. Bass writes that he is still an instructor at Northwestern University in Evanston, Illinois—"and still single."

Kendall F. Famularo is now a physicist in the weapons division of the Los Alamos Scientific Laboratory in New Mexico.

Robert P. Crago, MS, formerly general manager of IBM's Kingston, N.Y., plant, has been promoted to director of engineering for the military products division of IBM in New York. He's been with the company since 1949.

1950

Dr. Jerry O. Matthews is practising industrial medicine with the Bishop Medical Group in Long Beach. The Matthews' have two daughters—Julie, 2, and Leslie Ann, 5 months.

Lt. Col. Adam F. Schuch, PhD, is a staff member of the Los Alamos Scientific Laboratory in New Mexico, as well as executive officer of the 4012th Research and Development Unit of the U.S. Army Reserve in Los Alamos.

Donald Merrifield, S.J., received his MA in philosophy at St. Louis University and is now at MIT working for his PhD in physics. He writes: "This summer I saw my fellow classmates, *Monte Marks*, '50 and *Richard Knipe*, '50, both in California, and, more recently, here at MIT, *Fernando Corbato*, '50, on the staff of the computation center and *John Greene*, '50, from Project Matterhorn at Princeton. I also visited with *Marion Joncich*, '55, a fellow Jesuit as well as fellow alumnus, who is studying at Los Gatos, California."

John P. Moffatt, Jr., is now director of the quality control department of the central manufacturing division of Consolidated Electrodynamics in Pasadena.

Carel Otte, Jr., PhD '54, research geologist with the Pure Oil Company in Crystal Lake, Illinois, now has a four-month-old son, Eric Charles.

Werner B. Riesenfeld, who had been a project associate at the University of Wisconsin, is now a physicist in the theoretical division of the Los Alamos Scientific Laboratory in New Mexico.

1951

John B. Johnston, PhD '55, is an assistant professor of mathematics at the University of Kansas City in Missouri.

William R. Smythe, MS '52, PhD '57, writes: "Since finishing graduate work at Caltech's synchrotron last December I have been at the G. E. Microwave Laboratory in Palo Alto, working on high power klystrons and traveling wave tubes. I have accepted a position as a research associate at the University of Colorado where Professor *David Lind*, MS '43, PhD '48, is directing the design of a variable energy cyclotron. My wife, Carol, and daughter Stephanie (2 years), and I are living in Boulder."

Stuart D. Cavers, PhD '51, writes that "I've been associate professor in the department of chemical engineering at the University of British Columbia in Canada

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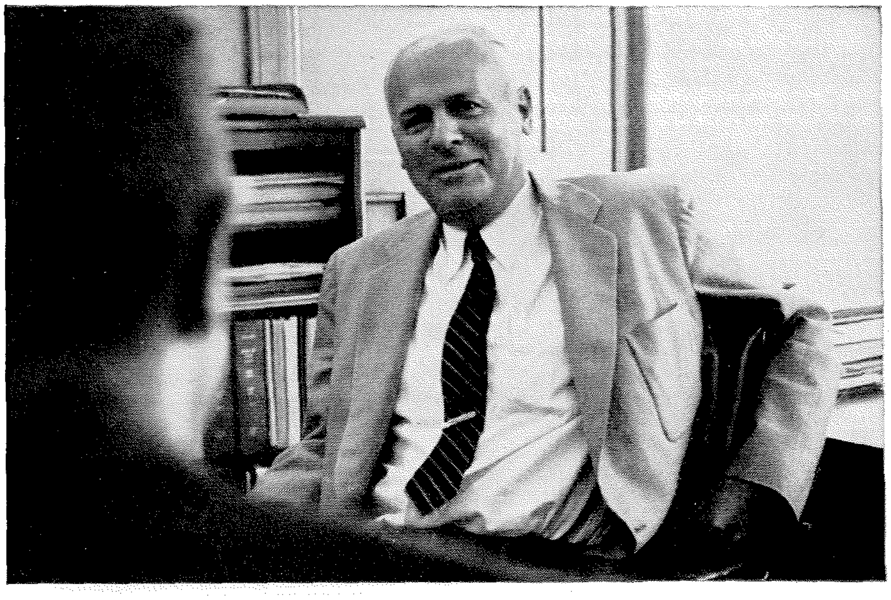
CAREERS WITH BECHTEL



JAMES F. DEL CURO, *Mechanical Engineer, Power Division*

MECHANICAL ENGINEERING

One of a series of interviews in which Bechtel Corporation executives discuss career opportunities for college men.

QUESTION: *As I understand it, Mr. Del Curo, the Power Division is concerned with the engineering phases of steam-electric generating plants?*

DEL CURO: That's true. Our own department is specifically concerned with the mechanical engineering phases of such plants.

QUESTION: *When the engineering graduate joins your department are his starting duties standard?*

DEL CURO: Yes. The routines are pretty well defined. We know a man learns best by actual doing, so he is put to work immediately on heat balances, line size calculations, specifications, miscellaneous and minor auxiliary equipment, instrument data sheets and information for plant data books.

QUESTION: *In other words, you sort of throw the man in and he has to learn to swim by himself?*

DEL CURO: No. He has plenty of help. He works under the direct supervision of a job engineer or the mechanical group supervisor.

QUESTION: *How long does this training phase last?*

DEL CURO: That will vary with the man, since aptitudes and desires to learn are different. The average is somewhere between a year and eighteen months.

QUESTION: *During this period he will gradually advance to more complicated equipment?*

DEL CURO: Yes. For example, after a while he will be doing original work on heat balances and system studies. He will be able to take an entire "piece" of a project and handle it on his own responsibility. He will become involved with bigger equipment and with the overall aspects of the power plant. Somewhere along the line he will likely be assigned to try his hand at piping materials, piping specifications and combined control specifications.

QUESTION: *What about the man who wants to specialize?*

DEL CURO: If, for example, a man shows a particular interest in steam turbines, instrumentation or control, and demonstrates a special aptitude for one of them, he will often be called on to work on that specialty, without being confined to it exclusively. Thus we encourage specialization, even during the training period, but also make sure that the young man gets overall experience through work in all phases of mechanical engineering.

QUESTION: *What about field experience?*

DEL CURO: That is, of course, highly desirable from his standpoint and ours. We make every effort to assign the young engineer to field work as soon as possible.

QUESTION: *What will he do in the field?*

DEL CURO: When we are building a power plant we try to get the young engineer on the job five or six months before the scheduled start up of the plant. He will actually help the chief start up engineer by writing up procedures, planning the hydraulic washing to steam lines, working on the start up of each piece of the equipment, checking out controls, etc.

He will also handle paper work such as filling out the data sheets that are later turned over to the plant operators to aid them in running the plant. By the time the turbine is rolled and the job ends, the young engineer has been able to see the end result of all the engineering work he and others have done back in the office.

QUESTION: *Are there any other types of field assignments?*

DEL CURO: If the young engineer desires such experience, he is sometimes used in the construction department if that group is shorthanded.

Bechtel Corporation (and its Bechtel foreign subsidiaries) designs, engineers and constructs petroleum refineries, petrochemical and chemical plants; thermal, hydro and nuclear electric generating plants; pipelines for oil and natural gas transmission. Its large and diversified engineering organization offers opportunities for careers in many branches and specialties of engineering—Mechanical... Electrical... Structural... Chemical... Hydraulic.

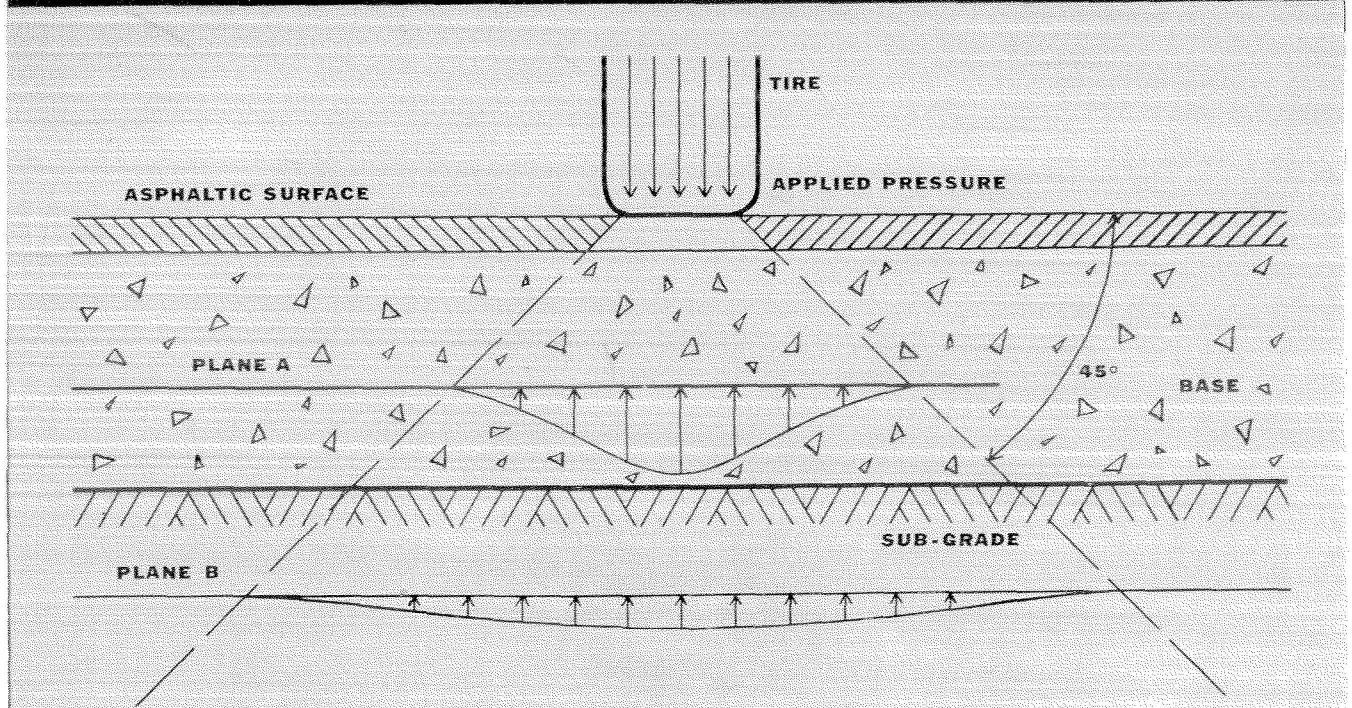
Write for new brochures showing the wide variety of projects Bechtel builds throughout the world.

Address: John F. O'Connell,
Vice President, Industrial Relations
220 Bush Street, San Francisco 4, Calif.

BECHTEL CORPORATION

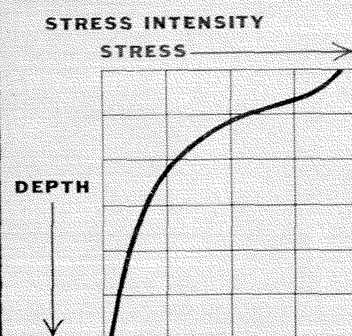
SAN FRANCISCO
Los Angeles • New York • Houston

ASPHALT ENGINEERING BULLETIN #4



Assume a loaded wheel on a typical Asphalt pavement consisting of Asphalt surface, base course and natural sub-grade. The entire load is transmitted to the pavement by the tire. The load, applied at the surface, is distributed downward and outward through the Asphalt pavement and base into the native soil or sub-grade. The load spreads out at an angle of approximately 45° in the manner indicated above.

Look at the curved line. It shows the approximate manner in which intensity of stresses in flexible type pavements decreases in depth. The total load affects the shape of the curve: the greater the unit load, the greater the stress at the given depth . . . except that it cannot exceed 100% of the contact pressure at the surface.



Design of flexible ASPHALT pavement

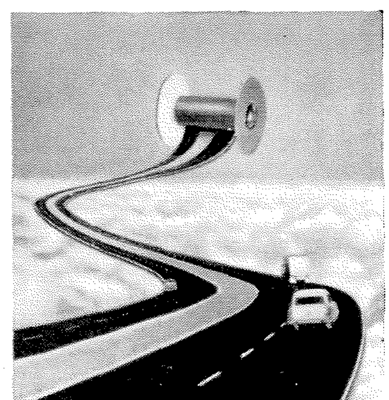
The flexibility of modern Asphalt pavement is one of the great achievements of scientific road-building.

It is the planned result of layer-upon-layer construction that "locks" surface to foundation to help spread the weight load, absorb shock and pounding without cracking.

Modern Asphalt paving is designed to make maximum use of native soil and other native materials such as sand, stone, slag and gravel. This is one important reason for the economy of modern Asphalt roads.

Study the diagrams on this page. They show how the load is distributed on modern Asphalt construction and how the maximum stress varies with depth of pavement.

Be sure to cut out and file this data sheet and those previously inserted in this publication. Make them your professional reference material.



Ribbons of velvet smoothness . . .
MODERN **ASPHALT** HIGHWAYS

THE ASPHALT INSTITUTE, Asphalt Institute Building, College Park, Maryland since September, 1956. Prior to that I worked for the B.C. Research Council for a year and the University of Saskatchewan for five years. We had a daughter, Shelagh Sarah, on October 18 last year. This makes 2 girls and 1 boy."

1952

C. Barclay Ray, PhD '56, assistant professor of geology at Caltech, was married to Linda Pauling, daughter of *Linus C. Pauling*, PhD '25, chairman of the division of chemistry and chemical engineering at Caltech, on September 8.

Charles R. Miller is acting instructor in physics at the University of California's new College of Letters and Science. He's been a graduate student at Caltech for the past five years.

1953

Gerald H. Ross is now on the staff of the saw chain division of Omark Industries, Inc., in Portland, Oregon.

1954

Yusuf A. Yoler, PhD, is manager of aerodynamics laboratory investigations at General Electric's missile and ordnance systems department in Philadelphia.

1955

Juris Hartmanis, PhD, is now assistant professor of mathematics at Ohio State University in Columbus.

Theodore K. Matthes is now studying on a University Fellowship in mathematical statistics for 1957-58 at Columbia University in New York City.

Frederick Martin writes: "I have been working for UC's Radiation Laboratory since last November at Livermore, California. Last summer I spent 6 weeks on a mountaineering trip to the Cordillera Blanca in Peru where we attempted first ascents of some 5,700-meter peaks."

Carl Bowin writes that after receiving his BS at Caltech he traveled almost 2,000 miles east only to find that he had barely reached the Midwest. "Despite this shock," he says "I stayed to begin graduate studies at Northwestern University near Chicago.

"The 400-million-year-old undisturbed sedimentary rocks of that area were in striking contrast to the folded and faulted rocks of southern California, some of which are only one million years old. And, gradually I begin to think that perhaps every valley in the world does not have a fault in it.

"My master's thesis on the geology of an area in northern Maine was completed last June, and one week later I was swimming in the blue waters of the Caribbean. This summer I was engaged in mapping the geology of an area in the Dominican Republic as part of Princeton University's Caribbean project.

"My wife, Jean, whom I married a little over a year ago (an Oxy girl) will be able to spend next summer with me in the Dominican Republic when I will finish the field work for my PhD dissertation at Princeton."

1956

Lt. Joseph N. Kanevsky, USN, was killed on June 6 while testing a jet plane at the Naval Air Facility in Crows Landing, California.

Kyle D. Bayes, who is working for his PhD, received the Standard Oil Foundation Fellowship in chemistry for 1957-58 at the Harvard Graduate School of Arts and Sciences.

1957

A news roundup on last year's geology graduates from The Fumarole, *the Caltech geology club's enterprising publication:*

Thomas Bilhorn, MS, geologist with Standard Oil Company, Salt Lake City, Utah.

Gunnar Bodvarsson, PhD, engineer for heat authority, Government of Iceland.

William M. Chapple, MS, University of Paris on Fulbright Fellowship.

Lawrence Griffith, graduate work at the Rice Institute in Houston, Texas.

Gerard Grau, PhD, research geophysicist, Institut Francais du Petrole, Paris.

Stanley Hart, MS, graduate student, MIT.

Charles Helsey, MS, graduate teaching assistant, Princeton University.

Ralph O. Kehle, MS, Shell Fellowship, University of Minnesota.

Kenneth E. Lemon, PhD, U.S. Geological Survey, Washington, D.C.

Richard L. Nielsen, MS, geologist, Bear Creek Mining Company, Mellen, Wisconsin.

John C. Ruckmick, PhD, geologist, Orinoco Mining Company, Puerto Ordaz, Estado Bolivar, Venezuela.

Allan R. Sanford, PhD, teacher, New Mexico Institute of Mining and Technology, Socorro, New Mexico.

James C. Savage, PhD, teaching halftime at MIT.

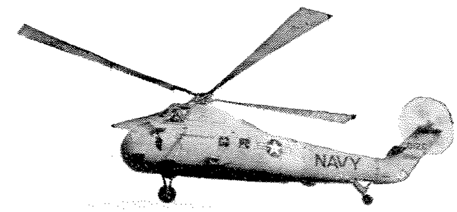
Harrison Schmitt, Fulbright Fellow, Mineralogical Institute, Oslo, Norway.

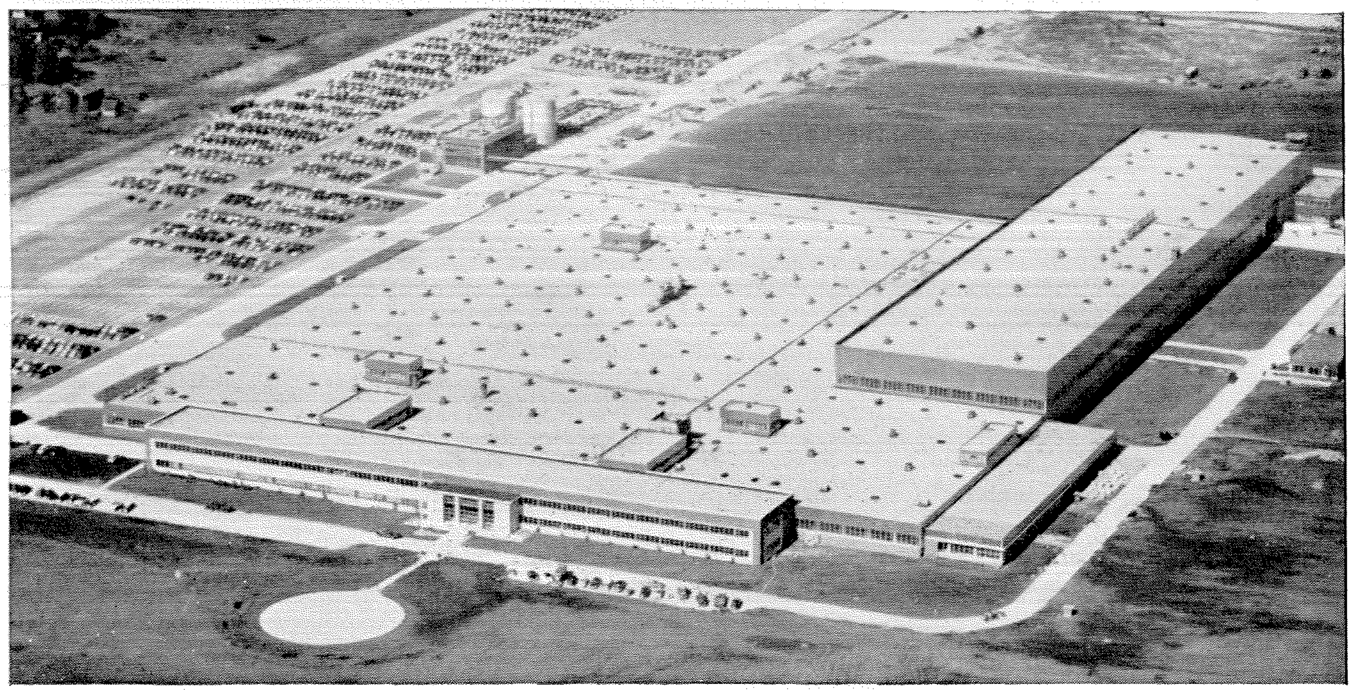
Fred W. Tahse, Jr., MS, geologist, Geodynamics Associates, Arcadia, California.

James G. Welsh, graduate work, UCLA.

Pittsburgh 22, Pa.

For Sikorsky's new 18-acre plant . . .





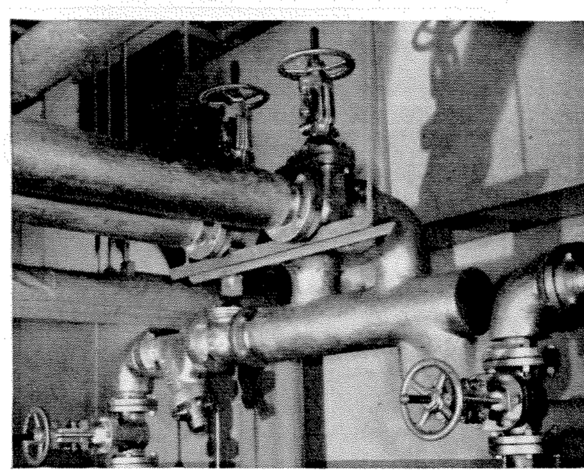
Where reliability is the watchword
JENKINS VALVES were selected

Architects and Engineers: F. A. FAIRBROTHER AND GEORGE H. MIEHLS, Detroit; with ALBERT KAHN ASSOCIATED ARCHITECTS AND ENGINEERS, Detroit, as consultants.
General Contractor: E. & F. CONSTRUCTION CO., Bridgeport.
Mechanical Contractor: JOHN WINKLE, INC., Larchmont, N. Y.

Reliability has characterized Sikorsky Helicopters throughout a long record of military and commercial service. A watchword in the building of these versatile airplanes, *reliability* also was made the critical measure of all equipment for the 18-acre Sikorsky plant recently completed in Stratford, Conn.

On the valves to control much of the complex network of pipelines, management, architects, engineers and contractors found it easy to agree. From long experience on many jobs all could be sure of the reliability of Jenkins Valves.

This confidence in the specification "JENKINS", has been shared by building experts and plant operating men alike for 93 years. The valves that have won this great confidence bear the Jenkins Diamond trademark . . . and *they cost no more.* Jenkins Bros., 100 Park Ave., New York 17.



JENKINS VALVES shown controlling heating lines. Used throughout the Sikorsky plant on steam, water, air and process piping.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES SINCE 1864 TRADE JENKINS MARK
Jenkins Bros

Sold Through Plumbing-Heating and Industrial Distributors

LOST ALUMNI

The Institute has no record of the present addresses of the men whose names appear in the list below. If you find your own name here—or that of someone you know—please drop a card, giving the current address, to the Alumni Office, California Institute of Technology, 1201 East California Street, Pasadena 4.

1906
Norton, Frank E.

1911
Lewis, Stanley M.

1921
Wulff, Robert G.

1922
Cox, Edwin P.
Yerby, Harold V.

1923
Skinner, Richmond H.

1924
McKaig, Archibald
Mercereau, James T.
Tracy, Willard H.
Young, David R.

1925
Bailey, Emerson

1926
Chang, Hung-Yuan
Huang, Y. H.
McCarter, Kenneth C.
Yang, Kai Jin

1927
Evjen, Haakon M.
Langer, R. Meyer
Riggs, Eugene H.

1928
Chou, P'ei-Yuan
Hicks, Hervey C.
Martin, Francis C.

1929
Briggs, Thomas H., Jr.
Burns, Martin C.
Nagashi, Masahiro H.
Nelson, Julius
Reed, Albert C.
Robinson, True W.
Sandberg, Edward C.

1930
Chao, Chung-Yao
Douglass, Paul W. Sr.
Janssen, Philip
Russell, Lloyd W.
Scharf, David W.
Shields, John C.
White, Dudley
Zahn, O. Franklin, Jr.

1931
Ho, Tseng-Loh
Voak, Alfred S.
West, William T.
Woo, Sho-Chow
Yoshoka, Carl K.

1932
Fraps, A. W.
Schroder, L. D.
Watson, George G.
Wright, Lowell J.

1933
Applegate, Lindsay M.
Ayers, John K.
Downie, Arthur J.
Hsu, Chuen Chang
Larsen, William A.
Lockhart, E. Ray
Michal, Edwin B.
Murdock, Keith A.
Rice, Winston H.
Shappell, Maple D.
Smith, Warren H.
Solomon, Hyman

1934
Harshberger, John D.
Liu, Yun Pu
Lutes, David W.
Moore, Morton
Radford, James C.
Read, John

1935
Becker, Leon
Ehrenberg, Gustave, Jr.
Gelzer, John R.
Huang, Fun-Chang
Kitusda, Kaname
McNeal, Don
Obatake, Tanemi

1936
Bassett, Harold H.
Chu, Djen-Yuen
Creal, Albert
Kelch, Maxwell
Kurihara, Hisayuki
Nichols, Robert M.
Ohashi, George Y.
Onaka, Takeji
Rodee, Walter F.
Watts, Euclid V.

1937
Burnight, Thomas R.
Chen, Ju-Yung
Davis, Roderic C.
Easton, Anthony
Jones, Paul F.
Lotzkar, Harry
Maginnis, Jack
Moore, Charles K.
Munier, Alfred E.
Nojima, Noble
Penn, William L., Jr.
Rechif, Frank A.
Servet, Abdurahim
Shaw, Thomas N.
Yin, Hung Chang

1938
Gershzohn, Morris
Goodman, Hyman D.
Kanemitsu, Sunao
Lowe, Frank C.
Ofsthun, Sidney A.
Okun, Daniel A.
Schoech, William A.
Stone, William S.
Tilker, Paul O.
Tsao, Chi-Cheng
Velazquez, Jose L.
Wang, Tsun-Kuei
Watson, James W.

1939
Asakawa, George
Brown, William Lowe
Easton, R. Loyal
Fan, Hsu Tsi
Hopper, Richard H.
Jones, Winthrop G.
Kyte, Robert M.
Liang, Carr Chia-Chang
Neal, Wilson H.
Robertson, Francis A.
Tatom, John F.
Tsien, Hsue-shen

1940
Batu, Buhtar
Green, William J.
Hsu, Chang-Pen
Menis, Luigi
Paul, Ralph G.
Payne, Charles M.
Tajima, Yuji A.
Tao, Shih Chen
Ustel, Sabih A.
Wang, Tsung-Su

1941
Blake, Charles L.
Bruce, Sydney C.
Clark, Morris R.
Crowson, Delmar L.
Damberg, Carl F.
Dieter, Darrell W.
Easley, Samuel J.
Feeley, John M.
Frank-Jones, Glyn
Geitz, Robert C.
Green, Jerome
Harvey, Donald L.
Hubbard, Jack M.
Kuo, I.Cheng
Robinson, Frederick G.
Standridge, Clyde T.
Stephenson, William B.
Taylor, D. Francis
Tiemann, Cordes F.
Waigand, LeRoy G.
Wald, Edwin P.

Lost Alumni . . . CONTINUED

White, John R.
Whitfield, Hervey H.
Yui, En-Ying

1942

Bebe, Mehmet F.
Bergh, Paul S.
Callaway, William F.
Carr, Earle A.
Chastain, Alexander
Go, Chong-Hu
Hughes, Vernon W.
Levin, Daniel
MacKenzie, Robert E.
Martinez, Victor H.
Sternberg, Joseph

1943

Angel, Edgar P.
Bethel, Horace L.
Bridgland, Edgar P.
Burlington, William J.
Bryant, Eschol A.
Carlson, Arthur V.
Colvin, James H.
Daniels, Glenn E.
Enikeieff, Oleg C.
Hamilton, William M.
Hewson, Lawrence
Hillyard, Royal L.
Hilsenrod, Arthur
Johnson, Edwin G.
King, Edward G.
Koch, Robert H.
Kong, Robert W.
LaForge, Gene R.
Lee, Edwin S., Jr.
Leeds, William L.
Ling, Shih-Sang
Lobban, William A.
Lundquist, Roland E.
Mampell, Klaus
McNeil, Raymond F.
Mixsell, Joseph W.
Mowery, Irl H., Jr.
Nesley, William L.
Neuschwander, Leo Z.
Newton, Everett C.
O'Brien, Robert E.
Patterson, Charles M.
Pearson, John E.
Rambo, Lewis
Rivers, Nairn E.
Roberts, Fred B.
Rupert, James W., Jr.
Scholz, Dan R.
Shannon, Leslie A.
Smitherman, Thomas B.
Tindle, Albert W., Jr.
Vicente, Ernesto
Walsh, Joseph R.
Courtland, L. Washburn
Weis, William T.
Wood, Stanley G.
Yung, Chiang H.

1944

Alpan, Rasit H.
Baranowski, John J.
Barriga, Francisco D.
Bell, William E.
Benjamin, Donald G.
Berkant, Mehmet N.
Birlik, Ertugrul
Burch, Joseph E.
Burke, William G.
De Medeiros, Carlos A.
Fu, Ch'eng Yi Fu
Gray, J. Doyle
Harrison, Charles P.
Hu, Ning
Johnson, William M.
Kern, Jack C., Jr.
Labanauskas, Paul J.
Leenerts, Lester O.
Marshall, John W.
McAnlis, Robert G.
Shults, Mayo G.
Stanford, Harry W.
Stein, Roberto L.
Sullivan, Richard B.
Sunalp, Halit
Taylor, Garland S.
Trimble, William M.
Unayral, Nustafa A.
Wolf, Paul L.
Wood, George M.
Writt, John J.
Yik, George

1945

Gibson, Charles E.
Jenkins, Robert P.
Kuo, Yung-Huai
Mendelson, Burton G.
Romney, Carl F.
Tseu, Payson S.
Zambon, Louis B.

1946

Barber, John H.
Burger, Glenn W.
Conradt, Robert H.
Dethier, Bernard
Dyson, Jerome P.
Esner, David R.
Foster, R. Bruce
Hayne, Benjamin S., III
Hege, Douglas W.
Hoffman, Charles C.
KeYuan, Chen
Lang, Serge
Lewis, Frederick W.
Lowery, Robert H.
Maxwell, Frederick W.
MacDonald, Norman J.
Prasad, K. V. Krishna
Simmons, George F.
Sledge, Edward C.
Smith, Harvey F.
Stone, Dean P.
Tung, Yu-Sin
Uberoi, Mahinder S.
Weldon, Thomas F.

1947

Atencio, Adolfo J.
Boyd, John R.
Clock, Raymond M.
Dagnall, Brian D.
Hsu, Chi-Nan
Hsueh, Chi-Hsun
Huang, Ea-Qua
Leo, Fiorello R.
MacAlister, Robert S.
Manning, Ordway T.
McClellan, Thomas R.
Molloy, Michael K.
Monoukian, John
Moorehead, Basil E. A.
Nelson, Conrad N.
Orr, John L.
Rosell, Fred E., Jr.
Sappington, Merrill H.
Swatta, Frank A.
Vanden Heuvel, Geo. R.
Veale, Joseph E.
Wan, Pao Kang
Wellman, Alonzo H., Jr.
Ying, Lai-Chao

1948

Agnew, Haddon W.
Bingham, Andrew T.
Blue, Douglas K.
Browne, Charles I., Jr.
Bunce, James A.
Collins, Burgess F.
Crawford, William D.
Hall, James N.
Harris, John N.
Hsiao, Chien
Hsieh, Chia Lin
Leavenworth, Cameron
MacNeill, Robert J.
Mason, Herman A.
McCollam, Albert E.
Morehouse, Gilbert G.
Oliver, Edward D.
Rhynard, Wayne E.
Robinson, Martin S.
Swain, John Sabin
Swank, Robert K.
Walters, James W., Jr.
White, Harvey J.
Winniford, Robert S.
Yanak, Joseph D.

1949

Barker, Edwin F., Jr.
Baumann, Laurence I.
Clancy, Albert H., Jr.
Clendening, Herbert
Cooper, Harold D.
Dannan, John H.
Foster, Francis C.
Heiman, Jarvin R.
Krasin, Fred E.
Kuchar, Charles E.
Lowrey, Richard O.
MacKinnon, Neil A.
Matteson, Robert C.
McElligott, Richard H.
Orme, Eric C.
Petty, Charles C.
Ringness, William M.
Rudin, Marvin B.
Stappler, Robert F.
Weiss, Mitchell
Yi, Sien-Chiue

1950

Bryan, William C.
Edelstein, Leonard
Hendrickson, James
Li, Chung Hsien
McDaniel, Edward F.
McMillan, Robert
McNamara, John H.
Monroe, Alfred J.
Nelson, Robert C.
Pao, Wen Kwe
Paulson, Robert W.
Roberts, Morton S.
Roddick, James A.
Scherer, Lee R., Jr.
Schneider, William
Shen, San-Chiun
Spevak, Ezra
Sullivan, John H.
Vivian, James A.

1951

Arosemena, Ricardo
Brewer, Richard G.
Davison, Walter F.
Denton, James Q.
Hawk, Riddell L.
Latdjian, Jacob P.
Li, Cheng-Wu
Padgett, Joseph E., Jr.
Palmer, John M., Jr.
Summers, Allan J.

1952

Abbott, John R.
Arcoulis, Elias G.
Baugher, John D.
Gates, Victor
Jepson, James O.
Kennon, Richard E.
Loftus, Joseph F.
Long, Ralph F.
Lunday, Adrian C.
Noll, J. Crawford
O'Brien, Joseph
Price, Edgar P.
Primbs, Charles L.
Robieux, Jean
Schaufele, Roger D.
Shelly, Thomas L.
Wiberg, Edgar
Woods, Joseph F.
Zacha, Richard B.

1953

Fink, George B.
Gardner, William D.
Mishaan, Alberto
Morishita, Naoji
Muss, Daniel R.
Rankin, Fred W., Jr.
Slodowski, Thomas R.
Vidal, Jean L.
Wood, Robert H.

1954

Cardinale, Otto
Peterson, Clarence E.
Quiel, Norwald R.
Rosen, Benjamin M.

1955

Moore, William T.
Muraru, Vasile
Nesman, Miles

1956

Sharp, Robert V.
Viens, Charles H.

1957

Lawrence, Alfred F., Jr.

ALUMNI DIRECTORY SUPPLEMENT

A supplement to the 1957 Alumni Directory will be ready for distribution sometime around the middle of December. This supplement will list the names and addresses ONLY of those who received degrees in June, 1957. Copies of this supplement will be sent automatically to paid alumni who received a degree in 1957. Other paid alumni may secure a copy of this supplement by filling in the form below and sending it to the Alumni Office.

Please send a 1957 Directory supplement to:

Name..

Address..

City.......................................**State**...............

F Y I

FOR YOUR INFORMATION

Allied Chemical

DIVISIONS
Barrett
General Chemical
National Aniline
Nitrogen
Semet-Solvay
Solvay Process
International

▶beat barnacles *▶water-resistant coatings*
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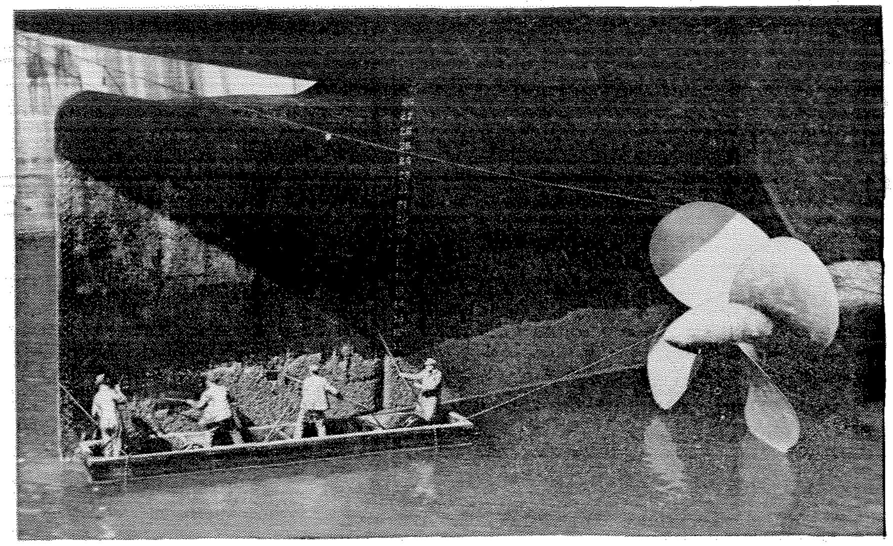

Beat barnacles

"Barnacle Bill" is not only the title of an old sea song—it's the price ship operators pay for inefficient operation due to barnacle-fouled hulls.

Although you can combat fouling with copper pigments, conventional copper bottom paints may create new problems by accelerating the corrosion of steel hulls.

MUTUAL sodium copper chromate to the rescue: research shows that it has both anti-fouling and anti-corrosive properties. No surprise either, because it is a member of the same pigment family as "zinc yellow," a chromate long used as a corrosion inhibitor in metal priming paints. Anti-fouling of course, because it contains copper.

This useful combination of properties also has led us to test MUTUAL sodium copper chromate in preservative combinations for wood, cordage, fabrics and paper, and in agricultural fungicides.

Olefin opportunities

Did it ever occur to you that your product might be epoxidizable? Or even hydroxylatable?

What, never? All we mean is you can upgrade it with hydrogen peroxide, to put you in new markets with greater profits.

With H_2O_2*, you can upgrade* such olefins as soya bean oil, cottonseed oil, tall oil, turpentine, linseed oil or unsaturated petroleum derivatives.

By upgrading, you find yourself making resin plasticizers, glycols, stabilizers, insecticides, monomers, lubricants, waxes, surfactants or brake fluids.

In the epoxidation and hydroxylation processes, hydrogen peroxide reacts with unsaturated olefins to form a completely different class of chemical compounds. Of course, hydrogen peroxide has been around for some time, but recent developments now permit broad commercial use of these processes.

Research people working in chemicals, plastics and pharmaceuticals will be interested in a new Solvay Process Division up-to-date review and bibliography on the subject.

Water-resistant coatings

Paper coaters know that if they want to keep a coating from coming off in water, they must insolubilize the binder after application.

Starch, casein, protein and latex are the most widely used paper coating and sizing adhesives. The major advantage of starch is its ease of use, but this is offset by its lack of water resistance. On the other hand, although casein, protein and latex give good water resistance, they are more expensive.

May we suggest a starch coating modified with U.F. CONCENTRATE-85, for low-cost, water-resistant paper coatings. A product of our Nitrogen Division, U.F. CONCENTRATE-85 is a low-cost, non-resinous, high-concentration urea-formaldehyde product.

You can obtain different degrees of insolubility by adding 2 to 50% to the starch, though 20% generally makes an excellent coating. Other assets: a simple mixing operation, a useable pH range of 4 to 8.

We have available a new technical paper on the subject, "A new product for the insolubilization of starch films."

New urethane booklet

In these columns, we've talked about what the industry calls "the next great synthetic." Allied's interest in urethane materials lies with our National Aniline and Barrett Divisions, which produce the key chemicals—diisocyanates and polyester resins respectively—used in making these versatile plastics. Now we have a new booklet available on urethane materials, detailing their applications and their future.

MUTUAL and U.F. CONCENTRATE-85 are Allied Chemical trademarks.

Creative Research

These examples of product development work are illustrative of some of Allied Chemical's research activities and opportunities. Allied divisions offer rewarding careers in many different areas of chemical research and development.

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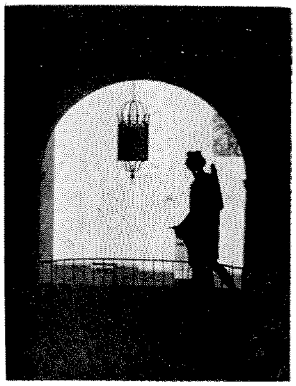
61 Broadway, New York 6, N. Y.



CALTECH CALENDAR

ALUMNI EVENTS

January 16	Dinner Meeting
February 22	Dinner-Dance
April 12	Annual Seminar
June 11	Annual Meeting
June 28	Annual Picnic

ATHLETIC SCHEDULE

VARSITY BASKETBALL

January 10
Caltech at Riverside

January 15
Pomona at Caltech

January 17
Occidental at Caltech

January 18
Caltech at La Verne

January 21
Caltech at Nazarenes

January 25
Caltech at Redlands

FRIDAY EVENING DEMONSTRATION LECTURES

Lecture Hall, 201 Bridge, 7:30 P.M.

December 20
Geologic Aspects of Engineering Disasters in Southern California
Dr. Richard Jahns

January 3
Satellites
Dr. Albert Hibbs

January 10
Plants are Weather-Conscious
Dr. Frits Went

January 17
A New Method for Exploring the Depths of Oceans
Dr. Harrison Brown

ALUMNI ASSOCIATION OFFICERS

PRESIDENT
Willis R. Donahue, '34

SECRETARY
Donald S. Clark, '29

VICE-PRESIDENT
Edward P. Fleischer, '43

TREASURER
George B. Holmes, '38

BOARD OF DIRECTORS

Frank C. Bumb, '51
L. Fort Etter, '35
John R. Fee, '51
John E. Fleming, '46
Chester W. Lindsay, '35
John E. Osborn, '39
Nick T. Ugrin, '34

ALUMNI CHAPTER OFFICERS

NEW YORK CHAPTER

President — E. Morton Holland '36
A. G. Edwards & Sons, 501 Lexington Avenue, New York 17

Vice-President — Albert E. Myers '29
530 Rock Road, Glen Rock, New Jersey

Secretary-Treasurer — Frank F. Scheck '48
Pennie, Edmonds, Morton, Barrows & Taylor,
247 Park Avenue, New York

WASHINGTON, D.C. CHAPTER:

President — Frank H. Shelton '49
Armed Forces Special Weapons Project

Secretary-Treasurer — Richard G. King '49
Applied Physics Laboratory, Johns Hopkins University
Silver Springs, Maryland

SAN FRANCISCO CHAPTER

President — Donald E. Loeffler '40
Shell Oil Company, Martinez

Vice President — Jules F. Mayer '40
Chemical Division, Standard Oil Co., Richmond

Secretary-Treasurer — Norman Bulman '52
Shell Oil Company, Martinez

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

CHICAGO CHAPTER:

Secretary-Treasurer — Lawrence H. Nobles '49
Northwestern University, Evanston

SACRAMENTO CHAPTER:

President — Wayne MacRostie '42
State Department of Water Resources, Box 1079, Sacramento

Vice President — Charles M. Herd Ex. '30
State Division of Architecture, 1120 "N" Street, Sacramento

Secretary — John Ritter '35
State Division of Highways, 1120 "N" Street, Sacramento

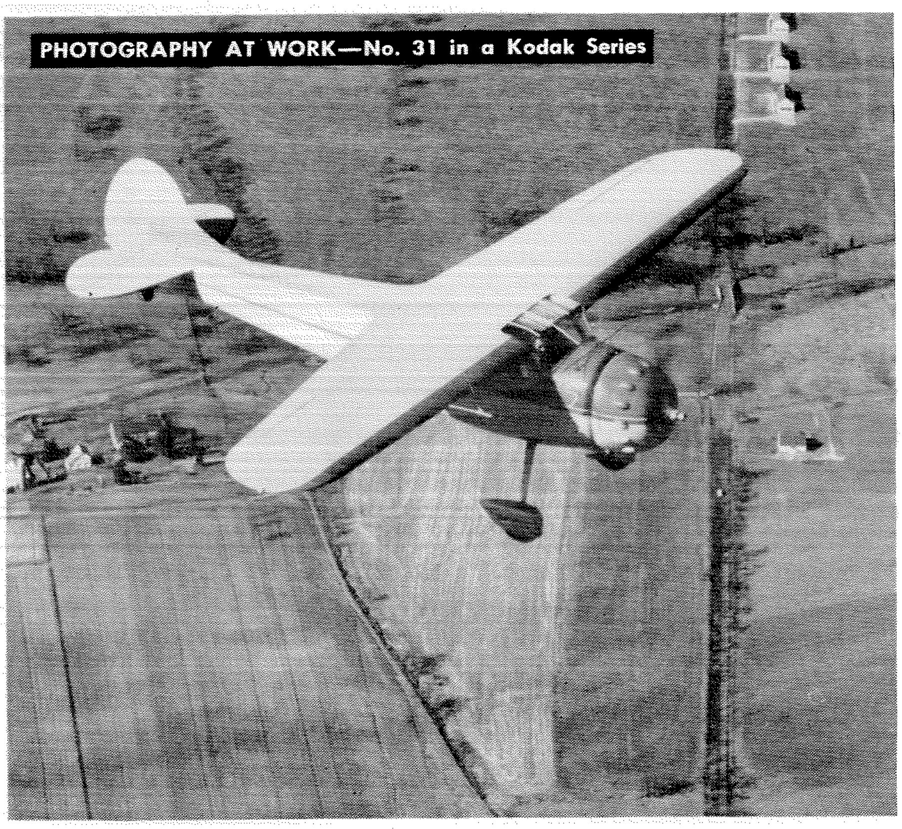
Meetings: Luncheon first Friday of each month.
University Club, 1319 "K" St., Sacramento

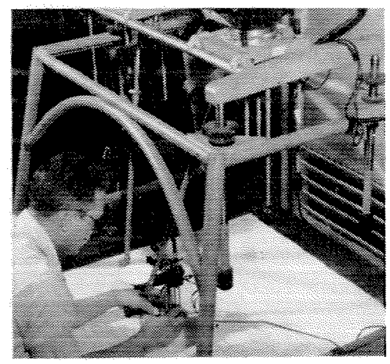
SAN DIEGO CHAPTER:

Chairman — Maurice B. Ross '24
3040 Udal Street, San Diego 6, Calif.

Secretary — Frank John Dore, Jr. '45
Consolidated Vultee Aircraft Corp., San Diego

Program Chairman — Herman S. Englander '39
U. S. Navy Electronics Laboratory





Using a stereoscopic plotter the engineer can prepare a contour map. The photo-analyst reads the photographs directly for the meaning of earth and foliage in determining subsoil characteristics and much other valuable data.

In minutes the survey plane flies over the prospective site, making overlapping stereo photographs.

A sharp eye in the sky picks plant sites, appraises soil and water supply

Stereo aerial photographs in the hands of Donald J. Belcher & Associates Incorporated, Ithaca, N.Y., reveal a wealth of information about a location in a fraction of the usual time and at far less cost.

Picking a plant site, determining drainage and foundation conditions, routing a highway or pipeline, can mean months of trudging toil and sampling.

But not when you put photography to work.

The sharp eye of the depth-revealing 3D camera gets every detail down on paper where the trained analyst can translate the photographic record into invaluable facts for the engineers.

Whether it is in finding a plant site, or in aiding research, improving a product or increasing sales, photography plays an important position on industry's team. For small companies and large, it picks up chores that free technical hands for creative work. It trains, it sells, it takes over office routine. You'll find it can work for you, too.

CAREERS WITH KODAK

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

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TRADE MARK

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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