Winter 1-1958

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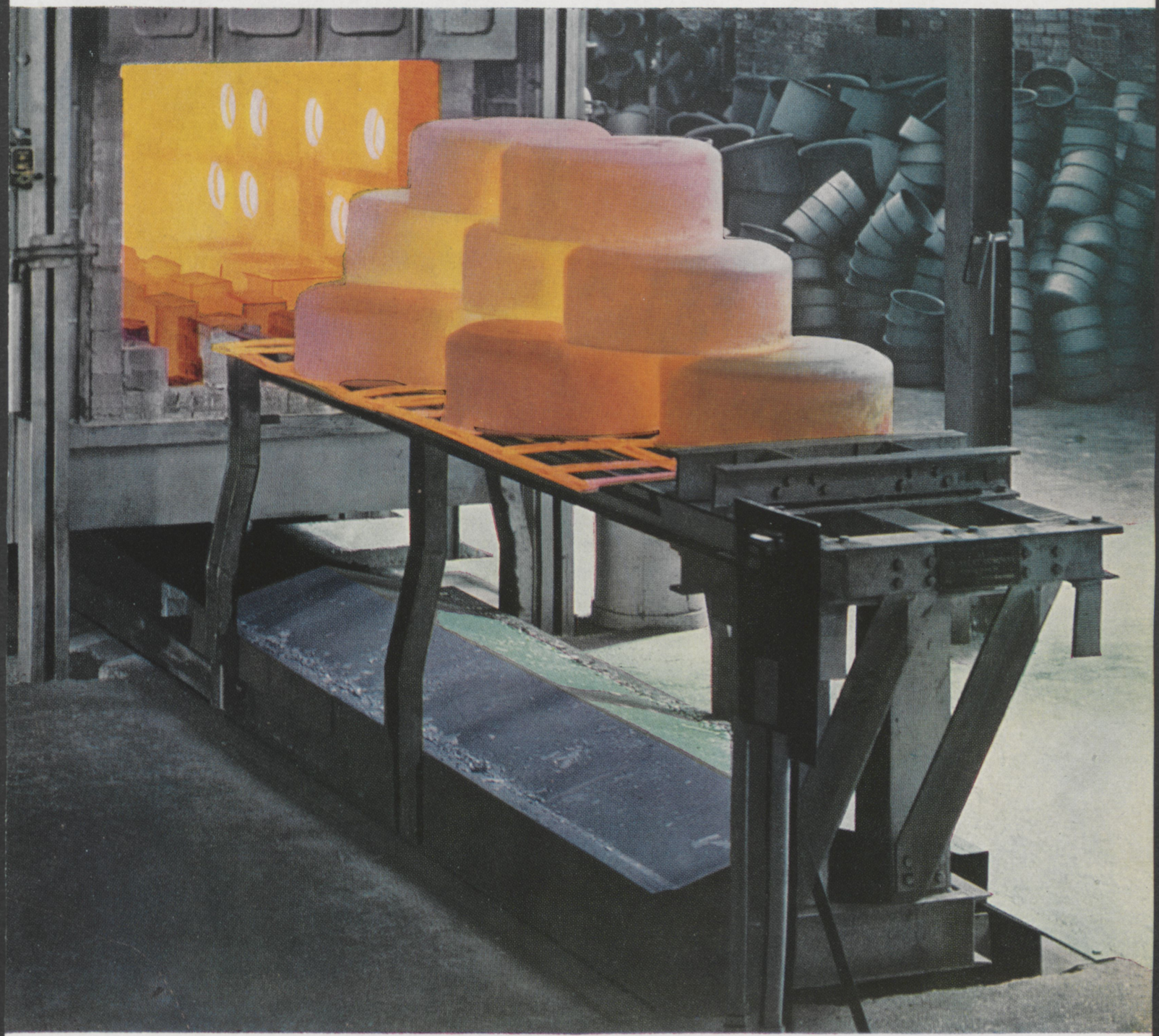
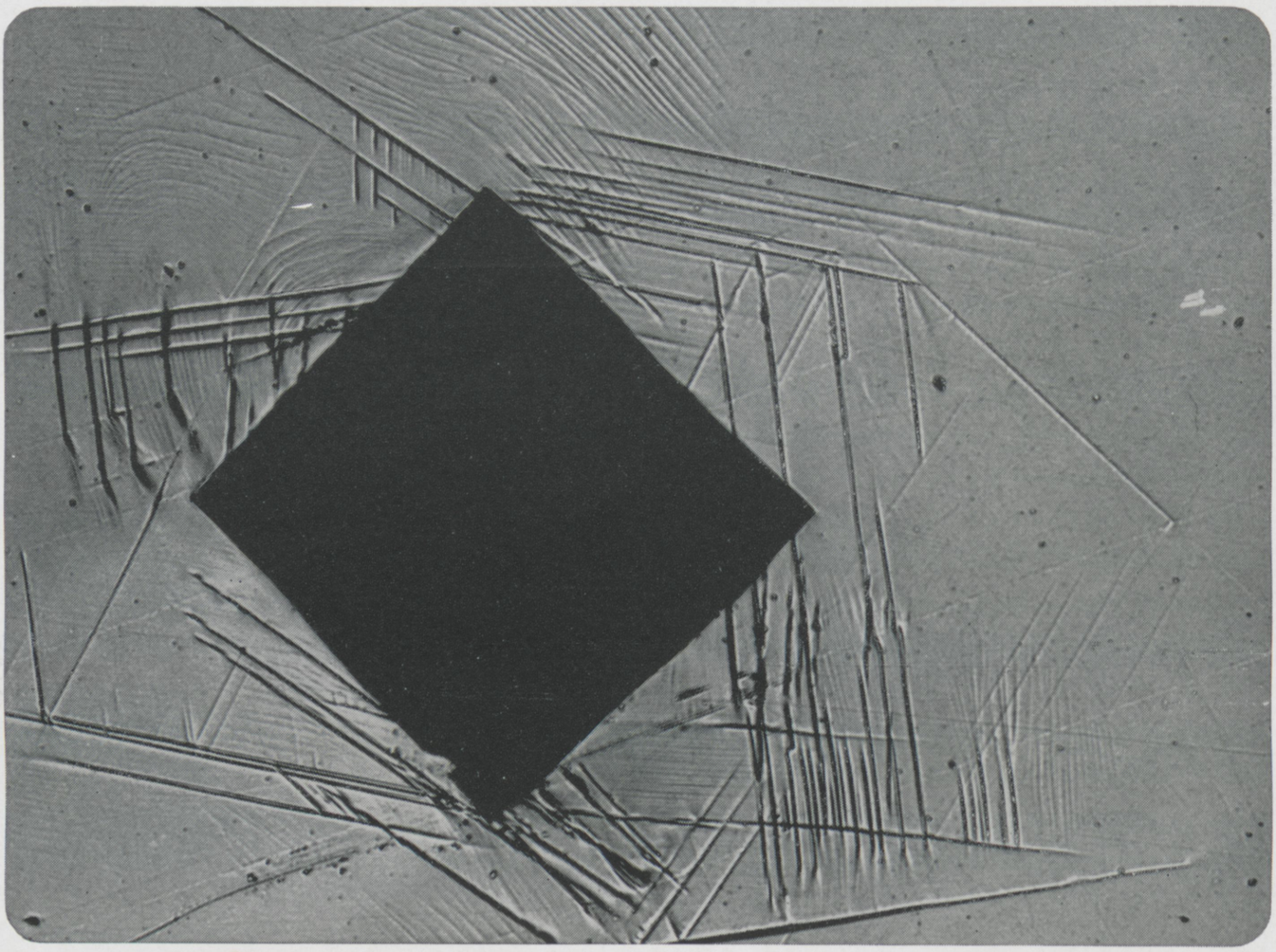
Rose Technic Staff
Rose-Hulman Institute of Technology

Rose Technic

January 1958



In This Issue:



Did you ever hear atoms move?

The physicist positions a single crystal of age-hardened steel under the sharp diamond penetrator. He touches a pedal, and the pyramidal tip of the diamond squeezes into the polished surface of the steel.

The instant that it touches, things begin to happen inside the crystal. Atoms begin to slip and slide, in layers. Some layers abruptly wrinkle and corrugate. If you listen hard when this happens, you hear a faint, sharp, "click." This is the sound of atoms suddenly shifting within the crystal.

You can see the action, too—or, rather, the results of it. The photomicrograph above shows the characteristic ridges and ripples. The black diamond in the center is the depression made by the penetrator.

By studying these patterns, and correlating the information with other data, scientists at U. S. Steel are trying to learn what happens atomically when a steel is bent, flexed or broken. Thus, they try to develop new and better steels for an exacting and ever-growing steel market.

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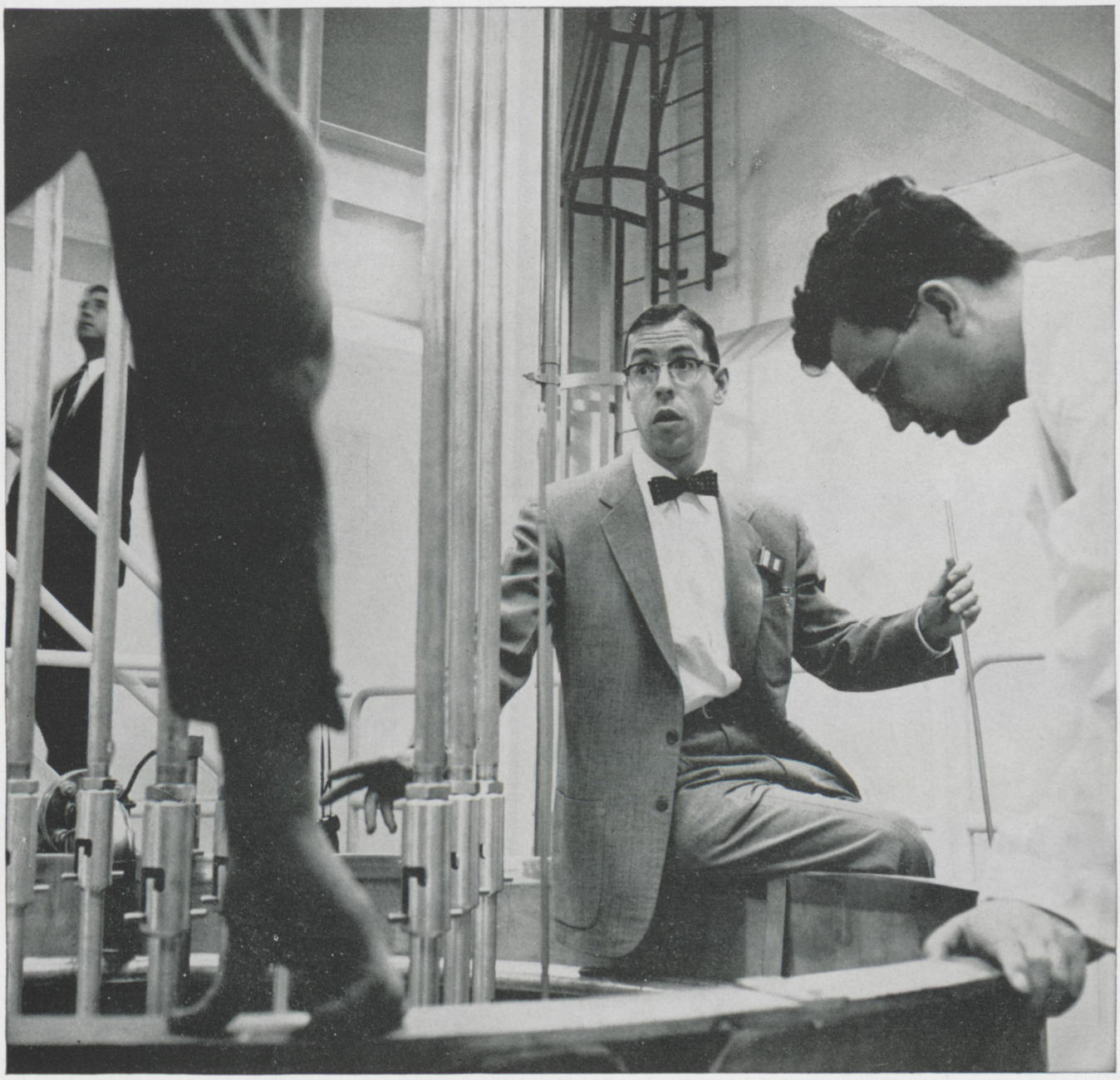
USS

UNITED STATES STEEL



Harvey Graves (Dartmouth, BA '50, MSEE '51) discusses a reactor experiment at the Westinghouse Reactor Evaluation Center, in Waltz Mill, Pa. As manager of the Nuclear Design Section, Mr. Graves works with Dr. Wilfried Bergmann (Vienna, PhD '51), on right, and other young scientists who operate the facility.

At 30, Harvey Graves directs nuclear design of two major Westinghouse reactors

After completing the Westinghouse Student Training Course in 1951, Harvey Graves attended the Westinghouse Advanced Design Course* and was sent by Westinghouse to the Oak Ridge School of Reactor Technology for one year. Back at Westinghouse again in 1953, Engineer Graves did advanced work on nuclear reactor development.

In 1955, he was promoted to supervisory engineer on the Belgian reactor project. In 1956, he was again promoted to Manager, Westinghouse Nuclear Design Section. Today, Mr. Graves' 24-man section is developing and designing the nuclear portion of commercial reactors for the Yankee Atomic Electric Company and the Center d'Etude de l'Energie Nucléaire in Belgium

*Fully accredited graduate school

Progress? Certainly. And if you have ability and ambition, you'll find Westinghouse offers equal engineering opportunities in automation, jet age metals, radar, semiconductors, electronics, large power equipment, guided missile controls and dozens of other fascinating fields.

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A chemical engineer, Bill came to us from the University of Michigan. He and his associates work on problems involving chemical engineering, economics, cost control and sound advance planning. Facing new situations daily, they work with many people in the Research Center and in the refinery. As a result, they gain an ever-widening knowledge of refinery operations.

Sound interesting? Bill Nemec is one of hundreds of young men with widely varied backgrounds, talents and responsibilities building careers at Standard Oil's progressive Whiting, Indiana, laboratories.

Standard Oil Company

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STANDARD

Rose Technic

VOLUME LXIX, NO. 4 JANUARY, 1958

Contents

Cover

Shown in the cover is the white hot steel as it comes from the annealing furnace. The furnace produces large quanities of annealed partially-drawn vacuum chambers for water-cooled ignition tubes. The cover plates are supplied through the courtesy of the American Machinist Journal.

COURTESY GENERAL ELECTRIC COMPANY.

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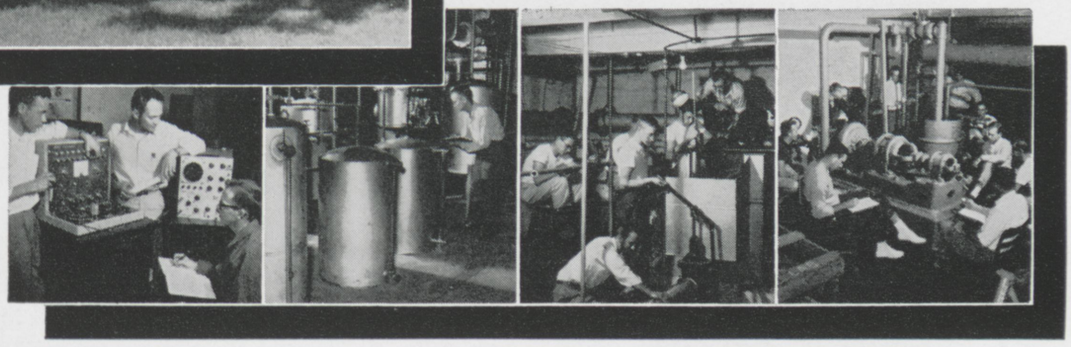
ROSE



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Office OF ADMISSIONS

ROSE POLYTECHNIC
INSTITUTE
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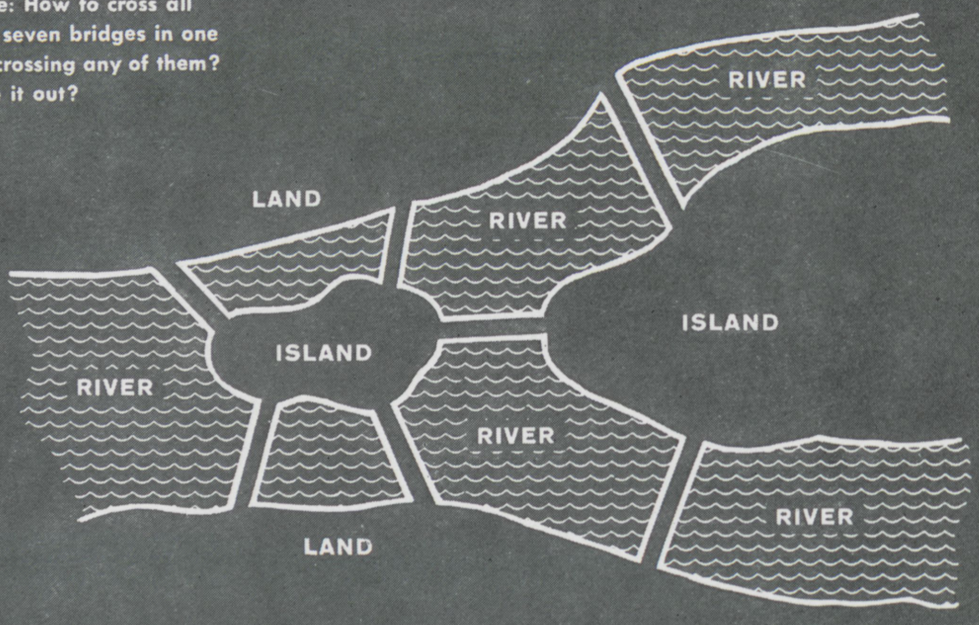
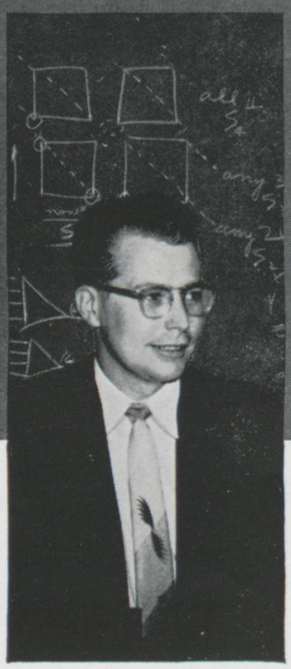
CAN YOU FIGURE IT OUT?

223 years ago, the good townspeople of Koenigsberg amused themselves with this puzzle: How to cross all of their town's seven bridges in one trip without recrossing any of them? Can you figure it out?



*"Solution" at bottom of page



Robert G. Hildenbrandt tells what it's like to be . . . and why he likes being . . . an Electronic Circuit Designer with IBM.

FIGURING OUT A CAREER?

Selecting a career can be puzzling, too. Sometimes, as with the seven bridges, the answers aren't always available. In engineering and research, it's just as important to discover that no solution may be possible as to find the solution. It is equally true in career selection that some companies can provide solutions . . . opportunities for growth . . . not always available in all companies. Here's how Bob Hildenbrandt *found* the solution to his career problem—at IBM:

"Since joining IBM," Bob says, "I've seen some amazing developments in advanced circuitry. In my opinion, transistorized digital airborne computers represent one of the most progressive assignments in electronics today. As we enter the missile age, the technology of packaging and miniaturization will take on increasing importance. Transistorized computers offer an excellent chance for development work in computer circuits . . . high-frequency power supplies . . . magnetic amplifiers, regulators, storage devices. Challenge? It's tremendous—for we're working not only on present systems, but those of the future!"

* * * *

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

JUST WRITE TO:

Mr. R. A. Whitehorne
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590 Madison Avenue
New York 22, N. Y.

***"SOLUTION"**

This is one of the celebrated problems of mathematics, dating from the 18th century. That it CAN'T be done was proved by the great mathematician Euler in 1735. Euler's "solution" founded the science of topology, important today in electronic circuit design.

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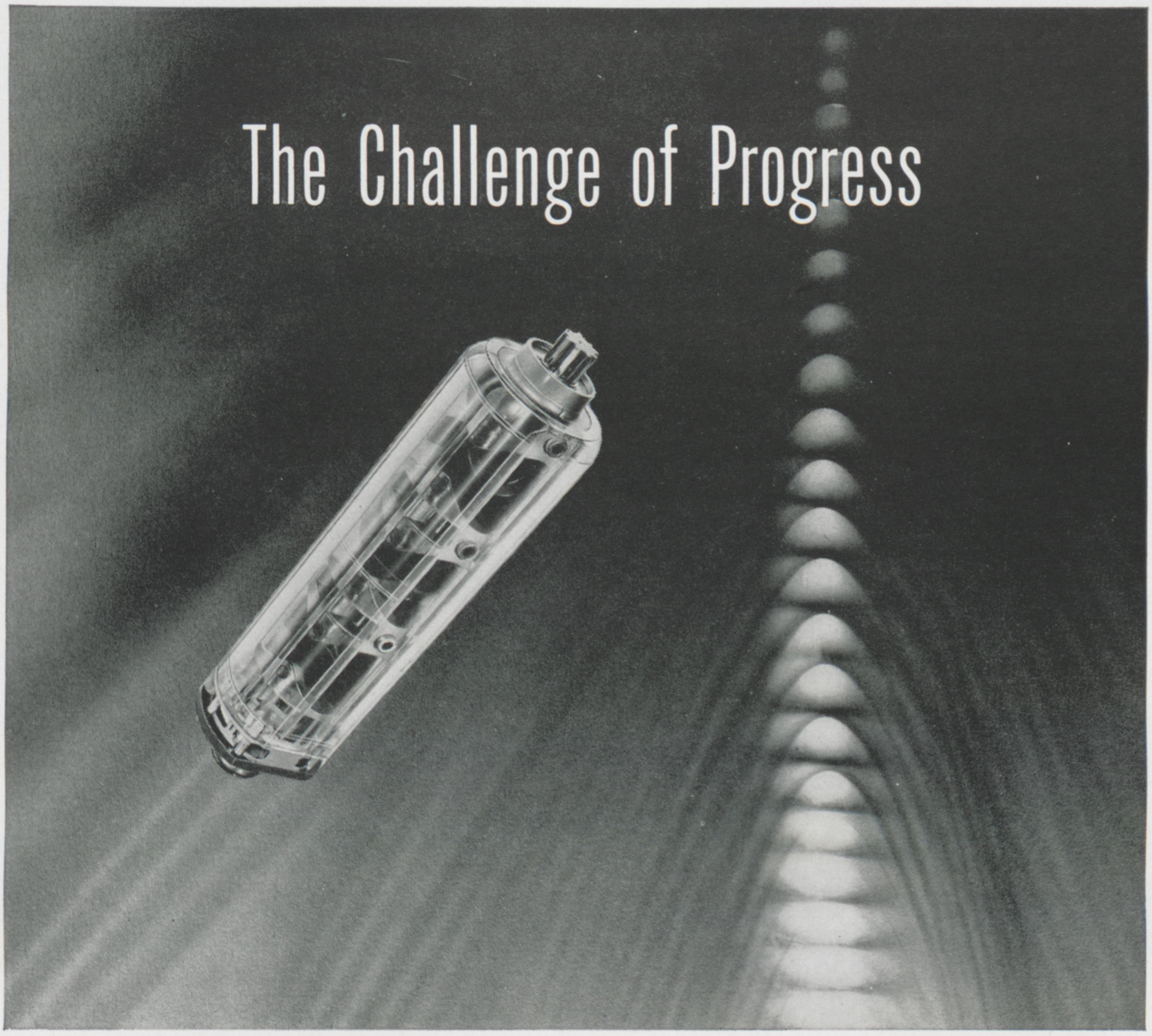

Recently AiResearch engineers were called upon to develop an accessory power motor for aircraft and missiles which would operate at +1000°F. . . . a temperature area where present-day hydraulic and electrical devices fail.

Their answer was this cam piston air motor, pictured above in a specially built transparent shell. Operating on hot air or gas, its efficiency actually increases as temperatures rise.

This problem and its solution are typical of many encountered at AiResearch in aircraft, missile, nuclear and electronic fields. Specifically, you'll find them in system electronics; computers and flight instruments; gas turbine engines and turbine motors; cryogenic and nuclear systems; pneumatic valves; servo control units and air motors; industrial turbochargers; air conditioning and pressurization; and heat transfer.

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

Project work is conducted by small groups where individual effort is more quickly recognized and opportunities for learning and advancement are enhanced.

• *For full information write to Mr. G. D. Bradley,*

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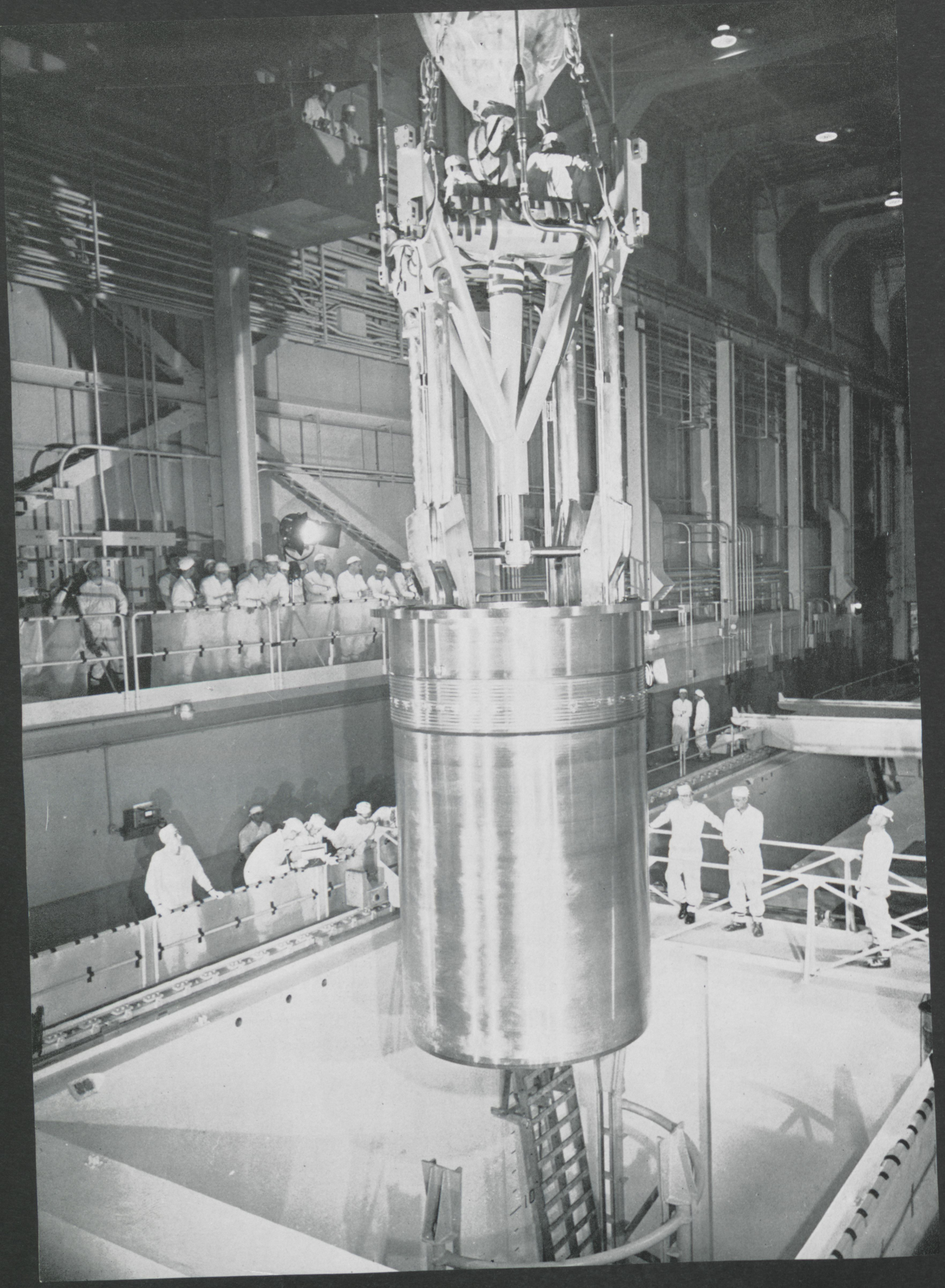


EDITORIAL

Incentive and Initiative

With the changing of the TECHNIC staffs, there is no better time than now to speak of incentive and initiative. Many people talk of the apathetic atmosphere that surrounds Rose. To a certain extent this must be true—for there always seems to be a lack of willing hands in student activities. We all recognize that this is true, to some extent, and the majority of us wish to correct the situation. The engineer, who is in industry, is the "creator of tomorrow" and the "builder of today." Surely he can show no apathy if he is to get ahead in the cold business world. He must show incentive and initiative if he is to better himself, get that promotion or raise his salary.

The true engineer of today is the theory of incentive and initiative in practice. Rose men have always made their place in industry and society and are prepared for this challenge as well as, if not better than, the next graduate engineer. If they are successful, or even mildly so, then they have accepted initiative and incentive as their byword and have proceeded to display their talents in whatever line of endeavor they might choose.

If it is necessary to accept these traits to get ahead, why should we wait until going into business to use them? Why not call on incentive and initiative now and develop them so that they will be ready to work for us when we really need them? Be two steps ahead of the next man; exert ourselves to the fullest; show what we are capable of doing on our own. By putting ourselves, our very being, behind our school and its activities, we will dispell this idea of disinterest that surrounds Rose. At the same time we will be doing ourselves a big favor. It is not so much doing just what you are told to do, but more important, going ahead and doing more than you need to. In short, finding work to be done and then doing it. Find a job that suits you and your talents and that needs to be done, then give your whole self to it until you think you can give it no more, then do just a little more. If you can successfully do this, you have learned the secret to initiative and incentive and can use them the rest of your life—they are yours.

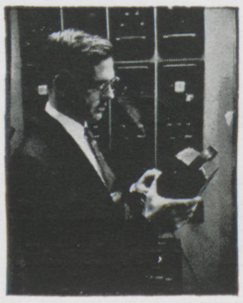
R.L.T.

FRONTISPIECE—The heart of the nations first full-scale atomic-generating station slowly is lowered into position with its precious fuel consisting of 13 tons of natural uranium and 165 pounds of highly enriched uranium. The multi-million dollar nuclear core weighs 58 tons. Engineers and technicians of Duquesne Light Company and The Westinghouse Electric Corporation are seen here supervising the installation of the huge core.

What is an AGE engineer?

Wheeling, West Virginia — SUBSTATION ENGINEER Wilbur L. Kelvington outlines plans for service extensions to new customers.

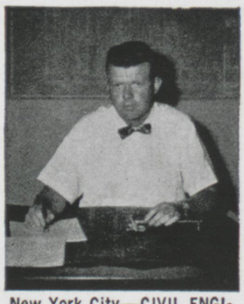
New York City — NUCLEAR POWER ENGINEER Robert Hunter looks to the future in nuclear power research and development work.



Roanoke, Va.—ELECTRONICS ENGINEER Curtis Bondurant finds electronics fascinating and in widespread use on the AGE System.

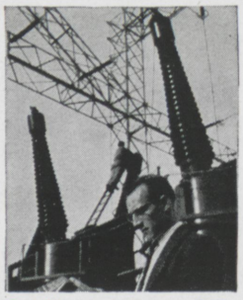
Pikeville, Kentucky — DISTRICT SUPERVISING ENGINEER James R. Burdsal and Line Foreman discuss a power line maintenance problem.

Glen Lyn, Virginia — CHEMICAL ENGINEER David E. Ketlewell supervises the chemical laboratory at a major power station.



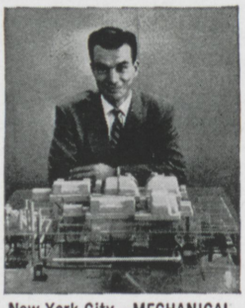
New York City—CIVIL ENGINEER Francis P. Keane helps design power plants and auxiliary facilities.

New York City—MECHANICAL ENGINEER John Tillinghast confers with manufacturer and colleagues on super-critical steam pressure unit.



Fort Wayne, Indiana — SUBSTATION ENGINEER Allen Wilson supervises installation of 345,000-volt oil circuit breaker.

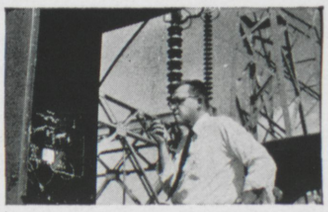
Lima, Ohio — INDUSTRIAL POWER ENGINEER Cal Carlini tackles a difficult engineering problem posed by a major customer.



New York City—MECHANICAL ENGINEER Alfred J. Banks with a model of a new AGE generating unit.

Beverly, Ohio—TEST ENGINEER Norman Blair taking readings in the control room of a 430,000-kw generating plant.

Roanoke, Virginia — COMMERCIAL MANAGER John W. Vaughan directs the promotion and sale of electric power to customers.



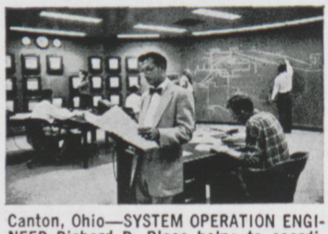
Fort Wayne, Indiana—COMMUNICATIONS ENGINEER Wilho R. Roy has responsibilities in radio, microwave and carrier current communications.

Butler, Indiana — DISTRICT MANAGER William R. Nimmo supervises the restoration of service during a storm.

Columbus, Ohio — SYSTEM OPERATION ENGINEER William D. Omspach helps plan economical operation of world's largest private power system.

New York City — SYSTEM PLANNING ENGINEERS Conrad F. DeSieno and Anthony F. Gabrielle plan the AGE System of the future with a network analyzer.

Philo, Ohio — MECHANICAL ENGINEER Alan G. Lloyd helps supervise installation of world's first super-critical pressure generating unit.



Canton, Ohio—SYSTEM OPERATION ENGINEER Richard P. Blaes helps to coordinate load scheduling and the exchange of power with other electric utilities.

He's a man with a future. He may be any of the eighteen engineers pictured above who daily solve problems of energy conversion, power application, transmission and distribution. Or he may be one of our nearly 800 other engineers who work in eight states solving many stimulating and challenging problems faced by the AGE Electric Power System. Find out about career opportunities for YOU at AGE. Read our new 24-page brochure "Join the Company that *Makes* the News!" It's at your local placement office . . . or write for your own copy to any of the addresses listed below, attention: *Employee Relations Department.*

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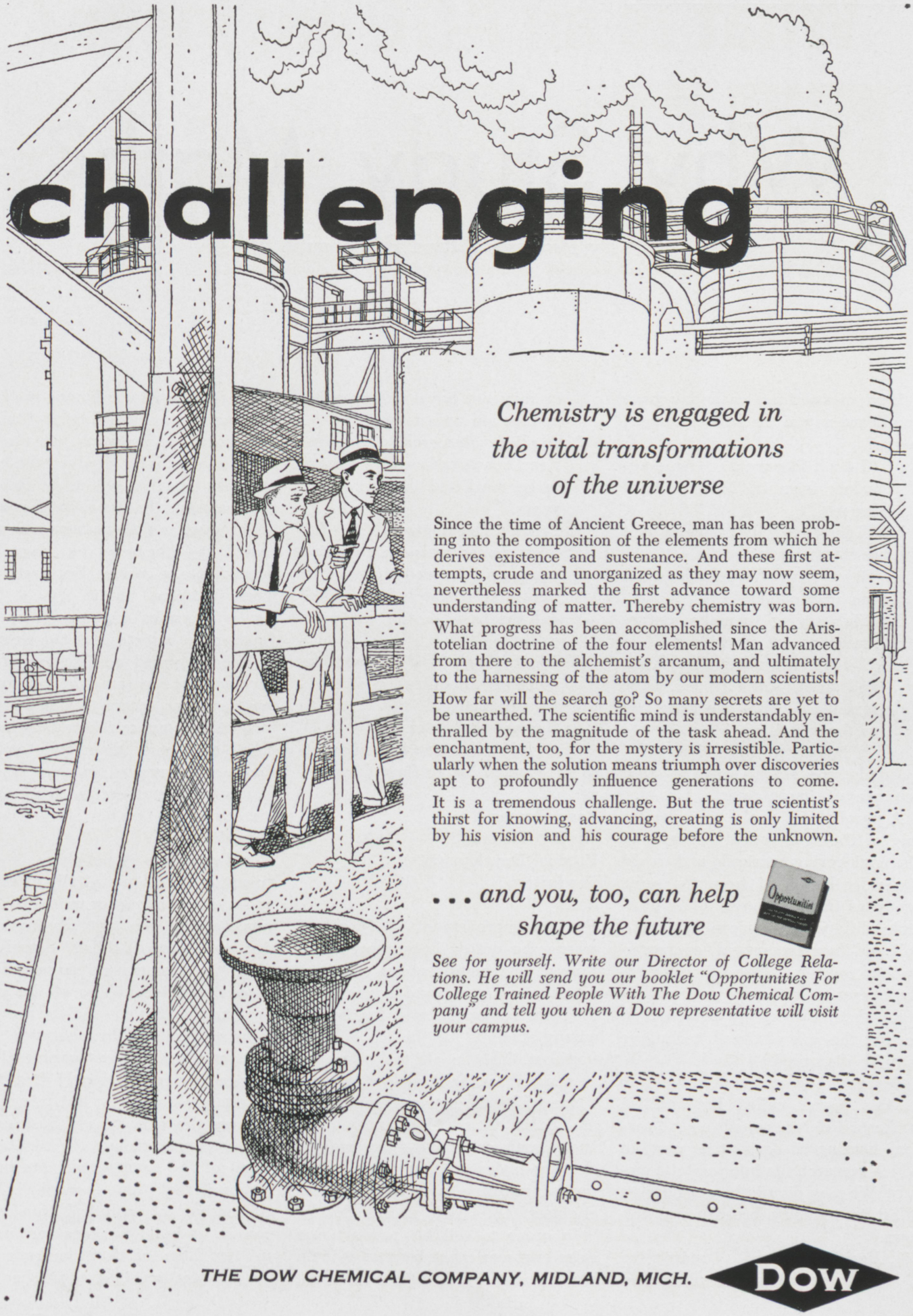
AMERICAN GAS AND ELECTRIC SYSTEM



challenging

Chemistry is engaged in the vital transformations of the universe

Since the time of Ancient Greece, man has been probing into the composition of the elements from which he derives existence and sustenance. And these first attempts, crude and unorganized as they may now seem, nevertheless marked the first advance toward some understanding of matter. Thereby chemistry was born.

What progress has been accomplished since the Aristotelian doctrine of the four elements! Man advanced from there to the alchemist's arcanum, and ultimately to the harnessing of the atom by our modern scientists!

How far will the search go? So many secrets are yet to be unearthed. The scientific mind is understandably enthralled by the magnitude of the task ahead. And the enchantment, too, for the mystery is irresistible. Particularly when the solution means triumph over discoveries apt to profoundly influence generations to come.

It is a tremendous challenge. But the true scientist's thirst for knowing, advancing, creating is only limited by his vision and his courage before the unknown.

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DOW

Why Study Math?

By Professor Alfred R. Schmidt

How many times each day have you heard any of the following comments?

a) "I don't like math!" (An equivalent form is "Math is hard for me.")
b) "I don't see why I have to take so much math-"
c) "Why don't they use a text I can understand?"
d) "He's trying to make mathematicians out of us!"
e) "I don't care about derivations and proofs—all I'll need is the formula." (This one gave rise to the sub-title.)
f) "I just don't like 'theory'."

(Usually, the actual form of these comments is more colorful.)

A parallel list could be made for any of the "theoretical" courses in the engineering curricula and would generally be heard from the same group as the list above. (The principle difference between "theoretical" and "non-theoretical" courses in applied science is *time*—time for researchers to discover and understand the nature of the phenomenon so that the rule-of-thumb technique may be discarded.)

Before going on, suppose we look at this "ogre" called Research—it strikes a different sound to each person hearing it—and the way in which research fits into the total picture. We may divide the engineering effort in industry broadly was follows:

1. *Basic Research.* A search for fundamental truths which may or may not have a foreseeable application and market.
2. *Applied Research.* Investigations concerned with products to be marketed in five or ten years.
3. *Product Development.* This follows applied research in getting a new product ready for production after research has worked out the basic design and principles.
4. *Product Improvement.* Improvement and modification of existing products.
5. *Engineering Sales.*

This total effort can be represented in general by a "flow diagram" as

Basic Research
Applied Research
Product Development
Production
Sales
Product Improvement

where the dotted lines represent a flow of information about customer needs, complaints, and suggestions.

There seems to be a fascination among students for the job of sales engineer. This is all too often accompanied by the idea—perhaps encouraged by the apparent separation of "Sales" from "Research" in a chart such as above—that only a sketchy understanding of engineering is necessary to be a good sales engineer. Let's look at this closely.

In order to sell his product, the sales engineer must be able to help his customer by scientifically laying out the proposed use for the product and proving that it will be profitable. The more one knows of the fundamentals of why his product, the better able he is to sell it. In fact, a good salesman knows as much about his product as the engineer who designed it—otherwise he may get backed into a corner. Furthermore, when business slumps (as it has and will), sales engineers may be (and are in some cases) transferred to either applied research, product development, or product improvement sections where they are generally in deep water. There they must be able to man their own oar if they are to survive. In short, there is more to engineering sales than just having a flexible elbow and a Pepsodent smile.

In fact, there is no phase of engineering that is not vitally affected by research directly or indirectly. So suppose that we quit playing ostrich and stop kidding ourselves. With the tremendous advances in science and technology of the past two decades, the cut-and-try process is being replaced by analytical investigation wherever possible. This changeover results partly from international pressures, but principally from the very reason businesses exist—to make money. An inevitable result of the competitive enterprise system is that "time is money". The alternative to analytical investigation is to build perhaps ten units and test them for 10,000 hours to get the information that could be ob-

tained from careful analysis of *one* miniature.

For example, at least one designer of jet engines precedes the building of prototype compressors with a complete analysis of the performance characteristics of possible designs by using a computor. Another example is the important problem of weight in the field of rockets—design must yield a vehicle sufficiently strong to do the job and yet have minimum weight. Even in the automotive field, incorporating more nearly rigid surface shapes into the design has enabled the industry to use thinner steel and yet retain the necessary strength—but a study of rigid surfaces is not simple!

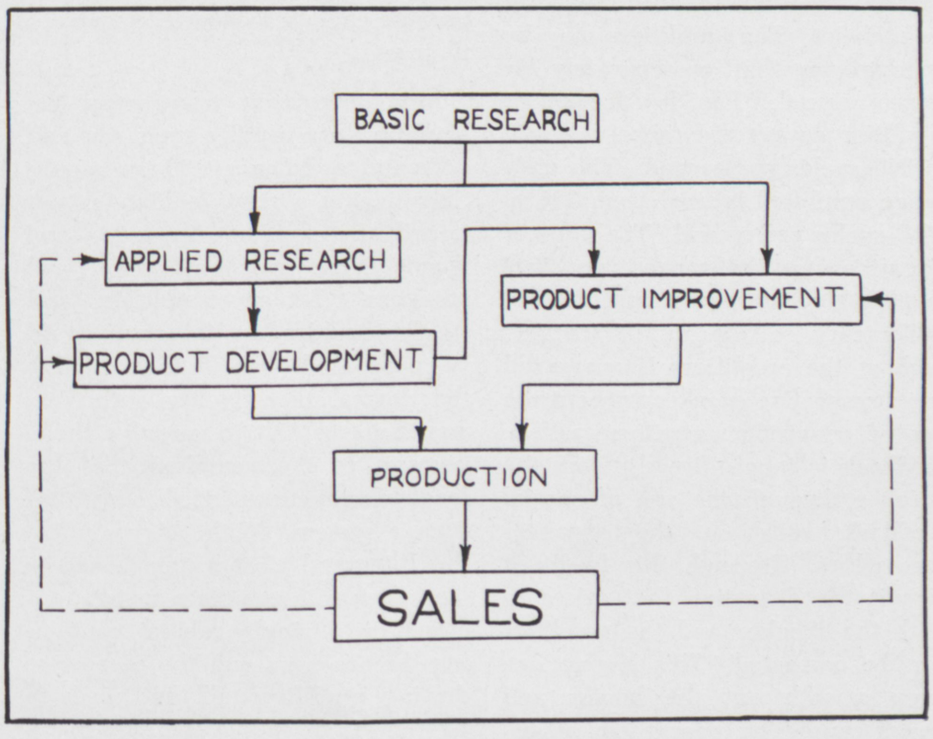
Examples of analytical approaches to design can be given in any field of engineering and are far too numerous to list. Let us note here that analytical (i.e., theoretical) investigations are no longer the sole property of universities—many industries are developing their own research laboratories pure and applied), totally the result of the profit incentive.

By now, you may be saying that this is all well and good for those students who want to go into research, but what about those who don't? And what about those who don't know what they want to do? Even after four years, it is doubtful whether a student knows the nature of research and development. Therefore, it is somewhat risky for a senior to say with certainly that he doesn't like research and development and much more so for an underclassman who hasn't been exposed to enough engineering to distinguish between an engineer technician. To restrict one's goal to a technician level will in general lessen the opportunities that lie ahead, whereas working toward a higher goal does not preclude working at a less involved task (and perhaps doing a better job of it). With the increasing value of graduate training, it may even be well to avoid thinking of an engineering education in terms of four years only.

So what about the comments that started this article? Mathematics, because it is the short-hand of science and because it enables one to organize his thoughts, must precede any attempts at physical understanding. Getting closer to the problem of the student, the need for facility in mathematics (at least through the calculus and differential equations, at present) should be almost obvious after glancing through almost any textbook used in the engineering curricula—if *all* the mathematics were removed, what would remain? But mathematical facility alone is not enough; one must know when a particular mathematical tool may be used and when not. All the formulas in mathematics as well as the majority of those of physics and engineering are *derived,* not empirical, and therefore each is accompanied by a list of assumptions (hypotheses). These formulas are useless to a particular problem unless the assumptions are satisfied, and yet the tendency is to skip over the derivation and assumptions and get the formula. But remember, A FORMULA TELLS US NOTHING THAT ISN'T ALREADY CONTAINED IN THE ASSUMPTIONS!

Finally, to those who are impatient with theory (mathematical or physical), it need only to be mentioned that *everything* that is today considered "practical" was at one time considered to be research of one form or another. So conversely, who can say whether the research problems of today will be "practical" ideas in five hundred years? We are often prone to be like the gentleman who suggested several decades ago that the patent-office be closed since everything had already been invented. But remember—*anything which is being done now can be done better*! Improvements as well as new ideas are the products of inquisitive people who are not convinced that "everything has been done" and that the only thing left is to produce what we have.

It is important that each student realize that the present cry for more engineers, scientists, and mathematicians is not so much a plea for more "doers" as it is for more "thinkers" — creative, imaginative people who are willing to recognize the attendant responsibility that accompanies the *gift* of mental capacity and ability. It is time for each of us to quit looking for some engineering equivalent of "coed-cooking—3 credits", or hunting rationalizations (such as the opening list of comments), and start working. *We must train engineers for tomorrow's world, not that of yesterday!*



Basic Engineering Organization

A New Hi-Fi

By Robert

Recently the Integrand Corporation released for the consumer a radically different speaker system. Although the principle used is not new, the chief advantages that are incorporated in the system are transistor servo amplifiers and speakers using special feedback coils mounted within the speakers. In over all characteristics this system compares favorably with the best systems on the market employing output transformers.

In this system the crossover networks are placed before the servo amplifiers instead of after the amplifier as is the case in most other systems. Three amplifiers operate in parallel to cover the full range of frequencies. The amplifiers may be operated together, or separately for stereo sound. The low-frequency amplifier covers the range from 20 to 350 cycles per second. The mid-range amplified is used from 350 to 2500 cycles per second. The tweeter circuit covers the range from 2500 to 20,000 cycles per second.

Contrary to the usual practice, each of the amplifiers is connected to its respective speaker without the use of an output transformer. The feedback is taken directly from the speaker through the use of special feedback coils on the speakers themselves. Through this feedback circuit the distortion that arises in both the speaker and the amplifier can be corrected. This stepup can even smooth out the booms and peaks caused by poor room acoustics.

Using a separate coil on a speaker to provide the feedback into the amplifier is not new. It has been discussed in technical literature for many years. Experiments have shown that the method is very promising, but two factors have deterred its development.

First. Since both the amplifiers and the speakers used in such a system must be carefully matched for characteristics unique to this circuit, commercial development has been slowed because speakers and amplifiers are not usually made by the same manufacturer.

Second. In a circuit using output transformers, feedback coils do not provide enough feedback to warrant their use.

Previous output transformer-less amplifiers are usually expensive and difficult to balance. These amplifiers having a relative high output impedance require expensive and fragile high resistant voice coil speakers. If an amplifier and speaker required for this setup could be purchased (which is unlikely) the normal high-fidelity enthusiast would not be able to assemble them, because of the complexity of the feedback network needed to stabilize such a system. With this in mind, the Integrand Corporation chose to manufacture a complete system, enclosed in a single cabinet containing the speakers and the respective driving amplifiers, all that needs to be done is to couple the system directly into the output of a pre-amplifier, radio tuner, or a tape deck without the need of external amplifiers or crossover networks.

The electrical circuit in the Integrand amplifiers and crossover networks use transistors. A separate amplifier drives each unit of the three speaker system. This makes possible the direct connection of the amplifier to the speaker and eliminates the output transformers. With this direct coupling, over several stages, a large amount of feedback can be used from the feedback coils of the speakers.

This system creates a completely new concept of high fidelity reproduction. Previous systems demanded amplifiers that delivered power for the output transformers. The only way of measuring this power output was to insert a resistor for the speaker. With the characteristics of each amplifier and speaker being different, the proper matching of the amplifiers and speakers could be extremely difficult. This does not reflect on the amplifiers or speakers, but rather on the underlining problems of building a high-fidelity system.

The Integrand Corporation system has completely eliminated this problem. The solution provides the enthusiast with a system containing speakers and amplifiers that are literally born for each other while using any front-end with his heart desires. This may mark a new milestone in this field.

The use of the direct-coupling of the transistor-ized amplifiers and

Speaker System

Jackson, jr., e.e.

the speakers makes possible the full use of the over-all feedback, to correct the distortion in just the amplifiers (as usual) but in the speakers also. Properly designed transistor amplifiers give as clean an output as do the best tube amplifiers. With the same amount of feedback, the distortion from the amplifier will be as low as that from the best tube amplifiers.

When the speakers are placed in the specially designed feedback loops, the distortion reduction applies equally as well to the amplifier and the mechanical action of the speaker. To understand this more fully, a discussion of the distortions that occur in the speaker other than frequency response will follow.

The current from the amplifier flows through the voice coil windings, setting up a magnetic field. This field reacts with the permanent magnet of the speaker. The permanent magnet field in which the voice coil moves is never perfectly uniform; hence, the voice coil motion being created by the amplifier output current must reflect the nonuniformities of this field. Failure of the voice coil to obey the amplifier output current precisely constitutes distortion. Another source of distortion occurs in the suspension system. The spider that keeps the voice coil centered in the magnetic gap and the support of the cove is the cause of the distortion in the electrodynamics speaker. The nonuniformities in the deflecting constants of these members contributes additional distortion.

Magnetic feedback from the voice coil of the speaker can reduce some of the distortion, but it can never work on both sources. Both sources distort the current taken from the voice coil while the spider distorts the voltage needed as well. The amplifier has no means of knowing just how much correction of each will be needed. With the use of a separate feedback winding on the voice coil both kinds of distortion may be "worked on" equally well. In addition, these distortions will be reduced by the same factors as all other distortions, including those in the amplifier. This type of feedback, which includes the speaker, not only shapes up the waveforms to what they should be, but also smoothes the frequency response.

To make the feedback effective, it must work instantaneously. The feedback coil must be fixed rigidly to the voice coil. For feedback to be effective, the feedback voltage must be directly dependent on the movement of the coil, and this requires a small working coil in the uniform portion of the magnet field.

Cone movement in any speaker is resisted by the compression of the air in the enclosure, particularly at some frequencies. At other frequencies a cabinet resources may affect the cone movement also. When the cone moves readily the frequency is accentuated, giving a peak or resonance. When the cone moves more stiffly the frequency is diminished and a trough appears. The Integrand system is to correct with more or less current as needed to give a smooth movement of the cone, regardless of the acoustic properties of the speaker or its relative enclosure.

Another cause of distortion is the standing waves that are set up in the listening room. These standing waves have exactly the same effects as though room were a large enclosure. They are not quite so pronounced as the waves in the enclosure, because the room is larger. The same feedback loops are used to correct for these standing waves as the waves in the enclosure. The net result of this is that transient should sound much cleaner than from a conventional type of speaker in any kind of room.

The transistor power amplifiers are called servo amplifiers, because that is just what they are. They are similar in construction to the servo amplifiers used in guided missiles in that any deviation is corrected automatically. In the Integrand system the feedback signal is compared to the imput signal and any deviation is corrected automatically.

The price of the Model 372, complete, including all of the transistors, amplifiers, crossover networks, and speakers is $550, available in a variety of hand rubbed oil finishes. Crowhurst, Norman H., "New Hi-Fi Speaker System," *Radio and TV News,* Vol. 58, No. 4, October 1957, pp. 58-59.

Fraternity Notes

Theta Xi

The TX Fraternity Notes this month will be short and sweet because everyone is studying for finals, including yours truly.

The TX Tigers are still on the prowl. The latest victim was ATO by 18 points. Keep it up, fellows, that football trophy is lonesome on the mantle.

The photo shows brothers Pierson, Mathews, Hollingsworth, and Gompf working in the Rec. room. More improvements will be made over semester break.

Congratulations to brothers Goheen and Whalen, who were recently initiated. Now it's a race to see who loses his new pin first.

Congratulations also to brother Tate, who became engaged to Carolyn Lawrence. You're a lucky guy, Gary, she's a peach.

What's this I hear about brothers Olson, Wolf, Sweet, and House? Our condolences, guys. Ah, well, there are other girls.

All the fellows are cramming for finals (with a few exceptions). Brothers Pierson and Blickhahn seem to be drinking their knowledge. Take a few minutes out to hit the books, guys. Then I'll join you.

Lots of luck on the finals, and a happy, non-studying vacation to all the Rose men. I'll see you in the next Technic.

Eugene Amick

Sigma Nu

Christmas vacation proved to be disastrous as it wiped out three of our snakes from among the ranks of the unattached. Brother Jerry Parr pinned Miss Coleen Klosterman of Seymour, Indiana, and Brother Jack Gaughan pinned Miss Cynthia Boyd. Miss Boyd lives in "good ol" Terre Haute, and Jack told me that she was pinned before she realized what was happening. Miss Boyd was cold and without a wrap one evening and I must say, it's being pretty sly when you wear your pin on the outside of your topcoat.

The third man to go really lost his way. This pinning business is old stuff to him so during the vacation Brother Wegrich and Miss Nancy Cade announced their engagement. Dick, has been wearing an ear to ear grin ever since. Being engaged must be an agreeable business, I think I'll advise it—and even more.

Sunday, the 12th of January, was White Rose Sunday and marked another milestone in the yearly Sigma Nu calender. Pews reserved in Church and the entire house turned out for services. The White Rose looked very nice, and it's to bad it was rather cold out—White Roses look much better when you don't have on a topcoat.

The singing group in the house—formerly the octet, then the dektet, and which now has only nine men,—

(*Continued on Page* 45)

A TX Work Session

Count Down

By Francis J. Hirt, fresh.

The pale blue light that radiated from the various instruments on the control panel gave the entire interior of the cockpit a ghostly palor. Here and there the light would reflect from a glass covering on another instrument face and throw wierd shapes on the walls and windows of the enclosure. As the needles on the instruments completed cycle after cycle, or moved ever so minutely, the phenomenon would take on different sizes and shapes, adding to the mysterious cast of the compartment.

One complete side of the room, that being the panel toward the nose of the ship, was devoted to such instruments and their strange illumination. The remaining two walls of the triangularly shaped enclosure were dominated by charts, logs, and numerous folders that contained papers necessary to such conditions as would be present in the ship.

In the vertex of the triangle, toward the rear, was an exit. This, once closed from the inside, could only be opened from the same place. It had been constructed thusly to discourage entrance into the flight cabin from the rear compartments without the expressed desire of the pilot to admit said intruder.

Beyond the flight compartment was a corridor four and one-half feet long. It had been constructed at that specific length to enable fuel-bearing tanks to utilize the space between the walls and hull of the ship. Such corridors were used extensively throughout the length of the structure to give added space for fuel necessary to the flight.

The compartment immediately aft of the flight deck contained communication devices of the latest development. They enabled the communications personnel to track any object that might come within either dangerous or distant proximity with the slightest turn of a knob. Any of the mechanisms that would be frequently used during the course of the journey were operated by beams of light that had to be broken by passing the hand through them when it was desired to use their facilities. Occupants of this compartments, numbering two, would be seated in exceedingly comfortable chairs, placed so that they could use all of the instruments in the room without having to disembark from their sitting places.

This constituted the interior portion of the craft, except for the unmerous fuel tanks, engines, and devices necessary for the propulsion of the ship to its destination. This destination was hot by the crew. Upon take-off, the pilot would open an envelope that was to be handed to him prior to his boarding and read its contents to the other two members of the crew.

Emerging from the ship, one could see the exterior of its body. It was bullet shaped and had three fins placed at equal intervals about its circumference. These fins were only functional during the immediate take-off, adding stability to the sleek body. Careful attention had been given to polishing the exterior members to a high lustre. The purpose of this was to discourage heat from being absorbed and conducted by the hull. Once completely polished and readied, exterior was encased with a transparent film that would melt off when the engines built up enough heat for the take-off.

Considerable time had been given to the details of planning and construction of the ship. After every possible flaw had been found and corrected, it was still checked and double checked until the possibility for anything going wrong had been completely eliminated. There was nothing that could go wrong — absolutely nothing.

Three minutes remained before take-off when the crew was brought by a security vehicle to the ship. They boarded immediately. Only the pilot stopped long enough to receive his sealed orders.

Once inside the ship, they scaled the ladders and steps that led them to their various stations and readied themselves and their instruments for the blast that was to ensue. The pilot locked and secured all ports and compartmental openings.

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Campus Survey

By Bill Johnson, soph., e.e. and Rod Baird, soph., e.e.

The Christmas Spirit was slow in coming to Rose this year. Although decorations had been up in Town ever since Thanksgiving, and the radio had been playing a generous proportion of Yuletide selections for several weeks, hardly anyone here had even mentioned the coming Holiday Season. That is, until the day a committee of four, comprised of Bob Schukai, Marshall Garino, Gary Phipps, and Hal Miller, put up and decorated the Christmas tree in the Student Center. From that time until dismissal for Christmas, the whole school seemed to bustle with organized and unorganized celebrations occuring in rapid succession both on and off the Campus.

The main celebration was the annaul Christmas Party. It was held Thursday, Dec. 19, and included a dinner with trimmings, a program, and a dance for the Campus students and their dates. A lot of the credit for the success of the program and dance goes to the various committees and their Director Tony Whalen.

The Decorations Committee, made up of Jack Milnes, John White, Rod Baird, and Dave Laterneau succeeded in adding the necessary "touch" to the auditorium by bringing the tree over from the Student Center, shifting the seating arrangement, decorating the stage curtains, and getting refreshments ready.

The entertainment for the party was supplied by Jim Montgomery, Jim Edds, Jim Giordano, Larry Myers, and Bob Amos. Jim Montgomery gave some interesting demonstrations on how to make milk float in air, scarves appear in empty boxes, inseparable rings come apart, etc., all by using simple magic. Using a selection of monstrous and vicissitudious words, Jim Edds gave a reading entitled "Don't Use Big Words." Giordano, Myers, and Amos gave a comical representation of a saxophone and accordion trio who were giving an appearance without having previous practice. They achieved the effect very well, which is understandable, since they had spent but just a few minutes practicing before hand.

Following the entertainment, Campus Club President Paula Cella presented to Mr. and Mrs. Ross a set of brass candle stick holders, a Christmas gift from the Campus Club.

Soon after the presentation, the lights were dimmed for dancing, and refreshments of potato chips and soft drinks were served. The dancing broke up about 8:30 thus ending the Christmas Party for 1957.

Radio station WBOW, "the most heard on Campus," recently set aside a special evening for the benefit of the Cancer Fund. This evening, Jan. 13, was devoted to playing requests of contributors who donated $1.00 or more.

Rose joined in the spirit of the day and at various times during the evening a group of students "passed the hat" through the halls, each time taking the contribution to the radio station and requesting a song. By eleven P.M. Rose had contributed almost $50; however, it was found that Indiana State Teachers' College had contributed almost nothing. This discovery prompted Rose to take "just" action. With the next contribution, they dedicated in honor of the boys at State, the song "Poor Boy", and in honor of the girls at State, the song "Saturday Night is the Loneliest Night of the Week". The girls were the first to respond. They requested that "I'm Available" be played for Rose. The ISTC Boys came back with a request that the record "We Don't Want Them, You Can Have Them, They're Too Fat For Us" be dedicated to Rose in honor of the girls at State. The last request by either college was Rose for the State Boys; "Wooden Head, Puddin' Head Jones".

During December of 1957 the Institute received three grants, totaling $22,000, from Esso Education foundation, Shell Assists (Shell Oil Company), and Lilly Endowments, Inc. During the next three and a half years this money will be given in the form of scholarships to faculty members who wish to take advanced studies. Under this program six faculty members will complete work on their doctorate and an additional six or more will complete their masters degree.

Easy Money

By John Fenoglio, jr., ch.e.

Are you the proud owner of the latest 35mm masterpiece that has more buttons and gadgets than professors have quickies? Or maybe you have an old reliable Baby Brownie? If you fit somewhere between these classifications, the Camera Club's Photo Contest is for you! You need not be a professional to enter or win some hard cash in this contest.

The rules have been worked out by members of the Camera Club and approved by the entire membership of the Club. These rules are posted all over school to enable you to check up on any details of them at any time. A brief comment and explanation follows each of the rules:

(1) *Open to all students, faculty, and staff of Rose Polytechnic Institute.* Although alumni members of the faculty may enter, this rules out alumni participation in the contest. Rule 4 makes it difficult for anyone not on campus to get good photographs for the contest.

(2) *Standard size black and white prints preferred, but any size may be entered if the least dimension is 2 1/4 inches or greater. The maximum dimension is 10 inches.* These dimensions enable the amateur to submit pictures that are obtainable through several local photofinishing shops. The corner drugstore can usually give you decent prints at a very small cost. These dimensions also enable the advanced amateur to use his skill in the darkroom in the printing of the final picture.

(3) *Pictures must have been taken after June 1, 1957.* This limits the contest entries to current pictures and puts everyone on an even basis as far as their previous opportunities for pictures. So if you didn't have a camera on campus to record last winter's snowscenes, you haven't lost a thing.

(4) *Winners must submit negatives which shall be returned.* If you are a winner, the Camera Club would like to have the negative available for later publication. The negatives of all winning entries will be returned to the owners as soon as possible. So keep that negative handy in case you are a winner.

(5) *All entries become the property of the Rose Tech Camera Club.* This just means that the Camera Club can exhibit them in any way it wants to. There will probably be an exhibit somewhere on campus of all the winning entries as well as those winning honorable mention.

(6) *All entries must pertain to Rose Polytechnic Institute.* All pictures must be of something or someone on campus, or of something that can easily be identified by the average Rose man as having to do with Rose. Look around you and have that camera handy at all times. You will be surprised how many good pictures you can get if you are prepared to snap them when they occur.

(7) *Entries will be judged for clarity, interest, composition, originality.* The judges are members of the Rose faculty. The judges will not know who took the entry. They will be judging them on the picture only. Let your imagination run free and get the unusual pictures and the different ones. Try picturing something you have never seen photographed before or try photographing the same old things but at a different angle or with new lighting.

(8 *Prizes are as follows: First — $15, Second — $10, Third — Two prizes of $5 each, Fourth — Five prizes of $2 each.* Here is the incentive for every student to enter. What an easy way to earn money. Just pick up your camera, snap that picture, and just like that you've picked up $15. Sounds easy, doesn't it? Well, it is!

(9) *Entries must have been taken by the entrant.* This prevents someone from having a professional photographer take the picture and entering it under the student's name.

(10) *Pictures taken with Modulus or Technic equipment are not eligible.* The advantage of the expensive equipment available to either of the photography staffs is gone. This doesn't mean that you can't borrow a camera from a friend, but then you have to find that friend.

(11) *There is no limit to the number of entries by one person, but each entry must be separately identified and should include photographic data if available.* You can enter all the pictures that you want

Sewage Disposal

By Paul Cella, sr., c.e.

Late in 1955 The American Society of Civil Engineers cited seven examples of engineering which they classed as the "Seven Wonders of American Engineering." They were:

1. Colorado River Aqueduct
2. Empire State Building
3. Grand Coulee Dam
4. Hoover Dam
5. Panama Canal
6. San Francisco-Oakland Bay Bridge
7. Chicago's Sewage Disposal System.

Of these seven examples, the first six all fall into some catagory of structural engineering; they are there to see. But the seventh is unique in that it is composed of many engineering works, and comprises a vast network of sewers, pumps, plants, and canals which work constantly, silently and unseen to serve the great metropolitan area of our nation's second largest city.

In order to understand the need for and operation of this massive work, it is first necessary to review the growth of Chicago and examine the problems which this growth produced.

Situated on the shore of Lake Michigan, Chicago appeared to be a natural trading place. The Des Plaines River, which passes close to Chicago, runs into the Illinois River which in turn runs to the Mississippi. But the portage from Lake Michigan to the Des Plaines River, a distance of some twelve miles, proved to be a serious obstacle to trade. In 1822, work was begun on the Illinois and Michigan Canal. Completed in 1848, the canal eliminated the portage between Lake Michigan and the Des Plaines and permitted Chicago to develop into the trade center of the Midwest.

The early residents of Chicago depended upon shallow wells for their water supply and sewage disposal was maintained with outhouses. By 1836 sewage was contaminating the ground water supply and typhoid and dysentery were prevalent. This pollution was the cause of fifty deaths per thousand population per year.

To remedy this situation the city piped in water from the lake. This method worked for a short time, but the Chicago River, which ran into the lake, carried a considerable amount of sewage with it. The water intakes became filled with sewage and the pollution began again. The city tunneled out farther and still farther into the lake, but the amount of sewage increased as the city grew. In 1854 a cholera epidemic killed 5.5 per cent of the city's population. It was evident that a sewer system was needed.

Work began on the sewers in 1856. This was the first attempt at a unified sewer system in the United States and the second in the world, Hamburg, Germany having built one a few years earlier. The sewers were made of brick and varied from three to six fee in diameter. Many of them are still in use today.

However, the sewers ran into the Chicago River which flowed into the lake, further contaminating the water supply. By 1862 the actual taste of wastes could be detected in drinking water. Engineers decided to try to reverse the flow of the Chicago River and make it flow away from the lake by deepening the Illinois and Michigan Canal. This was done at a cost of three million dollars, but the method failed when a flood in 1872 backed up the flow of the I & M Canal and short-circuited the entire system.

Another attempt at reversing the flow of the river was made in 1881 when pumps were installed at the junction of the river and the I & M Canal. The pumps were rated at a capacity of 1000 cfs, but they failed to provide the proper flow.

The problem was brought to a crisis by the storm of August 1885, when 6.19 inches of rain fell in less than twenty-four hours. (By way of comparison, the worst Chicago storm since then was the storm last summer when 6.11 inches of rain fell in less than twenty-four hours.) The storm completely scoured Chicago, cleaning out the sewers, streets, and catch basins. These scourings poured into the lake. Thousands perished from the resulting contamination.

The solution to the problem finally came into sight in 1889 when The

Metropolitan Sanitary District of Greater Chicago was organized. The engineers of the Sanitary District proposed the following plan:

1. Push the Des Plaines River to the west side of its valley;
2. Dig a new canal from the Chicago River to the Des Plaines;
3. Reverse the flow of the system, making it flow away from the lake;
4. Build intercepting sewers to flow into the canal.

In 1892 work was begun on the Chicago Sanitary and Ship Canal (Main Channel). The Main Channel runs for a distance of twenty-eight miles, much of it through solid rock. The channel, designed to carry 10,000 cfs, could not have a velocity greater than 1.5 miles per hour. A velocity greater than this would hamper navigation. Through the rock sections the slope of the channel would be approximately one foot per four miles; through the earth sections the slope would be about one foot per eight miles.

Late in December, 1899 with the end of the mammoth task in sight, the Board of Trustees of the Sanitary District learned that the State of Missouri had decided to seek an in junction in Federal Court to prevent the opening of the channel. The Missouri objection centered chiefly around the contention of St. Louis that the proposed dilution system of sewage treatment at Chicago would flush the wastes into the Mississippi River and imperil the St. Louis water supply.

The Board of Trustees regarded such an argument as academic. Reasoning that once started the flow would be hard to stop, the Board quietly ordered a needle dam knocked out on January 2, 1900; turning the water of the Chicago River into the channel. On the night of January 16, the Board went to the other end of the channel at Lockport, and early the next morning—minutes before the suit for injunction was filed in the United States Supreme Court —the controlling gates were lowered and the water from Lake Michigan flowed toward the Mississippi.

A secondary project was the digging of the Calumet-Sag Channel, which was completed in 1922. The Cal-Sag Channel runs from the Little Calumet River to the Main Channel at Sag and has a total length of sixteen miles. The digging of the Cal-Sag reversed the flow of the Calumet River and prevented it from contaminating the lake.

The North Shore Channel, completed in 1910, runs from Lake Michigan to the North Branch of the Chicago River. This channel serves both as a storm water outlet and as a carrier for the effluent from the North Side Sewage Treatment Works.

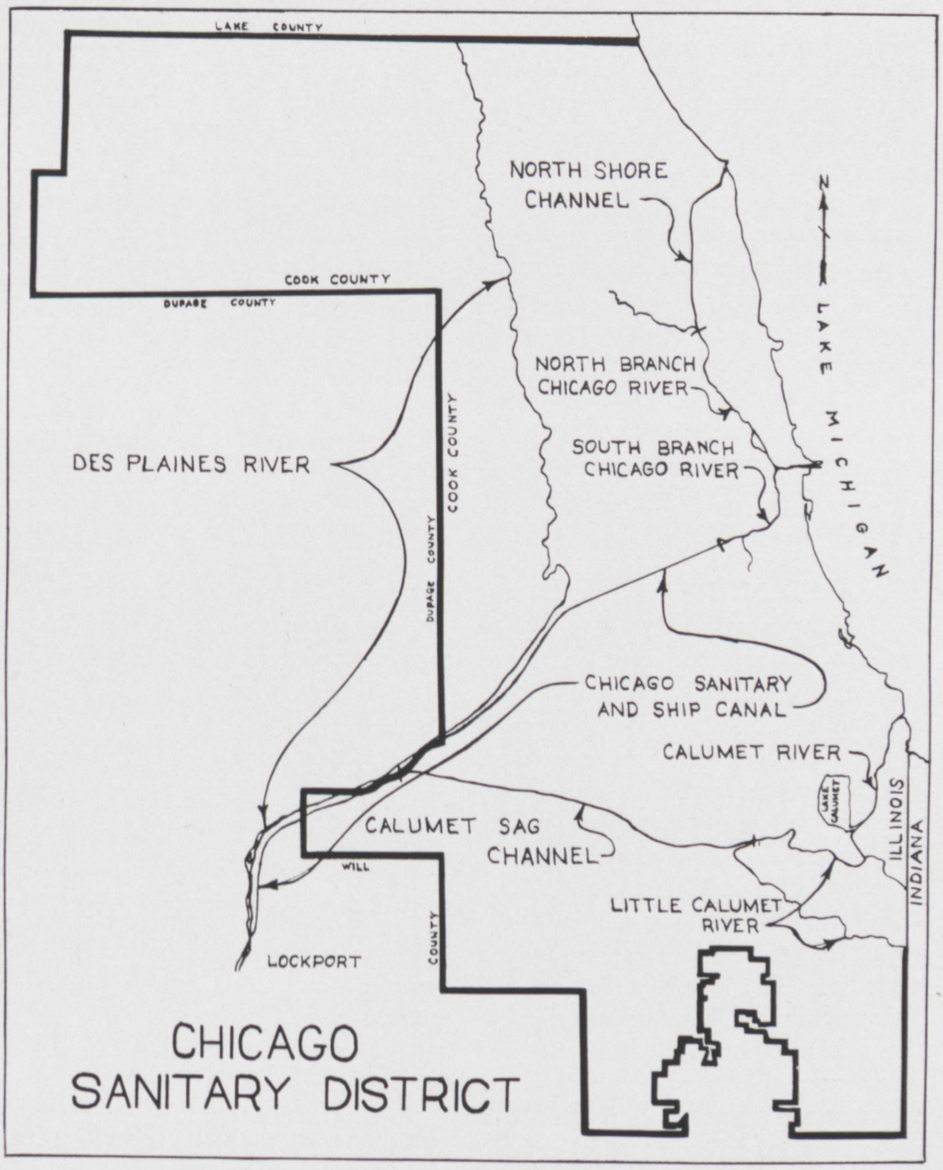
The result of all this can be seen by referring to the statistics on typhoid fever mortality rates for the year 1917. Deaths per 100,000 population for several of the country's largest cities were as follows:

New Orleans	23.1
Detroit	18.8
Indianapolis	10.3
Milwaukee	5.8
Los Angeles	4.7
CHICAGO	1.7

The intercepting sewers range from six to twenty-seven feet in diameter, have a slope of about one in 2000, and are designed for gravity flow. Most of the sewers are constructed in tunnel with the concrete poured in place. A depth of eighty feet below the ground is not uncommon.

The treatment plants of the Sanitary istrict have a combined capacity of 1,300,000,000 gallons per day and represent an investment of

(*Continued on Page* 40)



Evaluation

By John Williams, sr., m.e.

The subject of Statistical Quality Control is taught here at Rose in the Fall semester by Mr. Barnett along with elementary statistics which is necessary to the full understanding of the underlying principles of SQC. Upon completing the course, one is inclined to inquire as to the practical value of such things. Are they actually used in industry? Does it do any good to use such methods? Some manufacturers are inclined to ask the same questions themselves. They are reluctant to believe that such things as control charts, sampling plans and other statistical devices have any actual value. To enter a discussion of these things, one must have some understanding of statistics. Statistics is based on the familiar curve known as the normal curve or as the bell curve because of its shape. This is the same curve that our professors use when we ask after a test "Are you going to grade on the curve." If we take an accurate measurement of some physical value for example, the length of an object, we will get some variation in our readings for object produced on the same machine at about the same time. We could group the objects in different boxes according to their length. If the process were behaving normally, we would expect to find some average value for the length and have the parts grouped about that mean value. The farther from this norm that we go, the fewer the number of parts we would find some length other than the mean value. We might measure electrical resistance of a resistor. Suppose the resistor is a 50 ohm unit. The actual resistance might vary from 49.276 ohms to 50.731 ohms. The mean value might be 49.938 ohms. We would then be concerned with how many resistors would we be making that would fall outside of these limits. By applying Statistical Quality control methods to the data, we can estimate the normal spread that we should expect to find in any batch of manufactured parts. The number of parts with the low resistance should be small and the number of parts with higher resistances should be large for values of resistance up to the norm or mean value. Then the numbers should decrease for decreasing resistance. From this data, we estimate how the machine will run normally. Now, suppose the machine goes haywire. It begins to put out resistors with an average resistance of 51.870 ohms. Our Statistical methods will detect this change without having to examine more than a few resistors. To discuss the mechanism of this detection would require a long discourse on control charts, a subject which is adequately covered in most statistics books. Briefly ,on a control chart, we take samples of 5 resistors at various times during the day and plot the value of their average resistance each time on a chart. From control lines computed from previous data, the operator or inspector can tell when something is wrong because the average resistance of the five parts sampled falls outside of certain set limits. Then, action can be taken to correct the fault. These limits are computed so that the average resistance would fall outside of them only 0.3% of the time due to chance alone. In other words, if the average value falls outside these limits, it is quite unlikely due to chance alone.

Let us assume that we now know enough about SQC (convenient abbreviation for Statistical Quality Control) to understand a little of its operation. Do these things work? Some examples from industrial experience should explain. Johnson and Johnson, makers of surgical supplies, are required by the government to amintain extensive inspection procedures for the safety of the public. One product, inspected as a finished item, was causing many rejects. Through quality control, it was found that the product became defective about one-tenth of the way through its manufacturing process. By installing quality control on its production lines, the company was able to reduce rejections to a minimum.

At Alden's mail orderhouse, the technique is applied to: (1) operating, such as receiving goods, filling and shipping orders; paperwork; (2) buying goods for resale; and (3) guiding suppliers in directions which will improve their own processes and thus improve Alden's merchandise. A steady 3% error rate in outbound shipments was cut within 2 months to less than 1%;

At the manufacturing plant of the Sheaffer Pen Company, a direct

efficiency increased 82% to 107%. savings of $40 per day occurs in one of their 10-operator departments where SQC has been applied. The product here runs 99.7% acceptable although 98% would be considered very high.

One of the places where SQC has advanced to a very wide usage is in the operation of Western Electric Company, the manufacturing arm of the AT&T system. Much work in developing SQC was done in the Bell Telephone Laboratories by Dr. Shewhart who then passed it on to Western. One of Western's problem was in the reliability of soldered connections. Most of our electronic equipment assemblies, whether they are radios, electronic computers, guided missiles, telephone switching equipment TV sets or airplanes each will contain many hundreds or thousands of soldered connections, either manually soldered or automatically soldered. The following is an example of how Western tackled the problem.

Western presently works to a soldering quality level of no more than one loose connections in 10,000 connections made. While this seems to be a very small allowance, it is not small enough. Some weapons systems contain 75,000 connections. Seven or 8 loose connections would be intolerable. On some other military equipment, a demand of not more than one loose connection in 100,000 is being made. The requirements are being met of one in 20,000 connections by a combination of diligence on the part of the soldering operators and vigilant 100% inspection by our inspecting organization. But one loose connection in 100,000 is an uninspectable quantity. If their were two loose connections in 100,000 it would be futile to expect an inspector to find even one of the loose connections. Thus, if quality is to be improved, it cannot be inspected into the product, it must be built into it.

Someone has said that the electronics industry is at an awkward age - too old to build door bells and too young to build reliable complex equipment. The answer to this lies in the kit of tools commonly employed by the quality control engineer. If equipment is faulty, there is some definite cause for it. We must find out what the process is doing now and why it is doing it. If we are not satisfied with what we find, we may want to change the cause system to produce the desired results. One tool employed in SQC is the Law of Large Numbers. It states simply that no two things are exactly alike. The FBI knows that no two people have identically the same fingerprint. Everything has its own identity that separates it from its brothers. What this means is that each soldered connection is unique. If examined, it is reconizable different from the hundreds of thousands of other connections that have been made. The second part of the Law of Large Numbers tells us that individual items are unpredictable. If we flip a coin, it is impossible to reliably predict heads or tails every time. Even the most learned finger print expert is unable to tell the identifying characteristics of the next stranger he will meet. In spite of our past knowledge, we cannot predict the exact temperature of a soldering tip at any instant; or the weight of solder used by the best operator in making her next connection; the degree of oxidation on the terminal or the percent of area between wire and terminal that will be fused. For his reason, serious mistakes are made by basing important decisions on a first-part inspection. The third part of the Law is more reassuring. It tells us that groups of things from patterns with a definite and permanent characteristics. If, for example, we pour a cup full of sugar out on the table, we have no way of predicting where any individual grain will fall, but we can predict the pattern or shape of the mound that will be formed by the group. We could pour the sugar again and again, but each time it would form the same pattern. In fact, it is this pattern or mound that forms the shape of the normal curve mentioned earlier. One person's handwriting forms recognizable patterns also. If one a series of "a's" on a sheet of paper, each one is identifiable as that person's handwriting. Each letter is different from the next, but has some of the same characteristics as the others. If the same person were to write the same letter with his left hand, the pattern would change considerably. Likewise, if a second person were to write the series, the pattern would change also. In the first case, the difference was due to a change within the one cause system. In the second case the difference resulted from a totally different cause system. The conductivity, the corrosion resistance, and the tensile strength of any operator's soldered connections will each follow its own predictable pattern as long as its cause system is controlled. If the amount of oxidation on the terminals we connect to were to increase significantly, the patterns for conductivity, corrosion resistance, and tensile strength will also change.

Unfortunately, we do not have a good production test for all of the important characteristics of a soldered connection. However, we do have a test for the thickness of plating and other tests which we can use to control the solderability of the plating we use on the terminals to which we are soldering. Using the process capability study, the process control chart and other of the quality control engineer's sensitive methods for detecting significant differences in measurements or changes in patterns, the plating engineer can control the plating process as precisely as necessary to prevent the reliability of soldered connections from being impaired by poorly plated terminals. The important thing is that we prevent any potential loose connections by furnishing the assembly line with means from which to work.

This same type of engineering can be applied to other elements of the soldering operations. Quality control methods provide all the means required to obtain and maintain the necessary uniformity or reliability in the solder or flux we use.

In manual soldering, another basic factor that must be controlled is the soldering iron. Studies are made to determine the proper iron for differ-

(*Continued on Page* 46)

WHAT'S DOING at Pratt & Whitney Aircraft . . .

Pratt & Whitney Aircraft engineer checks a bread board model for a subminiature, encapsulated amplifier built with transistors.

A rig in one of the experimental test cells at P & W A 's Willgoos Laboratory. The six large finger-like devices are remotely controlled probe positioners used to obtain basic air flow measurements within a turbine. This is one of the techniques for obtaining scientific data vitally important to the design and development of the world's most powerful aircraft engines.

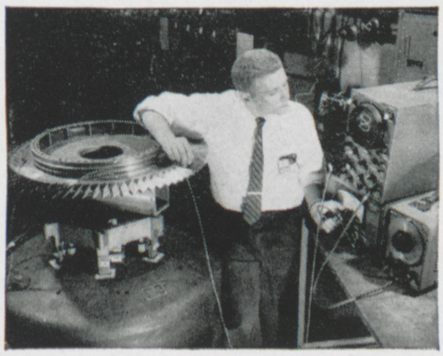
. . . in the field of INSTRUMENTATION

Among the many engineering problems relative to designing and developing today's tremendously powerful aircraft engines is the matter of accumulating data — much of it obtained from within the engines themselves — and recording it precisely. Such is the continuing assignment of those at Pratt & Whitney Aircraft who are working in the highly complex field of instrumentation.

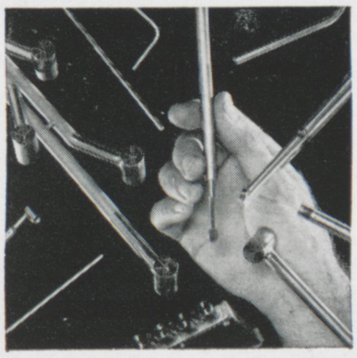
Pressure, temperature, air and fuel flow, vibration — these factors must be accurately measured at many significant points. In some cases, the measuring device employed must be associated with special data-recording equipment capable of converting readings to digital values which can, in turn, be stored on punch cards or magnetic tape for data processing.

Responsible for assembling this wealth of information so vital to the entire engineering team at Pratt & Whitney Aircraft is a special group of electronic, mechanical and aeronautical engineers and physicists. Projects embrace the entire field of instrumentation. Often involved is the need for providing unique measuring devices, transducers, recorders or data-handling equipment. Hot-wire anemometry plays an important role in the drama of instrumentation, as do various types of sonic orifice probes, high temperature strain gages, transistor amplifiers, and miniaturized tape recording equipment.

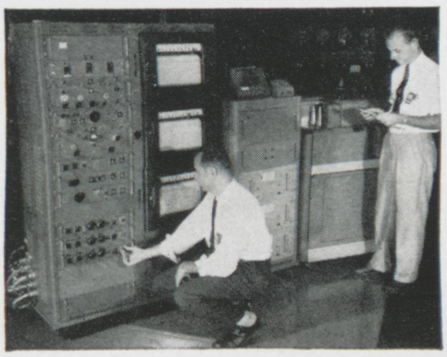
Instrumentation, of course, is only one part of a broadly diversified engineering program at Pratt & Whitney Aircraft. That program — with other far-reaching activities in the fields of combustion, materials problems, mechanical design and aerodynamics — spells out a gratifying future for many of today's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



Instrumentation engineer at Pratt & Whitney Aircraft is shown investigating modes of vibration in a blade of a single stage of a jet engine compressor.



Special-purpose probes designed and developed by P & W A engineers for sensing temperature, pressure and air flow direction at critical internal locations.



The "Plottomat", designed by P & W A instrumentation engineers, records pressure, temperature and air flow direction. It is typical of an expanding program in automatic data recording and handling.

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

World's foremost designer and builder of aircraft engines

PRATT & WHITNEY AIRCRAFT

Division of United Aircraft Corporation

EAST HARTFORD 8, CONNECTICUT

Locker Rumors

By John C. Fenoglio, jr., ch.e. and Elwood Stroupe, soph., ch.e.

FOOTBALL

It may be a surprise to find an article on football in a January issue of the Technic, but consider it just early for the 1958 season or late for the 1957 season. Just before Christmas vacation this year, Terre Haute was besieged by some very heavy rainfall. With an abundance of Civil Engineers around Rose, you would assume there would be no problem of drainage. Ah, but those unreasonable assumptions! This heavy rainfall deposited itself smack dab in the middle of the Rose football field. It remained for several days and finally had to be pumped out of our "sunken" football field. This flooding is of grave concern to Coach Brown with an outdoor track and field season just a few months away. This same scene was repeated last summer. However, last summer the water was even higher. That flood left the football field in the worst condition that it has been in for several years. This is the explanation for the "grassless gridiron" witnessed last Homecoming. One bit of good news had come up from the fieldhouse during the flood, however. Coach Brown reported landing an eighteen inch catfish near the high jump pit.

INTRAMURAL SPORTS BASKETBALL

The Rose men are back for the second semester ready and 'raring to go in the intramural basketball league. Those teams with good records are fighting to keep ahead of their opponents and the losing groups are digging in to get a few wins under their belts and perhaps even-up the earlier scores. At the end of the first semester, the standings were as follows:

BSB-II-B	6-1	Senior C	3-3
Senior A	5-1	BSB-II-A	3-5
Soph. Cats	5-1	Jr. Mech.	2-3
Ind. Frosh	5-1	BSB-I-B	2-4
Deming A	4-2	Soph. Aces	1-6
Soph. Mech.	4-2	BSB-I-A	1-6
Junior EE	3-2	Deming B	1-6

FRATERNITY LEAGUE

A commanding lead of the interfraternity league has been taken by Theta Xi. It seems almost impossible to catch them now with their huge lead, but I'm sure the other three fraternities will be fighting for all they're worth to gain that lead. At the end of the semester, Theta Xi had a 6-0 record. Lambda Chi and Sigma Nu were tied for second place with 3-3 records, and ATO led the league in losses with a 0-6 record.

ALL-INTRAMURAL TROPHY

With a semester's activities under their belts, the battlers for the intramural trophy have racked up quite a few points toward the trophy. With volleyball, track, field, softball, and other spring sports remaining, there is still plenty of time for the standings to be completely reversed. As of January 18, the standings were:

(*Continued on Page* 41)

Full Equipment Today!

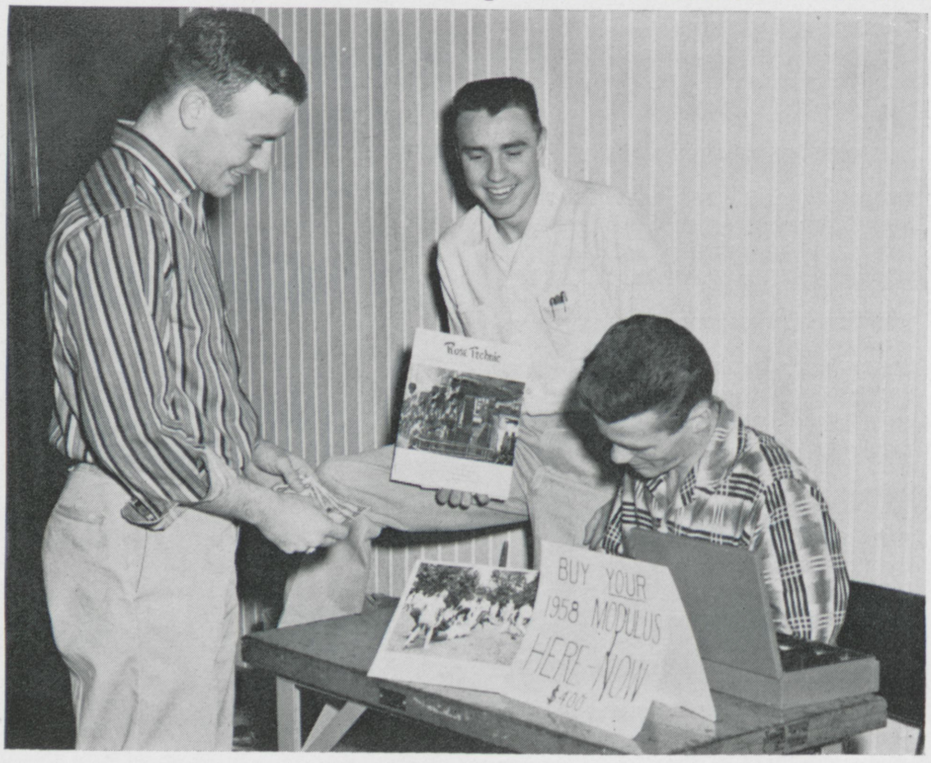
Suludom 8591

What makes a good yearbook? This is a question the *Modulus* Staff has been asking itself for the past two years. Consultation with other yearbook staffs and attendance at several yearbook conferences has produced some definite answers to this question.

First of all, a yearbook must be a factual record of the events of the year. This is just to fulfill the basic requirement of a yearbook. The record should be complete and contain some mention of every student in the school. It should tell who was in what clubs, and recognize any honors in scholarship, athletics, and other activities.

Over and above this, a book should give these facts in an interesting manner. It should be both attractive and "catchy", because yearbooks are read for entertainment as well as fact. The photography must be striking—tops both in technical quality and in subject material. Pictures are selected for quality and for good portrayal of pertinant subject matter. Copy is often a problem, for the story must be told so that any reader can understand it, and yet so that all readers will enjoy it. Good copy makes a person want to read it.

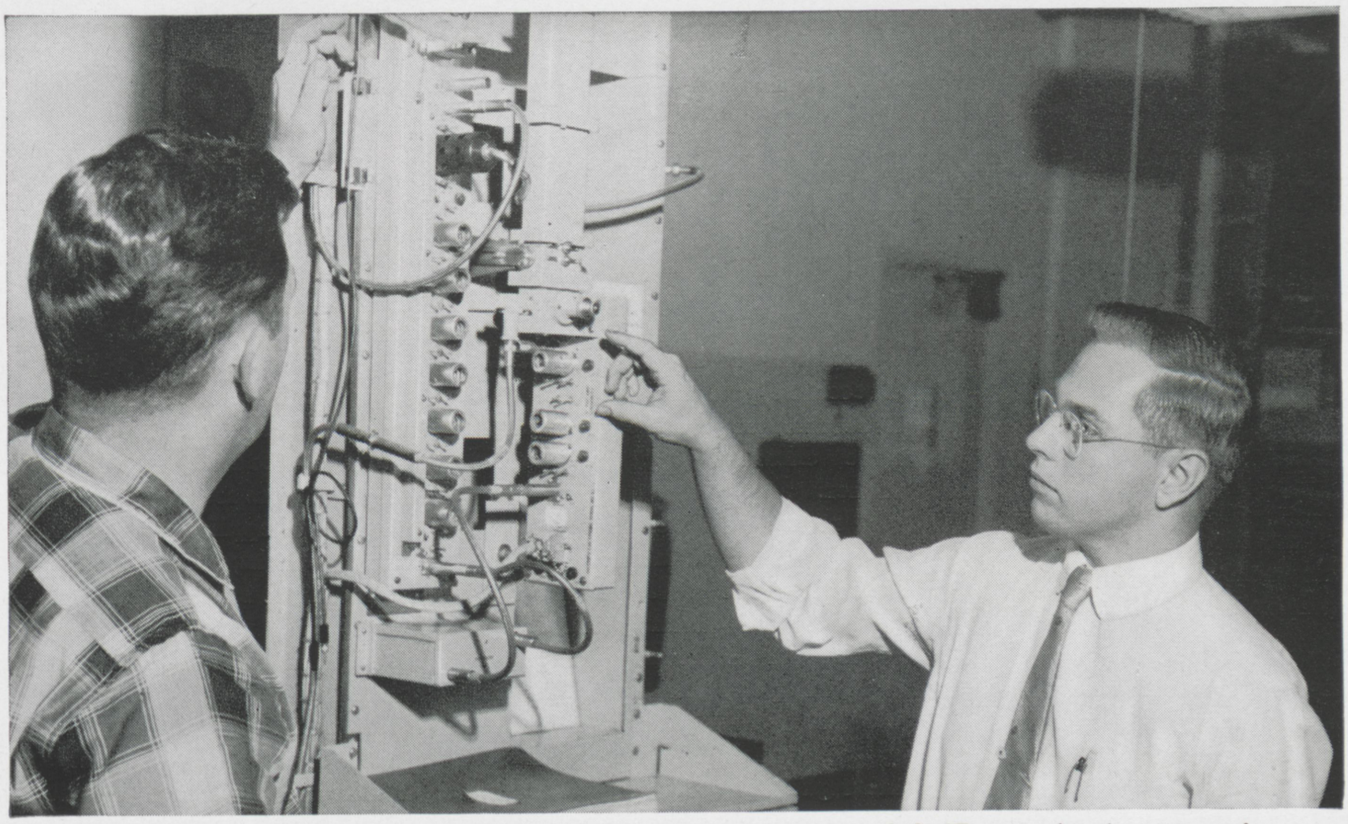
The staff of the *Modulus* has a great deal of material to use in a story of the year at Rose. The laboratories here offer marvelous opportunities for photography not found at liberal arts schools. But also the curriculum here leaves the staff working time than most staffs have. Nonetheless, The *Modulus* Staff believes that just as good a yearbook can be produced for Rose as for any other college of our size in the country.



Hurry! They're Going Fast!

Naturally, the production of a Rose yearbook entails some difficulties which normally occur in all such operations. Generally someone puts a caption on the wrong picture or makes some similar mistake. One or two such errors just serve to give the book a "homey" look. A perfect book looks too professional to be enjoyable. The Modulus will almost certainly have at least one mistake in it, even if it is only a mispelled word. But this should not make it any less entertaining or less valuable as a record.

Most of us would like to remember our years at Rose. There may be a few things we would like to forget —such as a low grade or two, maybe. The best way to remember the things about Rose that you would like to remember is by looking at a yearbook. Despite the certainty of there being at least one "goof", the *Modulus* Staff feels certain that the 1958 version will contain all the factors necessary for a good yearbook. And it will be out on time. Why don't *you* buy one and see? This year, next year, and for many, many years you will be glad you did.



John Reiter (right) discusses the route of signals from the wave guide through the IF stages of a microwave receiver

"This was the kind of challenge I was looking for"

John A. Reiter, Jr., B.S. in Electronics, Arizona State College, '54, discusses the biggest project so far in his Bell System career

"One of the reasons I joined a Bell Telephone Company," John says, "was because the engineering would be more interesting and challenging. I knew I'd chosen well when I was assigned to assist in planning a microwave radio relay system between Phoenix and Flagstaff, Arizona. This was the kind of challenge I was looking for.

"It was to be a system requiring five intermediate relay stations, and I began by planning the tower locations on 'line of sight' paths after a study of topographical maps. Then I made field studies using altimeter measurements and conducted path-loss tests to determine how high each tower should be. This was the trickiest part of the job, because it called for detecting the presence of reflecting surfaces along the transmission route, and determining the measures necessary to avoid their effects.

"Not the least part of the job was estimating the cost of each of the five relay stations, taking into consideration tower height, access roads, and the need for special equipment such as de-icing heaters. All told, the system will cost more than $500,000. When construction is finished in December of this year, I'll be responsible for the technical considerations involved in connecting radio relay and telephone carrier equipment. Initially this system will handle 48 voice channels, but can be expanded to 540. In addition to long distance telephone service, it will also provide data transmission circuits.

"This assignment is an example of the challenges a technical man can find in the telephone company. You take the job from start to finish—from basic field studies to the final adjustments—with full responsibility. To technical men who want to get ahead, that's the ultimate in opportunity."

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

BELL TELEPHONE COMPANIES

Research & Development

By John Kassebaum, sr., e.e. and Jack Milnes, fr.

3D COLOR TV

The world's first closed-circuit three-dimensional color television system has been developed by the General Electric Company for remote servicing of reactors used in development of a nuclear aircraft propulsion system.

It was developed to permit use of color-coded parts in reactor and to provide the degree of precise depth perception required for their correct positioning. The new system makes remote adjustments of parts much easier than by black and white, two-dimensional TV.

In use, the television camera will be positioned inside the radioactive area. The viewing screen will be located a considerable distance away, behind thick shielding walls and near the controls of a mechanical manipulator. Movements of the manipulator inside the radioactive area will be directed by a technician from the 3-Dcolor picture appearing on the screen.

The technician will view this picture through special polarizing similar to those used recent 3-D motion pictures. Included with manipulator controls will be one used to aim and focus the twin lenses of the camera.

The observer's viewpoint is effectively transferred to that of a camera equipped with a dual-optical system having perspective similar to that of the two eyes of the observer.

However, instead of presenting the pictorial image to two sensitive surfaces, as the human eyes do, the stereo-TV system presents two images to a single sensitive surface, a television tube on a time-sharing basis.

The frequency of the time sharing is at the picture rate of the television system, in this case 90 pictures a second. By alternating 45 pictures a second for each eye, engineers have elimated any objectionable flicker.

A rotating shutter in the special color-TV macera alternately transmits the scene as viewed from two points to the camera's tube.

An observer viewing the screen—with his polarized spectacles—sees the left optical path with his left eye and the right optical path with the right. The 45-frame-per second rate gives him stereovision without an objectionable flicker.

Laboratory test were conducted on the closed-circuit system using 250 feet of cable, but engineers say the cable can be lengthened to any required distance or replaced by a radio link without losing clarity, color or three- dimensional effct.

The new TV system is described by General Electric engineers as "currently not feasible for the American living room," but suited for adaption to outer uses for closed circuit television.

IMAGE STORER

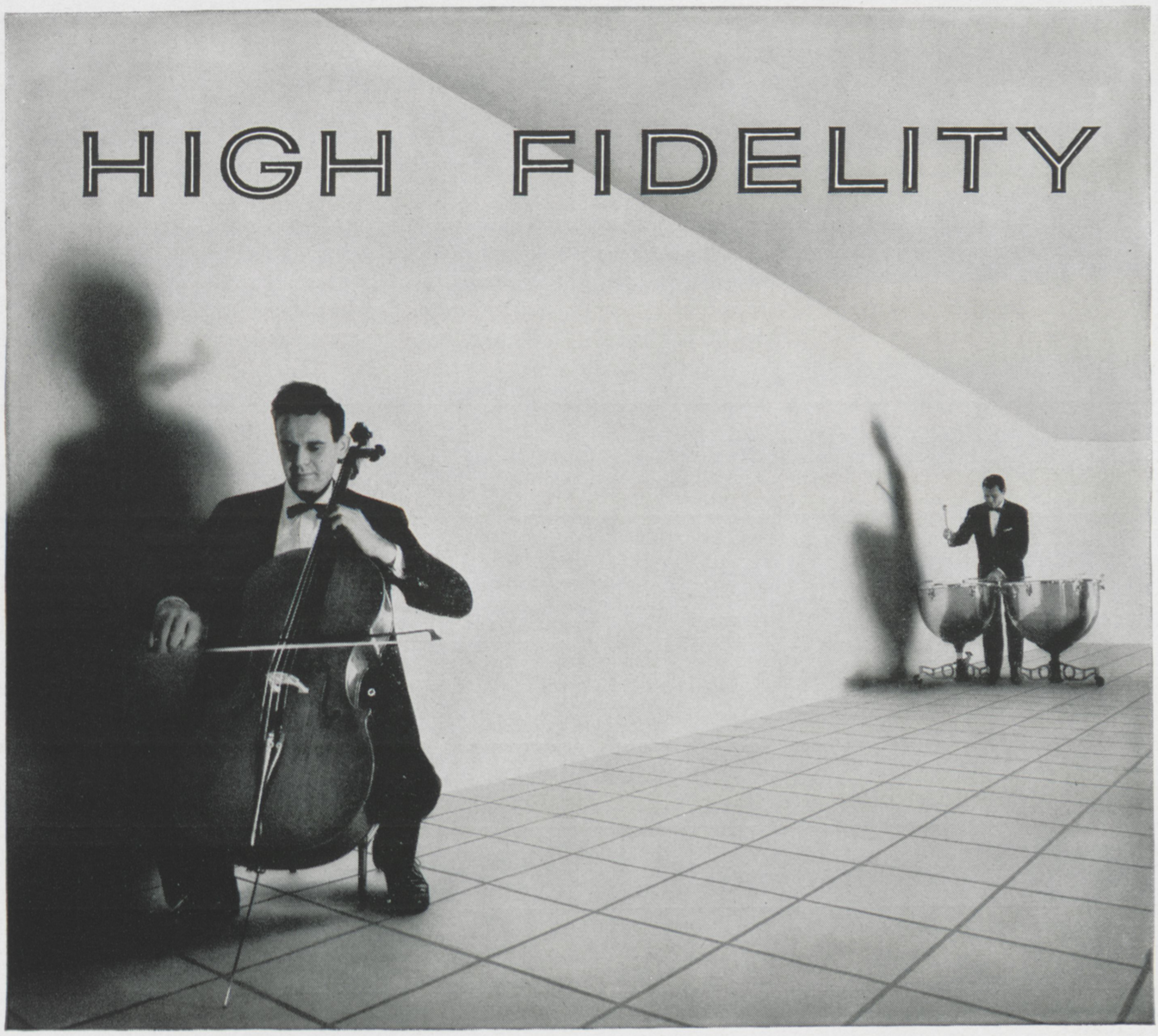
A novel electronic storage display panel that can be used for prolonged viewing of projected light images to which it is exposed for only fractions of a second, was described in Washington recently by scientist of the Radio Corporation of America.

A new electronic principles is employed to achieve a light amplifier which, after a 1/100-second exposure to a dim image, stores and displayes the imabe in bright form for several minutes or longer.

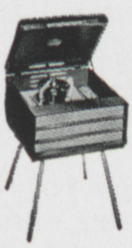
The ability of the panel to store a bright image after only a brief exposure results from the discovery of a previously unknown phenomenon in cadmium selenide, a photoconductor material which is an insulator in darkness but becomes a conductor of electricity upon exposure to light. It was found that under the influence of applied voltage and exposure to light, the conductivity of the cadmium selenide will increase sharply and will remain high for long periods after the light source has been cut off.

The panel itself is a "sandwich" formed by a thin layer of cadmium selenide photoconductor on one side, and a layer of electroluminescent material on the other, separated by a thin layer of opaque material. The electroluminescent material has the characteristic of emitting light under the influence of an applied voltage. To operate the panel, a voltage is applied across the whole assembly. In darkness, the current is prevented from flowing by the insulating property of the cadmium selenide layer. When the light of the projected image strikes this layer even for as little as 1/100-second, however, the cadmuim selenide becomes conducting in accordance with the pattern of light, allowing current to pass through the opaque layer to the electroluminescent layer. The electroluminescent material thereupon emits its own light in the same pattern, reproducing the original image in bright form.

Since the cadmium selenide remains conducting for along time after the light source has been cut off, the current keeps flowing to generate light in the elestroluminescent layer. When the image is to be erased, the voltage is interrupted for a fraction of a second. The cadmium selenide then drops back to its insulating condition, ready for the next exposure.



How RCA brings a richer, wider range of musical sound to your home



Before high fidelity, the sound of recorded music was limited—much as piano music would be if you could hear only the notes played on the center of the keyboard. No rich bass notes, no keen, vibrant highs.

RCA achievements in the science of sound and acoustics changed all that. Today, with RCA Victor records and high fidelity "Victrolas," the *full range* of sound is reproduced so faithfully that you can enjoy music almost as though you were *there*.

And now, Stereophonic Sound! A new and dramatic dimension in recorded music is also yours to enjoy on RCA high fidelity instruments. Stereophonic units can be added to most "Victrola"® Hi-Fi systems any time you choose.

In this, as in almost every area of electronic progress in home entertainment, defense and industry, the leadership of RCA serves you. RCA *means* electronics at its best!

WHERE TO, MR. ENGINEER?

RCA offers careers in research, development, design, and manufacturing for engineers with Bachelor or advanced degrees in E.E., M.E. or Physics. For full information, write to: Mr. Robert Haklisch, Manager, College Relations, Radio Corporation of America, Camden 2, N. J.

RADIO CORPORATION OF AMERICA

A DU PONT JOB-FINDER CHART FOR

Here is a sampling of the kinds of engineers and scientists which Du Pont will employ this year with BS-MS training—and their fields of work. The chart is an easy way to match your own interests against job openings at Du Pont.

For example: If you are a mechanical engineer, run your finger across the "Mechanical Engineers" column. The code letters refer to the type of work (Research, Development, etc.). The departments of the Company are listed across the top. The column across the bottom indicates some of the locations where these departments have openings. Du Pont also has opportunities for other engineering and scientific specialties, but space does not permit a complete listing.

DEPARTMENT ▶	ENGINEERING	ELASTOMER CHEMICALS	ELECTRO-CHEMICALS	EXPLOSIVES	EXPLOSIVES, ATOMIC ENERGY DIVISION	FABRICS AND FINISHES
PRODUCTS	Designs and constructs major plant facilities. Conducts research and development, and provides engineering consultation in chemical and mechanical engineering, instrumentation, and materials technology.	Neoprene Rubber Chemicals Organic Isocyanates	Metallic Sodium Hydrogen Peroxide Vinyl Products Sodium Cyanide Chlorinated Solvents Nylon Intermediates	Sporting Powders Blasting Supplies Dynamite Polymer Intermediates	Nuclear Reactor Materials Heavy Water	Coated Fabrics Paints, Varnishes, Lacquers Synthetic Resin Finishes
CHEMICAL ENGINEERS	A, B, C	B	A, B, D, F	B, D	A, B	A, B, F
MECHANICAL ENGINEERS	A, B, C	B		E	A, B	
ELECTRICAL ENGINEERS	A, B, C			E		
METALLURGICAL ENGINEERS	A, B	A, B			A, B	
CHEMISTS			F			A, B, F
PHYSICISTS					A, B	
POSSIBLE INITIAL ASSIGNMENTS	Wilmington, Del., or Plant Locations	Beaumont, Tex. Louisville, Ky. Montague, Mich. Wilmington, Del.**	Memphis, Tenn. Niagara Falls, N.Y. Wilmington, Del.**	Gibbstown, N.J.	Aiken, S.C.*	Newburgh, N.Y. Parlin, N.J. Philadelphia, Pa.

PERSONALIZED INFORMATION—The kind of work you will do and the location of your first assignment depend on your qualifications and the openings available. Since the above chart was prepared, some of the openings listed may have been filled or new jobs may have been added to the list. For up-to-the-minute information about possible jobs for you, see the Du Pont representative when he visits your campus.

WATCH THE DU PONT "SHOW OF THE MONTH" ON TELEVISION

BS-MS ENGINEERS AND SCIENTISTS

A Research
B Development
C Design
D Production
E Plant Engineering
F Sales

FILM	GRASSELLI CHEMICALS	ORGANIC CHEMICALS	PHOTO PRODUCTS	PIGMENTS	POLYCHEMICALS	TEXTILE FIBERS
Cellophane Sponge Yarn Mylar® Polyester Film Cel-o-seal® Bands	Acids and Heavy Chemicals Biological and Agricultural Chemicals	Dyes Petroleum Chemicals Tetraethyl Lead Fluorinated Hydrocarbons	Photographic and X-Ray Film Photographic Papers Processing Chemicals	Titanium Pigment Pigment Colors Titanium Metal Hyperpure Silicon	Ammonia Antifreezes Urea Products Plastics Nylon Intermediates	Nylon Dacron® Polyester Fiber Orlon® Acrylic Fiber Rayon
A, B, D, F	A, B, D	A, B, F	A, B, D, F	A, B, F	A, B, D, F	A, B, D
A, B, D, E		A, B, F	A, B, E, F	A, B	A, B, D, F	A, B, D, E
B, D. E. F			E		A, B, D, F	B, D, E
		A, B, F	A, F	F	A, B, D, F	A, B, D
			A		A, B	A, B
Buffalo, N.Y. Circleville, O. Clinton, Ia. Old Hickory, Tenn. Richmond, Va. Wilmington, Del.**	Cleveland, O. East Chicago, Ind. Houston, Tex. Linden, N.J. Wilmington, Del.**	Deepwater, N.J. Wilmington, Del.**	Parlin, N.J. Rochester, N.Y.	Edge Moor, Del. Newport, Del. New Johnsonville, Tenn. Wilmington, Del.**	Charleston, W. Va. Orange, Tex. Parkersburg, W. Va. Victoria, Tex. Wilmington, Del.**	Camden, S.C. Chattanooga, Tenn. Kinston, N.C. Martinsville, Va. Old Hickory, Tenn. Richmond, Va. Seaford, Del. Waynesboro, Va. Wilmington, Del.**

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DU PONT
REG. U. S. PAT. OFF.
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Library Notes

By Carson W. Bennett and Anita Walden

Statistics

It is with pleasure that we report a substantial increase this year in the Library's monthly book circulation over the circulation of last year. The figures for December are especially impressive. The daily average for December, 1956, was 25; the figure for the same period this year was 38.17. Quite an improvement, wouldn't you say?

United States Steel Foundation Grant

We have recently been informed that the Rose Library has again been selected to receive a grant from the United States Steel Foundation. As you may recall the Library was awarded $300 from this Foundation last year for the purpose of expanding its 20th century literature collection. This program is to be continued with the $400 provided this year. We shall welcome any suggestions from the faculty or students on books to purchase from this fund.

Carl Sandburg

With the recent addition of Carl Sandburg's "The Sandburg Range" to our Library, we now have copies of the more important writings of one of America's most distinguished and beloved authors. In addition to "The Sandburg Range," the Library also has "Complete Poems," the six volume biography of "Abraham Lincoln," "Remembrance Rock," and "Always The Young Strangers."

The Sandburg Range

Here in one volume is a representative selection from the entire work of Carl Sandburg. The aim has been to present every aspect of a notable literary career and to provide a satisfying reading experience within each phase.

Ten new poems are added to selections from *Chicago Poems* and the six volumes of verse that followed. Many poems also appear in the childrens section, along with six of the Rootabaga stories and two new stories, 'The Five Marvelous Pretzels" and "Three Nice Mice." To represent the troubadour, several of the folks songs from *The American Songbag* are included.

Out of the novel *Remembrance Rock* a compact story of the American Dream is drawn, by following the main fictional characters living through each turbulent period of our history. A sketch of the young Carl Sandburg growing up in an Illinois prairie town has been called from the autobiography *Always the Young Strangers.*

The biography and history section opens with a memoir of Edward Steichen from *Steichen the Photographer,* followed by the Oliver Barrett story from *Lincoln Collector.* From the massive six-volume *Abraham Lincoln,* a portrait of Lincoln the Man is carved. Interwoven is a chapter from *Mary Lincoln: Wife and Widow.* And here for the first time the author's "A Lincoln Preface" is presented to the general reader.

The Sandburg Range will enable the reader who comes fresh to Carl Sandburg to discover at once the remarkable scope of a major writer of our time; it will also be treasured by his old friends for its new items and its new treatment of long-time favorites.

COMPLETE POEMS

Of all American poets, Carl Sandburg is closest to the people. Their speech and wisdom have given him his voice, and as a result his poetry appeals to people in all parts of the country and in all walks of live. It is no surprise that many are familiar with his tall, snow-haired figure, for he has read and sung his way throughout the United States. Other artists have been frequently inspired to set his verse to music, to dramatize it, to dance to it. His poetry is a vital part of our culture.

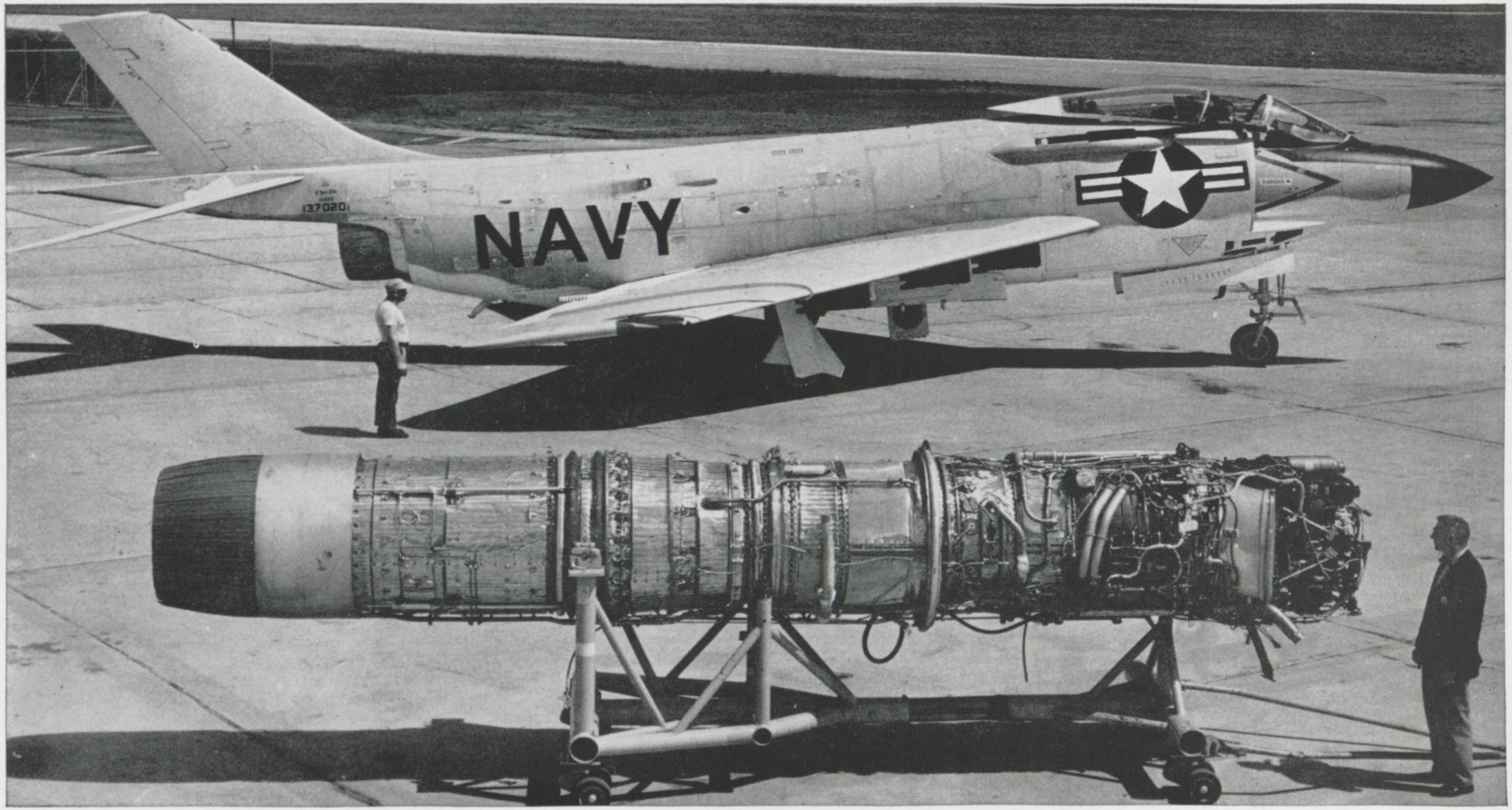
Across forty years, 1910-1950, Carl Sandburg has written the pieces in the volume. Six volumes of his poetry have been published: *Chicago Poems; Cornhuskers; Smoke and Steel; Slabs of the Sunburnt West; Good Morning, America;* and *The People, Yes.* All these volumes are now assembled in one definitive collection, and to them has been added a New Section of seventy-four poems not hitherto collected. About half of these appear in print for the first time, among them Mr. Sandburg's most recent work. Since the full body of his poetic production is thus made available in one volume, Mr. Sandburg has written an introduction which discusses his long career as a writer and reaffirms his unwavering belief in the people and in the efficacy of poetry. The full range and power of his voice ring out in this vast collection whose publication is a literary event.

ABRAHAM LINCOLN: THE PRAIRIE YEARS AND THE WAR YEARS

In the two volumes telling of Lincoln in his prairie years one finds the child, the young man, the lover, the lawyer, the patriot growing, filling out in stature, growing in grace, growing in some mysterious way as a man grows out of his environment into life through aspiration until he becomes the follower of visions.

The books will stand as one of the great portraits of Lincoln before he went to the White House. Here stands no plaster saint, but a clumsy, shrewd, ambitious, affectionate man. Here on the prairie, Sandburg, the

(*Continued on Page* 44)



INDIANAPOLIS, IND.: (Special) It takes a lot of teamwork to carry out the missions of carrier-based fighter pilots of our New Air Navy. And, it takes a lot of teamwork to design, develop and produce a fighting machine for these dedicated men. Such teamwork is exemplified in the Allison J71 turbo-jet engine with afterburner (above) which powers the Navy F3H-2N Demon all-weather fighter-interceptor. Many Allison engineers--out of school only a few years ago and now well entrenched on the Allison Division team of General Motors Corporation--contributed to the operational success of this powerful engine. If you would like to know more about the Allison team, write Personnel Department, College Relations, Allison Division of General Motors Corporation, Indianapolis, Indiana

A Changing Thing

By Larry Berger, soph., e.e.

Almost everyone enjoys music in some form. Some people who claim to be music lovers say that jazz is all bad. They say there is no music except classical. There are jazz fans with the same opinions about classical music. However, the true musician can see much in both jazz and clasical music. Actually the two are very much interrelated.

Although classical music is the older of the two, jazz had its beginning before many people think it did. Most people think jazz began with the Dixieland music of the South. However, every classical, and many jazz music lovers have heard of Bach. He is classified by many musicians as the first jazz musician. Many present-day jazz artists have styled themselves after Bach.

A distinctive characteristics of modern jazz is the several melodies all going on at the same time. Bach used practically every possible pattern in his Two and Three Part Inventions. The ways in which he works two and three melodies against each other is fascinating.

Jazz is a constantly changing thing. It has gone from the old style Dixieland, thru the time of the big bands, such as Miller and Goodman, to the modern progressive jazz.

The Dixieland bands, logically, had their start in the heart of the South. It was the only way these people could really express themselves. It was played in places fitting to the people, for they were poor, and sought the pleasure of life. Every hole-in-the-wall bar had it's Dixie music, with it's group of followers who were always there.

As jazz grew, the big band slowly developed. This was probably brought about by the love of dancing that the people were beginning to develop. The big band offered them the bigness of sound and beat that they desired.

As yet, jazz was still considered as trash by society. It was now time for jazz to be put in it's proper place. Paul Whiteman, a leading musician, asked a young jazz musician, George Gershwin, to compose a program for a jazz concert in Carnegie Hall. Gershwin forgot all about it, until he read the notice of the concert in the newspaper just two weeks before the concert.

He began composing that day. He worked up until the last minute, almost day and night, to get it finished. In this short time, he produced the Rhapsody in Blue. Needless to say, it was a great success, and it took jazz out of the street, and put it into the concert hall.

This concert gives you an insight on the love of music that jazz musicians possess. All of the men playing in the concert were out early in the morning to begin rehearsing. Because of the newness and the character of the music, they rehearsed all day. Then they played the concert that night. It was such a success that they had to play many encores. Most people would have gone home to bed then, but not these men. Some of them had heard of a new drummer in a little bar about fifty miles away from New York. They went to listen to him. The rest of them headed for a hotel room. There they had a jam session that lasted until about five o'clock in the morning.

The big bands have been slowly eliminated until only the best are left. They have been forced out by rising costs. Most places simply cannot afford to pay the five to ten dollars an hour per man that the quality of musicians in a big band demand. In their place has come the small combo. These range in size from trios to octets, with trios and quartets being the most prominent. These groups play almost every type of music, but much of what they play is progressive jazz. It is characterized by big chords and complicated rhythms. These chords are a departure from the chords used by the classical masters. A taste must be cultivated for the sounds of these chords, or they may even be unpleasant to the ear. If played by themselves, the chords are often very unpleasant, but the real jazz masters, move these chords into such surroundings that they sound perfect.

Although both classical and jazz

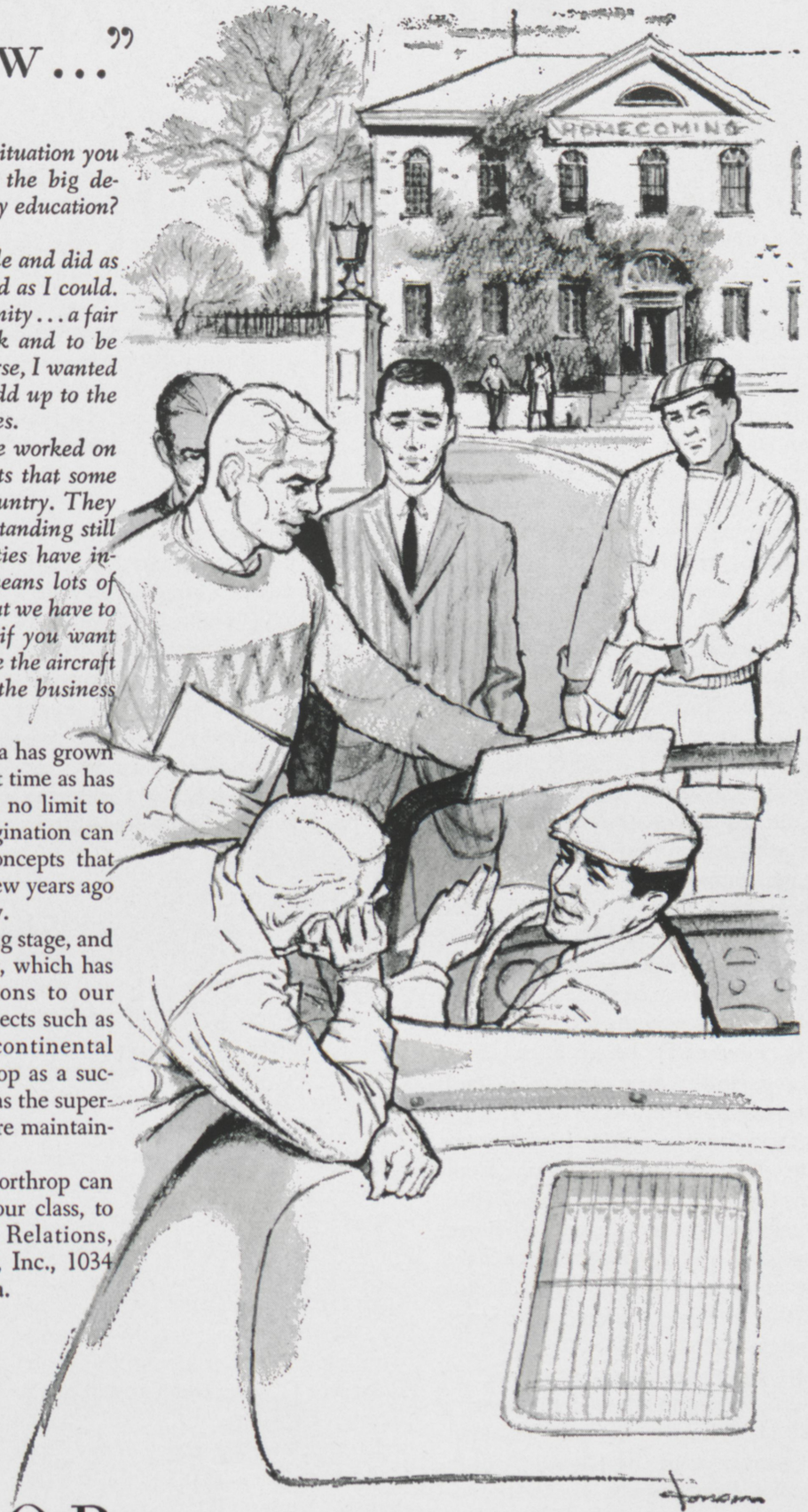
(*Continued on Page* 44)

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

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

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

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



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

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

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

NORTHROP

A Division of Northrop Aircraft, Inc.

BUILDERS OF THE FIRST INTERCONTINENTAL GUIDED MISSILE

Alumni News

By Richard Carter, fresh.

'92 Robert L. Wilson, M.E., died December 5, 1957. Mr. Wilson was a nationally known pioneer in electrical circles, having done extensive work in that field. Immediately after graduation, he was associated with the General Electric Company, and in 1894 with the Westinghouse Electric and Manufacturing Company, where he worked successively as engineer superintendent, general superintendent, and works manager until his retirement in 1931. Mr. Wilson superintended the original electrification of the Manhatten Elevated Railroad and the New York Subway; built and installed equipment for electrification of the N.Y., N.H. & H. Railroad and the St. Clair Tunnel of Grand Trunk Railroad—the first two important alternating current railroad electrifications in the United States. Since 1914, Mr. Wilson directed manufacturing operations at the Westinghouse Electric and Manufacturing Company at East Pittsburgh, until his retirement.

'21 Edward F. Jaenisch, m.e., was recently promoted to general sales manager of Louisville Gas and Electric Company. Mr. Jaenisch was with the Louisville Railway Company from 1922 to 1925, and spent a year with the Columbia Power Company at Cincinnati before starting at Louisville Gas and Electric in the Steam Production department in 1926.

'31 Anthony Blake, ch.e., will be coming to Rose next year to take Dr. Clauson's position as assistant professor in the Chemical Engineering Department. Mr. Blake received his Masters Degree at Massachusetts Institute of Technology. Mr. Blake was formerly the manager of the Cordoba Color Corporation, Terre Haute, Indiana.

'32 Dr. C. Chester Stock, ch.e, is now on a trip to Japan for Sloan-Kettering Institute. Dr. Stock has recently been made Associate Director of Sloan-Kettering Institute.

'41 Simon P. Gary, ch.e., has acquired the position of Consulting Chemical Engineering-Specializing in Metal Finishing, and Vice President of Corporation of Scientific Control Laboratories, Incorporated, Chicago, Illinois. Mr. Gary took graduate study and management study at Illinois Institute of Technology and Northwestern University, respectively, and has taught at Illinois Institute of Technology as a lab instructor. Mr. Gary was formerly plant manager at Grunwald Plating Company, Berkeley, Illinois.

'41 Lt. Col. John G. Appel, ch.e., has been recently assigned as Commanding Officer of the U.S. Army Chemical Corps' New York Procurement District. Col. Appel was previously Chemical Officer, United States Army, Caribbean. During World War II, he served at Edgewood Arsenal, Maryland, Camp Sibert, Alabama, and with a Chemical Base Depot in the European Theater of Operations. Col. Appel has attended the Command and General Staff School, the Chemical Corps School and as Plans and Policies Officer and later Deputy Chief for the Research and Engineering Division in the office of the Chief Chemical Officer, Department of the Army. February fith, Col. Appel will report to the Army-Navy Staff College of Norfolk, Virginia, for five month training. The purpose of the College is to correlate the different branches of the Armed Forces.

'45 Robert A. Manhart, e.e., who is Associate Professor of Electrical Engineering at the University of Arizona, has received an $11,500 National Science Foundation Science Faculty Fellowship which will enable him to carry on advanced study at Stanford University. This Fellowship is one of about sixty granted by the NSF in several branches of the sciences to improve the competence of college training.

'48 Al Yee, c.e., is Senior Vice President, Treasurer, and Director of Park and Yee, Ltd. The firm has been providing engineering design and construction supervision of such structures as apartment buildings, schools, churches, hospitals, offices, shopping centers, warehouses, industrial plants, and residences, in and around Oahu, Hawaii. Three other Rose graduates are also employed in the firm: Fujio Matsuda, c.e., '49; Satashi Don Shimazu, c.e., '49; and Tetsuichi Mitsuda, c.e., '49.

'49 Robert Fry, m.e., has gone to California where he has a position with Marquardt Aircraft. Mr. Fry was formerly in the Electronics & Parts Test Department, Allison Division, General Motors Corporation.

'51 Howard L. Jessup, e.e., is now Senior Project Engineer with Levinthal Electronic Products, Inc. at Palo Alto, California, concerned with design and fabrication of high voltage transformers. Mr. Jessup was formerly Design Engineer, Specialty Transformer Engineering Dept., Westinghouse Electric Corp.

'54 Robert D. Miller, e.e., who has been with Interstate Electronics Corporation, Anaheim, California, is now with that company in Cape Canaveral, Florida where he is working on a Navy missle project. Lynn York, '53, e.e., is also at Cape Canaveral working on the same project.

SEWAGE DISPOSAL

(*Continued from Page 21*)

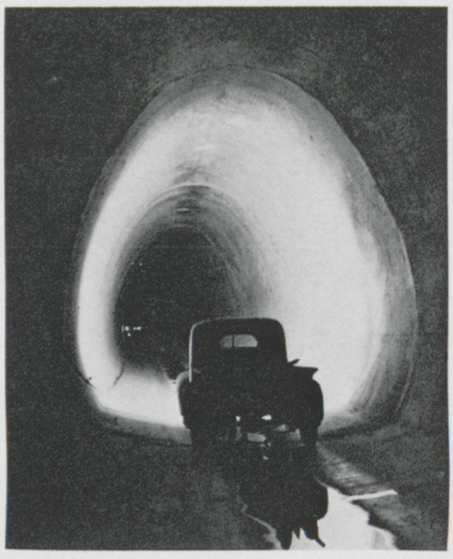
about $150,000,000.

The treatment process is as follows:

Incoming wastes from the interceptors enter the plant through two-inch bar screens with automatic cleaners which remove the large debris. The screenings are ground in hammer mills and pumped back into the sewage lines.

The wastes then enter the primary settling tanks. The retention time in these tanks is about thirty minutes. The settled sludge is drawn off the bottom. The sewage then flows to the aeration tanks where filtered air at a pressure of 8.5 psi is pumped through the liquid by blowers developing a total of 27,000 horsepower. At this point bacteria-laden sludge from previous batches is "seeded" into the fresh waters. This is known as the activated sludge process and aids materially in the digestion.

From the aeration tanks, the wastes flow to the final settling tanks, where the sludge is drawn off. The effluent is pumped to the Main Channel. The sludge flows to a concentration tank, where it remains for 4.5 hours. The excess liquid is returned to the incoming sewage. Coming from the concentration tanks, the sludge is treated with ferric chloride, then flows to the vacuum filter drums, which are covered with dacron blankets. The moisture is drawn through the blanket and the sludge is scraped off onto a conveyor belt.



Sewage Tunnel

The conveyor carries the caked sludge to one of the flash-drying units, each of which can evaporate 25,000 pounds of water per hour. The end product of this process is a commercial fertilizer, which is sold to help defray the expenses of the sewage treatment. More than 600 tons of fertilizer are produced every day, which yields a revenue of more than $2,000,000 a year.

With the development of this process, mankind has mastered a method to complete nature's cycle and return the growth factors to the soil without fear of contamination—and to do it a scale that roused the wonder and admiration of the engineering world.

Englishman (at college prom): "I say, what are they doing?"

American: "Dancing."

Englishman: "They get married later don't they?"

* * * * *

Sign in front of crematory: "We're Hot for Your Body."

* * * * *

"Did you follow my advice about kissing women when they least expect it?"

"Oh hell," said the fellow with the swollen eye. "I thought you said where."

* * * * *

Barber: "Was your tie red when you came in?"

Victim: "No."

Barber: "Gosh!"

* * * * *

A despondent old gentleman emerged from his club and climbed into his limousine.

"Where to, sir?" asked the chauffeur.

"Drive off a cliff, James, I'm committing suicide."

Wife—Darling, I'm afraid your dinner will be a little burned tonight.

Hubby—What's the matter? Did they have a fire at the delicatessen?

* * * * *

They laughed when I stood up to sing. How did I know I was under the table.

* * * * *

Joan: "I ought to warn you that my father will be home in 15 minutes."

Bill: "But I've done nothing I shouldn't."

Joan: "Well, I just wanted to warn you that if you're going to, you'd better hurry."

* * * * *

There is only one engineer who ever got rich. He recently died in Colorado and left a fortune of $50,000, which he amassed through unceasing toil, superhuman perseverance, remarkable ingenuity, and the death of an uncle who left him $49,000.

Deciding to teach her drunken husband a lesson, his wife dressed up in a devil's costume. That night when he came staggering home, all lushed up, she met him at the front door. Through his bleary, bloodshot eyes, he looked her over and said: "Who in the heck are you?"

"I'm the devil, you sinner."

"Well, I'm sure glad to meet you. I married your sister."

* * * * *

A field engineer, traveling between locations, boarded the sleeper and pulled back the curtains to his berth. He was extremely surprised to find two most personable blondes ensconced there.

After checking his ticket to see that he wasn't wrong, he said, "I deeply regret this, ladies, but I am a married man . . . a man of respect and standing in my community. I couldn't aford to have any breath of a scandal touch me, I'm sorry—but one of you will have to leave."

LOCKER RUMORS

(*Continued from Page 26*)

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BSB I	61
Sophomores	57
Juniors	44

VOLLEYBALL

The volleyball league has come to a temporary halt with semester break with seven teams active in league play. Two of the teams are not considered in the competition for the league championship, however. The AC team is composed of students of all classes, hence it represents several classes and housing units and would present difficulties in the counting of all-intramural trophy points. The other team left out is the Faculty. Their reasons for not competing for the league championship are: (1) they are getting to old for active sports (if they're having a losing season), and (2) they have too much experience on their side (if they're having a winning season). The standings for the league championship are:

Seniors	4-1
Deming	3-2
BSB-II	2-2
Ind. Frosh	2-3
BSB-I	2-4

These records do not include games played against the two teams mentioned above. Their records are: AC 1-1, and Faculty 5-3.

Although volleyball does not have the spectator following that basketball has in Indiana, volleyball should not be overlooked as a means of working off the tensions and pressures of long study sessions or "snow jobs" delivered by professors. Anyone who thinks it is a game strictly for girls gym classes should make a trip to the field house late some afternoon and get in a short game. Why not try it. I think you'll find it's a great game.

THE SHIP

(*Continued from Page 17*)

"Two minutes to zero," sputtered the loud speaker in the flight cabin. The pilot reached over and adjusted the knob under the speaker to take the sputter out of it.

Back in the communications communications the two occupants turned dials and flipped switches, readying themselves. They had to be ready when the firing time arrived. Nothing would, or could, stop or detain the firing. Things had been planned allowing the crew just enough time to make the final adjustments in their gear and instruments. It was fool-proof.

"Thirty seconds," blared the voice over the speaker. The pilot seated himself in a chair similar to those in the rear compartment. His body tightened as he reached for the firing switch. This was it.

Once more the speaker sounded. "Final count down. Five. Four." The pilot's hand tightened on the controls, his hand perspiring from the tension. "Three. Two. One. Zero." The pilot flipped the switch and immediately the engines fired. The ship vibrated as the engines built up enough force to lift the great mass from its resting place. Slowly, the ship began to rise. Then, as the weight was overcome by the thrust of the engines, the ship lurched forward and upward. Up, up, up until the engines automatically cut out and the craft coasted.

It was then that the pilot reached for the envelope containing his flight orders. He opened it and read silently to himself. No emotion was present on his face as he switched on the intercom system that could connect him with the rear compartment.

He read, "You are to proceed from our own solar system into that system containing the planet Earth. It is third in orbit from its sun. Here you will encircle this planet and observe its inhabitants, if there are any. You are not to land, but report back to your mother planet. Good luck."

EASY MONEY

(*Continued from Page* 19)

to. Put your name, other data, if available, on a piece of paper taped or glued to the back of the photograph. By putting your name on the back of the photograph, you will eliminate any chance for the judges to know who took the pictures. The pictures will be given a code number and a record kept of who took every picture.

(12) Winning pictures will be published with winners names. Any entry may be published at the discretion of the Modulus or Technic. Winning entries will probably be published by one of the two publications. Your efforts will not be limited to the few hundred students around Rose. If it is published in the Technic, it will be seen by approximately 1700 men who have an interest in Rose.

(13) *Contest closes* 4:00 *P.M. March* 1, 1958. You have only one month to get in those winning pictures. Get on the ball! No entries will be accepted after this closing time.

(14) *Entries should be submitted to: Photo Contest, Rose Camera Club.* Put your entries in an envelope preferably with a piece of stiff cardboard to protect them and drop them in the slot near the mailboxes.

(15) *Decision of the judges is final.* What good are judges if their word isn't final?

(16) *Black and white prints from color pictures may be entered.* A color slide may be used to make a black and white print for the contest. Any other type of film can be used as long as you can come up with a black and white print.

Any questions concerning technicalities, meanings of the rules, etc. should be referred to John Williams, President of the Camera Club.

There are many good books in the Rose library which will give you valuable aid in taking the prize-winning pictures. Any of the photography magazines in the library will give helpful hints on the techniques of taking good pictures, too. One of the best ways to get some ideas for good pictures is to look at one of the better magazines that have plenty of pictures in them. Look, Life, or Sports Illustrated are very good examples of this type of magazine. But let me warn you against trying to imitate these pictures. These photographers have had years of experience and have superior equipment. Use your imagination and try to get something different and original. The photographer should try to make the camera a part of himself and try to catch the picture with the feeling and atmosphere that actually surrounds the picture.

Good luck to all entrants and get those pictures in early!

LIBRARY NOTES

(*Continued from Page 34*)

poet, is at home, and here this Lincoln, made with the poet's hands, takes on reality.

In the four volumes telling of the war years Lincoln is not portrayed as the mighty hero, the great wise man who foresaw things perfectly and moved with unerring wisdom to the great end. He is shown as a poor limited mortal, of many moods, tempers, and distempers, stumbing, blundering along, trying this and trying that, telling jokes, bewildered, disappointed, weeping now, laughing then, ordering this, cancelling that, trying to smooth ruffled personalities, looking upon mankind, like Marcus Aurelius, as composed of little creatures playing and loving, quarrelling and fighting, and making up again, all without much rhyme or reason. Here we see Lincoln steadfast in his purpose of saving the Union, and, if possible reducing the area of slavery or getting rid of it entirely.

Advertisers Index

JAZZ

(*Continued from Page 36*)

musicians are artists, there is reason to believe that the jazz musician may have to be more of an artist in his own right. The classical musician plays music written many years ago. He must not depart from the written note, or he is disclaimed by other classical musicians. Herein lies the jazz musicians greatest pleasure. He can improvise. His music is a carbon copy of no one long dead, but it is his own feeling and mind poured forth in his instrument.

It is said that George Gershwin could improvise for hours on the same number, and never repeat himself. Another example of improvisation is Errol Garner. Although he is recognized by most as an outstanding jazz pianist, he cannot read a note of music, but must improvise everything he plays.

As with all of us, the jazz musician develops habits. This develops into his style, which is really his personality. Although he is playing a tune which has been around for years, he may so weave his own personality into the tune that only the most accomplished musicians can recognize it. In this way he weaves the web which holds his audience, and keeps them wanting his music.

The life of the jazz musician is not a good one by the standards of most people. If he plays with a big band, he is almost constantly on the road. He may play one night in one town, and then move several hundred miles to the next engagement the next night. He is on the move for several months at a time. Very seldom does he stay in one place too long, for the jazz loving public always wants something new.

The small combo, if it is really big time is always on the go,too. But if it is just a fair group, they will probably play small club dates in one area. These groups are often made up of the "one night musician", who plays one or two nights a week, mainly for the love of music.

The hours these men keep are very different from those most people keep. The typical musician usually doesn't see the morning. He starts to work at eight or nine o'clock in the evening, and plays until one or two in the morning. Then he sleeps until noon, before leaving for the next town.

Although by our standards, the jazz musician may have it rough, he has one big advantage. Every night, when he steps onto the bandstand, he is doing what he loves most. In almost any group he is playing with, he is given a chance to express himself every night.

This advantage can turn itself into a disadvantage, too. It is a great strain on a man to pour out his emotions night after night. It is for this reason that so many musicians turn to drugs and alcohol. These things losen their minds so that any worries they may have are forgotten, and they can concentrate on one thing, producing the jazz music the American people love.

The tastes of the people of America towards jazz are as varied as the musicians who play for them. The real lover of jazz wants his music according to his moods. If he is in a romantic mood, he may want the soft, sweet music such as Jackie Gleason plays. If he feels like dancing, he will probably go for someone like Duke Ellington, who has a good solid danceable beat. When he is in a wild mood, the big sounds, crazy rhythms, and the big chords of Stan Kenton will just fit his mood.

Each of these big bands has a small combo which is it's counterpart in the type of music being played. These combos are a reversal back to the way Dixieland existed. They are most often found in bars. This is due to the fact that only the bars can afford them.

Because of these high coats, the music world has turned to records, especially hi-fi. Here is about the only place the musician can really make steady money. This is because records allow him to get his music to a much larger section of the public.

FRATERNITY NOTES

(*Continued from Page* 16)

have been finding and practicing some very good numbers. This group is under the direction of Brother Ozzie Levene, and he is putting a good deal of time and energy into his group. With a little more practice we should sound pretty good.

Well, it's time now to drop this in the copy basket as the deadline is here, so until next month you all just remember that a Zillah is a provincial governmental district in India.

Fred Ryker

Lambda Chi Alpha

Well, its finals time in the valley again as the old semester draws to a close. Of course everyone is busy craming with an eye toward cracking the big one. So best of luck to all.

The great junior pin parade rolls onward. The latest victims are Barlow Brooks, who pinned Miss Jean McAllister of Terre Haute, and Don Johnson who gave his to Miss Helen Stone of Hamlet, Indiana. The ranks of the junior batchelors is thinning, and who will be the next to go?

Our faculty advisor, Al Schmidt, is taking a leave of absence from school for the next semester to complete work on his doctor's degree. This writer wishes Professor Schmidt many happy differential equations in the ensuing months.

The Lambda Chi basketball outfit is steaming along with a 3-3 record which ties them for second place with Sigma Nu in the I-F league.

Theta Kappa is being visited this week by traveling secretary Carl Enright.

As they say the well has run dry and I have run out of things to write so see you again some time.

Jim Barrick

Alpha Tau Omega

The excess energy usually expended on fraternity activities has been concentrated on the old books these past few weeks as the ATO's have been getting things in gear for finals. We are looking forward to a full February soccial calendar as gatherings during the past few weeks have been pretty much confined to study sessions. Good luck to everybody.

Many little jobs difficult to do during school are to be set in order by a work session scheduled for the semester break. The phone booth is to be remodeled, and the main bathroom will receive a new ceiling. Several aspiring ATO plumbers are bent on installing a newly acquired washing machine. The carpenters are going to enlarge several closets.

Over Christmas vacation two of the Tau's played Santa Claus with their pins. Norm Grimshaw gave his pin to Taffy Koss, and Elwood "Pasco" Stroupe gave his pin to Donna Schumpert. Bob Dinning really got clobbered by this romance busines and gave a ring to Doris Collier. The chapter's "percentage pinned" is running well over 50% now. Somebody said that even our beloved Brother Larr was caught talking to a girl a few days ago.

Robert W. Hall

STATISTICAL QUALITY CONTROL

(*Continued from Page 22*)

ent jobs, the proper method for maintaining the iron, and the interval through which the iron will dependably generate and transfer heat a satisfactory rate.

The final factor to consider is the operator who performs the task of soldering the connection. Just as two different people write the same letter differently, two operators have measurable differences in their performance. We are interested in the soldering operator's ability to perform a repetitive task thousands of times with sufficient accuracy to assure that each connection is mechanically secured to the proper terminal and that the heat, solder, cooling cycle is sufficiently controlled so that the variations which exist between the ensuing soldered joints will not be great enough to affect the security or reliability of the connection. However, we need some measure of the individual operator's ability to perform well. To do this, we make a list of all the attributes which make up a soldered connection as well as a list of those items which detract from the reliability of a conection. Some of the items would not affect the reliability of the connection but do impose a high standard of workmanship on the operator as she tries to prevent their occurrence. This list is then used to appraise the operator's work and score her ability to consistently perform her task in the specified manner. Through this total appraisal of the operator's performance, we are able to measure her repetitive accuracy with much greater precision than we could if we merely appraised her work for the presence or absence of a functionally acceptable joint. We can then rate each operator periodically and mark the ratings on a control chart. If the operator's performance is affected by a natural system of causes, the pattern will behave normally. If some extaneous cause enters the system, it will be shown on the control chart and the operator can compensate for it.

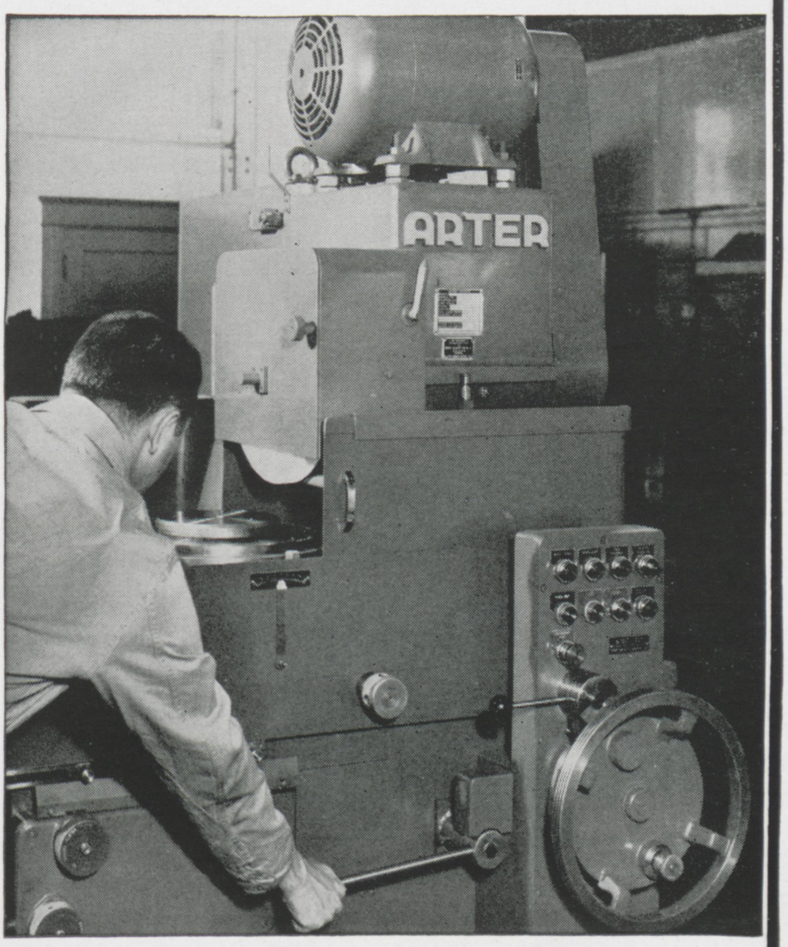
Thus, we have made every effort to assure a good soldered joint by carefully controlling all the factors which go into its manufacture. Through these means, the allowable error should soon reach the one in 100,000 called for many of our operations.

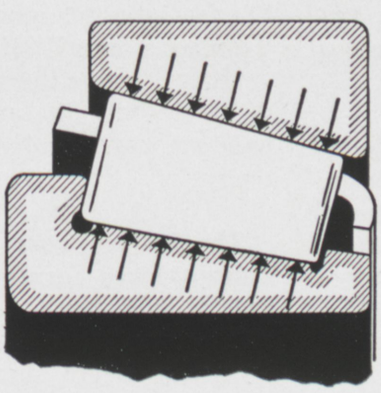
From the above, we can see the tremendous amount of effort that goes into the study of just one operation. When one considers that Western makes such evaluations on thousands of operations, he must realize that the company must have tremendous belief in the procedure to spend so much money on it. SQC is being applied more and more in various industries from the small to the large. As more use it, they invite others to do so also. It is important to know about SQC because we may run into it time and time again as it is applied to more industries.

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

How to get higher spindle accuracy, cut costs too

The engineers who designed this new surface grinder had to be sure of the highest spindle accuracy in order to get the smooth spindle operation required for extreme precision work. To hold the work and wheel spindles rigid, maintain highest accuracy, the engineers specified Timken® "00" tapered roller bearings. Timken "00" bearings make possible the closest machining tolerances ever achieved. Run-out is held to 75 millionths of an inch. And they gave the manufacturer greater capacity in less space, cut manufacturing costs ⅓ over earlier spindles used.





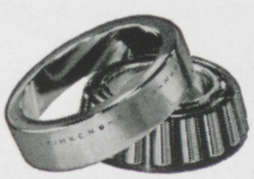
How Timken bearings hold shafts rigid to maintain accuracy—The full line contact between Timken bearing rollers and races gives shafts rigid support over a wide area. Shaft deflection is minimized. And the tapered design of Timken bearings permits them to be set up with the most desirable amount of end play or preload that gives the best performance.

Want to learn more about job opportunities? Timken bearings help make better machines. Better machines enrich our lives, give us more spare time. It's what the Timken Company calls Better-ness. Want to help create Better-ness? If so—write for your free copy of: "BETTER-ness and your career at the Timken Company". The Timken Roller Bearing Company, Canton 6, Ohio.

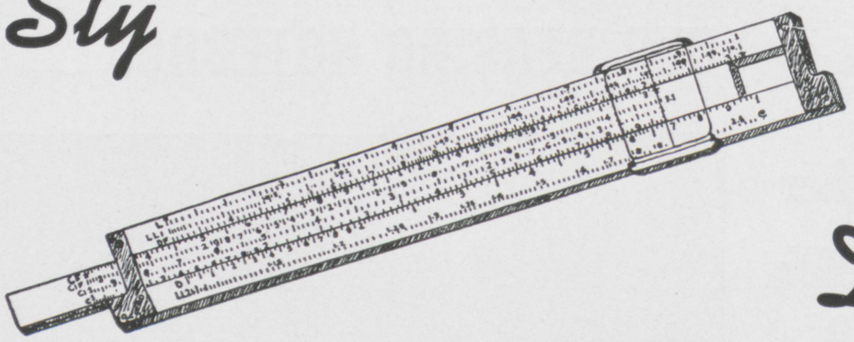
TIMKEN

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

TAPERED ROLLER BEARINGS



NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ↓◯↑ AND THRUST →◯← LOADS OR ANY COMBINATION →✳←

Sly  Droolings

Stolen By Max Hippensteel, sr., e.e.

The following advertisement appeared in a physical culture magazine: "Here's a good test for your stomach muscles. Clasp your hands over your head and place your feet together on the floor. Now bend to the right at the waist as you sit down to the left of your feet. Now by sheer muscular control, haul yourself up, bend to the left and sit down on the floor to the right of your feet. Keep this up and let us know the result."

The first letter received said: "Hernia."

* * * * *

The elevator was tightly jammed when a girl said fiercely: "Take your hands off me, you louse! No, not you! YOU!

* * * * *

He (in car, to sweet young thing) "Pardon me, but . . . er . . . ?"

Sweet young thing: "No, you've never met me before at Palm Beach, on the Pullman car, or the New York Central last Tuesday. I know I'm good looking and I'm not bashful. I'm not going your way, and I wouldn't ride with you on a bet. I didn't go to school with you; I'm waiting for a streetcar; I don't want a light; and I know plenty of college boys. Furthermore, I have a fiance who weighs 220 pounds. Now, were you going to say something?"

He (still in car): "Yes. You're losing your underwear."

* * * * *

Mother (putting Junior to bed): Shh . . . the sand man is coming.

Junior: For fifty cents I won't tell Daddy.

Socialism: You have two cows, keep one, government takes other for poorer people.

Communism: have two cows, government takes both, gives you some milk.

Fascism: government takes both cows, shoots you.

Unionism: two cows go on strike for more hay. No milk and no feed.

Capitalism: sell one cow to buy a bull.

Modernism: shoot the bull and breed artificially.

* * * * *

Stopping at the first farmhouse on his famous midnight ride, Paul Revere cried, "Is your husband at home?"

"Yes!" came the reply.

"Tell him to get up and defend himself; the British are coming."

At the second, third, and fourth houses the same conversation ensued, but at the fifth house it went something like this:

"Is your husband at home?"

"No!" came the reply.

"Whoa!"

* * * * *

Bus driver: "All right back there?"

Feminine Voice: "No, wait till I get my clothes on."

The driver led a stampede to the rear and watched the girl get on with a basket of laundry.

* * * * *

Jack and Jill went up the hill,
Upon a moonlight ride.
When Jack came back, one eye was black,
His pal, you see, had lied.

First coed: "Gosh, my laundry bill was $4.75 this week."

Second coed: "That's terrible. Mine was only $1.05."

First coed: "Yes, but you don't go with an engineer."

* * * * *

Pilot to Navigator: "What is our present position?"

Navigator to Pilot: "Due to my extensive training in calculus and trigonometry, I have calculated our position to be seven miles due south of infinity."

* * * * *

A newcomer knocked at the Pearly Gates for admission.

"Who is there?" St. Peter asked.

"It is I", came the reply.

"Go to hell-" he answered. "We have to many professors here already!"

* * * * *

The lumber camp foreman put a newly hired Carnegie Tech graduate to work beside a whizzing circular saw. As he started to walk away, he heard an "ouch!" and turned to see the Tech graduate looking puzzledly at the stump of a finger. Rushing back, he asked what happened.

"I dunno," said the boy. "I stuck my hand out like this and . . . . wel I'll be damned, there goes another one."

* * * * *

"Are you the young man who jumped in the river and saved my son from drowning when he fell through the ice?"

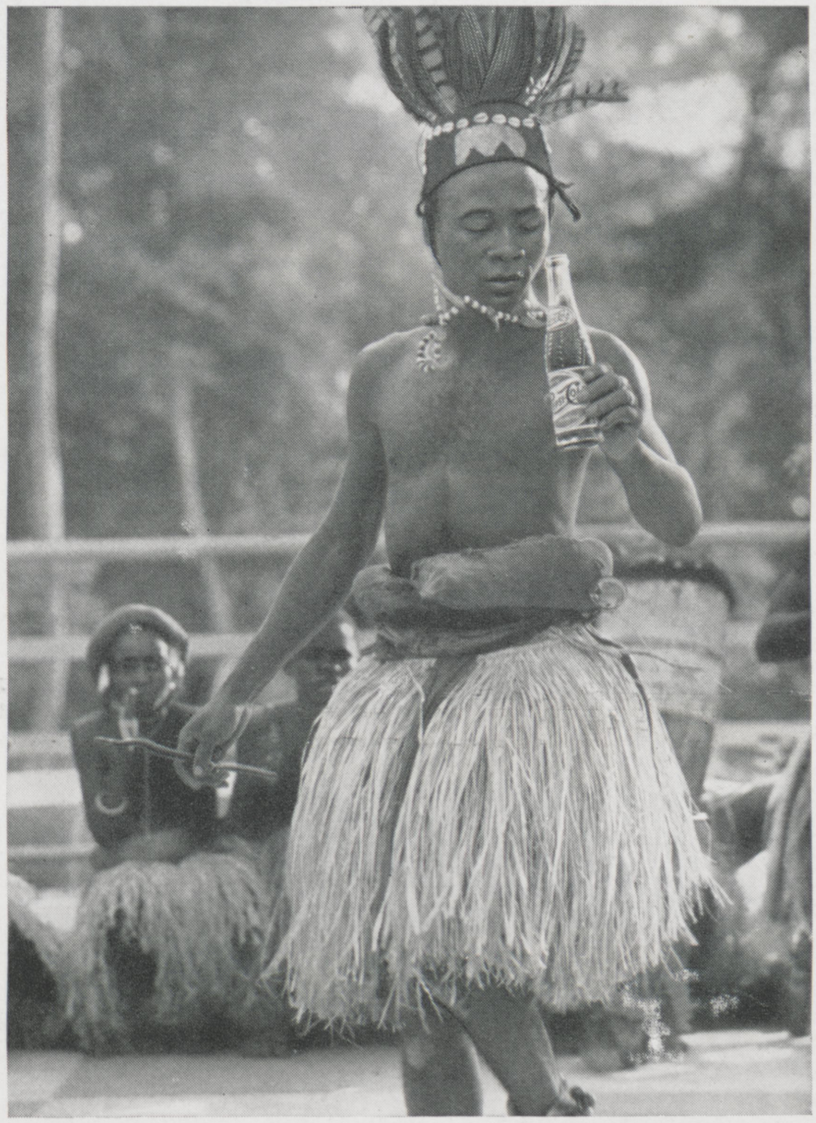
"Yes, ma'am."

"Where's his mittens?"

PHOTOGRAPHY AT WORK
No. 30 in a Kodak Series

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

Photography speaks in every language



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

This picture leaves no doubt that Netherlanders are neighborly.

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

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

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

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

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

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, engineering, electronics, design and production.

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

Kodak
TRADE MARK

One of a series*

Interview with General Electric's Earl G. Abbott Manager—Sales Training

Advancement in a Large Company: How it Works

Where do you find better advancement opportunities—in a large company or a small one? To help you, the college student, resolve that problem, Mr. Abbott answers the following questions concerning advancement opportunities in engineering, manufacturing and technical marketing at General Electric.

Q. In a large Company such as General Electric, how can you assure that every man deserving of recognition will get it? Don't some capable people become lost?

A. No, they don't. And it's because of the way G.E. has been organized. By decentralizing into more than a hundred smaller operating departments, we've been able to pinpoint both authority and responsibility. Our products are engineered, manufactured and marketed by many departments comparable to small companies. Since each is completely responsible for its success and profitability, each individual within the department has a defined share of that responsibility. Therefore, outstanding performance is readily recognized.

Q. If that's the case, are opportunities for advancement limited to openings within the department?

A. Not at all. That's one of the advantages of our decentralized organization. It creates small operations that individuals can "get their arms around", and still reserves and enhances the inherent advantages of a large company. Widely diverse opportunities and promotions are available on a Company-wide basis.

Q. But how does a department find the best man, Company-wide?

A. We've developed personnel registers to assure that the best qualified men for the job are not overlooked. The registers contain complete appraisals of professional employees. They enable a manager to make a thorough and objective search of the entire General Electric Company and come up with the man best qualified for the job.

Q. How do advancement opportunities for technical graduates stack-up with those of other graduates?

A. Very well. General Electric is recognized as a Company with outstanding technical skills and facilities. One out of every thirteen employees is a scientist or engineer. And approximately 50 per cent of our Department General Managers have technical backgrounds.

Q. How about speed of advancement? Is G.E. a "young man's Company"?

A. Definitely. A majority of all supervisors, managers and outstanding individual contributors working in the engineering function are below the age of forty. We believe that a job should be one for which you are qualified, but above all it should be one that challenges your ability. As you master one job we feel that consideration should be given to moving you to a position of greater responsibility. This is working, for in the professional field, one out of four of our people are in positions of greater responsibility today than they were a year ago.

Q. Some men want to remain in a specialized technical job rather than go into managerial work. How does this affect their advancement?

A. At G.E. there are many paths which lead to higher positions of recognition and prestige. Every man is essentially free to select the course which best fits both his abilities and interests. Furthermore, he may modify that course if his interests change as his career progresses. Along any of these paths he may advance within the Company to very high levels of recognition and salary.

Q. What aids to advancement does General Electric provide?

A. We believe that it's just sound business policy to provide a stimulating climate for personal development. As the individual develops, through his own efforts, the Company benefits from his contributions. General Electric has done much to provide the right kind of opportunity for its employees. Outstanding college graduates are given graduate study aid through the G-E Honors Program and Tuition Refund Program. Technical graduates entering the Engineering, Manufacturing, or Technical Marketing Programs start with on-the-job training and related study as preparation for more responsible positions. Throughout their G-E careers they receive frequent appraisals as a guide for self development. Company-conducted courses are offered again at all levels of the organization. These help professionals gain the increasingly higher levels of education demanded by the complexities of modern business. Our goal is to see every man advance to the full limits of his capabilities.

If you have other questions or want information on our programs for technical graduates, write to E. G. Abbott, Section 959-9, General Electric Co., Schenectady 5, N. Y.

***LOOK FOR other interviews discussing: • Qualities We Look For in Young Engineers • Personal Development • Salary.**

GENERAL ELECTRIC