Kenneth A. Brown, class of '46, speaks from experience when he says:

“There’s plenty of chance for advancement at U.S. Steel for the man who really wants to get ahead.”

If Kenneth A. Brown were to speak to you face to face, he would tell you: “Hi fellows . . . I’m not much older than you . . . I still like a lot of the same things you do. In addition, I like my work and I sincerely believe that you will like your work at United States Steel, and like the fine bunch of fellows with whom you will come in contact.”

Mr. Brown, at the comparatively young age of 29, is presently Works Engineer in charge of all engineering for the Worcester Works of the American Steel & Wire Division. He graduated from Brown University in 1946 with a B.S. degree in Engineering. He first joined U. S. Steel as a Junior Engineer at the Worcester Works, Worcester, Mass. Although his original duties included much drafting, he acquired a general administrative background and engineering experience. This qualified him for promotion to the position of Assistant to the Works Engineer in May, 1950. Despite a tour of military service for two years, Mr. Brown’s development resulted in his being transferred to the Construction Division in the Cleveland General Office. Starting January 1, 1953, he worked out of this office as Chief of Party on various construction projects.

On June 1, 1955, Mr. Brown returned to engineering and maintenance assignments at the Duluth Works. Although his work was primarily concerned with engineering problems, he also acquired a knowledge of various phases of maintenance. This experience qualified him for promotion to the position of Division Engineer on April 1, 1956. On January 1, 1957, Mr. Brown returned to the Worcester Works in his present capacity of Works Engineer.

Mr. Brown’s “success story” is typical of that of many graduate engineers who have associated themselves with U. S. Steel. “The unlimited opportunities at U. S. Steel,” says Mr. Brown, “plus the fine and helpful spirit that exists among the personnel, make success a matter of one’s willingness to work to learn and to fit into the friendly atmosphere which exists here.”

If you are interested in a challenging and rewarding career with United States Steel, and feel you can qualify, we suggest that you get in touch with your placement director for additional information. We shall be glad to send you our informative booklet, Paths of Opportunity, upon request. Write to United States Steel Corporation, Personnel Division, Room 1662, 525 William Penn Place, Pittsburgh 30, Pennsylvania.
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Your whole career can be affected by your decision, so choose carefully.

We sincerely believe you will make a wise decision in choosing Westinghouse, a company where big and exciting things are happening.

Here you can work with men who are outstanding leaders in fields such as:

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You will have an opportunity to work with a company that is having spectacular growth in many fields...giving you room to grow.

We value our engineers highly, for we know our growth has been due largely to the high caliber of engineering personnel we have succeeded in attracting. Their development into scientists and managers has resulted in dynamic and progressive planning and policies.

We help you apply your training to industry. You can pick a career in the industry of your choice...in the type of work you prefer, and in plants, sales offices and laboratories from the Atlantic to the Pacific. And, you can study for advanced degrees at Company expense.

These are just a few of many reasons why you should choose Westinghouse. If you want more information, ask your Placement Officer for our booklets, or phone or write the Westinghouse interviewer, or Educational Coordinator named below.

Mr. C. W. Mills
Regional Educational Co-ordinator
Westinghouse Electric Corporation
P.O. Box B
Chicago 9, Illinois

Paul Halpine, University of Pittsburgh '41, atomic engineer for Westinghouse, checking the operations of a model of the first nuclear reactor for the nation's first full-scale atomic power plant being built by Westinghouse for the AEC and the Duquesne Light Company.
THAT OLD PROVERB about necessity mothering invention certainly applies to the aircraft engine industry. Take these jet aircraft engine turbine blades, for instance.

New, higher thrust engines made it necessary to find—or develop—a material which would withstand the high temperature shock and stress conditions associated with these higher engine powers. Turbine blades turn at speeds over 13,000 rpm and are subjected to intense temperatures of over 1800°F. No ordinary metal would take that kind of punishment.

It was through the cooperative efforts of General Motors Research and Allison engineers that GM R-235 came into being. GM R-235 is a nickel-base alloy. Some of the outstanding high temperature mechanical properties requirements are combined with an inherent ability of the alloy to withstand momentary over-temperature exposures which are sometimes met in turbine engine operations. The results of such over-temperature exposure on GM R-235 are not reflected in deterioration of its normal expected properties when the engine is returned to normal operating temperatures. Previously, a 30 to 60 percent loss of blade life was encountered when such conditions existed. The superior qualities of GM R-235 have made possible a boost in engine temperature of about 150°F which can mean as much as 15% greater engine thrust. Since GM R-235 is a cast alloy, turbine parts can be mass-produced in controlled foundry facilities instead of being forged by highly skilled personnel.

Development of GM R-235 is typical of the interesting and challenging work going on at Allison. Want to know how you'll fit into the engineering picture at Allison? Arrange for an interview with our representative on your campus, or write for information: Personnel Department, College Relations, Allison Division, General Motors Corporation, Indianapolis 6, Indiana.
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Cover

“Conceptual drawings and flux distribution diagrams, a reference text and slide rule, blueprints and a slug of uranium enable Stanley Meltzoff to tell the story of the research and development that are helping harness atomic power to serve the needs of American industry. Reproduced through the courtesy of United Engineers & Constructors Inc. of Philadelphia, Chicago and New York.”


PRINTED BY MOORE-LANGEN PRINTING AND PUBLISHING CO.
140 North Sixth Street, Terre Haute, Ind.
This is about the time of year when engineering seniors sit down to some serious thinking about their futures.

For now is the time when they must start to decide which company they would like to join.

And now is the time when they must begin taking definite steps toward joining it.

So if you're among those mulling over that problem—here is some interesting news for you:

General Motors is seeking outstanding engineering graduates in a wide variety of technical fields.

- GM offers you the untold advantages of its nearly boundless facilities and resources—including the fabulous new GM Technical Center.
- Training programs to help you grow professionally.
- Increasing responsibilities to match your growing talents.
- Rewards in line with your achievements.
- The chance to work closely with some of America's finest engineering minds in one of GM's 34 decentralized manufacturing divisions, 126 plants in 68 cities.
- Most especially, GM offers you the creative climate of a corporation dedicated to what GM President Harlow H. Curtice recently called, "The inquiring mind."

If you feel these advantages can do for you what they've done for thousands of engineers who have carved richly rewarding careers with GM—now is the time to take steps.

If you believe that you have a great deal to offer General Motors in return—now is the time to let us know.

As a starter, why not see your Placement Officer this very week? Ask him to put you in touch with the GM College Representative. Or write us directly.

GM positions now available in these fields
- in GM Divisions throughout the country
  MECHANICAL ENGINEERING
  CHEMICAL ENGINEERING
  ELECTRICAL ENGINEERING
  INDUSTRIAL ENGINEERING
  METALLURGICAL ENGINEERING
  AERONAUTICAL ENGINEERING

General Motors Corporation
Personnel Staff, Detroit 2, Michigan
HIGH SCHOOL GRADUATES OF 1957

You are cordially invited to visit Rose Polytechnic Institute where you can earn a degree in:

CHEMICAL ENGINEERING
ELECTRICAL ENGINEERING
MECHANICAL ENGINEERING
CIVIL ENGINEERING

The next freshman class will be admitted
September 9, 1957
"Take my advice...

"Before I left school I just didn't know where to look for a job in engineering that offered the greatest opportunity. First of all I wanted to make sure of getting into an industry that wasn't overcrowded... where I wouldn't be lost.

"Also, I wanted to hook up with a firm that had pioneered in its field, yet was young enough to go places and take me along with it. And, I wanted to be certain that salary would be right and there'd be a good chance of lasting security for my family.

"After looking around, I decided to get into the aircraft industry because of the bright future it offered. That's particularly true now with the development of supersonic aircraft and missiles. To my way of thinking there's no greater opportunity in engineering—anywhere!

"So take my advice... your best bet is in the aircraft industry where you can build a real career for yourself and have something worthwhile to show for it the rest of your life.'

In choosing an engineering career, there is particular satisfaction in being with a recognized leader. At Northrop Aircraft, you will be with a forefront company that for more than seventeen years has pioneered in the development of entire weapon systems—manned and pilotless aircraft, all of them distinctive contributions to our aerial supremacy.

Northrop ingenuity is continually applied on new and revolutionary programs. Significant advances are being made in the important field of boundary layer control. Northrop is also world pioneer in the development of the first operational inertial and celestial guidance systems. Other vital projects include Northrop's new supersonic jet trainer plane, the T-38, and the Snark SM-62, first intercontinental guided missile for the Strategic Air Command of the U.S.A.F.

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Northrop's great new air-conditioned engineering center at Hawthorne, California, offers the latest in scientific equipment and comfortable working conditions. There you'll be among top engineers and scientists with whom you'll be proud to work... brilliant men who will be ready and willing to help you.

Write now and ask us questions as they apply to your engineering objectives. Tell us your ambitions... we believe we can relate them to opportunities at Northrop. Address Manager of Engineering Industrial Relations, Northrop Aircraft, Inc., 1019 East Broadway, Hawthorne, California.
G. Edward Gearhart was graduated from the University of Delaware in June, 1956, with a B.S. in chemical engineering, and is now working for his Ph.D. in chemical engineering at Lehigh. At Delaware, he was editor-in-chief of the yearbook, "Blue Hen," active in sports and secretary of the Engineering Council.

Ed Gearhart asks:

What does Du Pont mean by "on-the-job" training?

Denton Harris answers:

Training is pretty much full-time at Du Pont, Ed. The main objective is to train men to reach their full capabilities as soon as possible. So we give the new man responsibility the day he arrives, and increase it as opportunities are available and he's ready for more responsibility.

That's the basic, guiding policy. But Du Pont has many departments. And training has many facets.

In some plants, the college graduate being trained for supervision is moved through all areas of the production cycle. In others, where the technical phases are more involved, he may spend time in a laboratory or development group before moving on to production.

It works the same way in sales. The graduate may first learn the laboratory side of the products he's going to sell. Or he may start right out on learning selling techniques. That all depends on the products and markets involved.

The same on-the-job principle applies to new men in specialized fields of research, development or design... including daily contacts with supervision, frequent lectures, discussions and conferences. Periodic changes in assignment, too.

It's carefully planned, individualized training, Ed. We've found it's the most effective way to broaden a man quickly. Du Pont is a growing organization. And men with leadership potential are always in demand.

Denton B. Harris joined Du Pont's Engineering Research Laboratory in June, 1952, after completing work for an M.S. in civil engineering at the University of Massachusetts. He's currently working on an unusual project—a broad study of the philosophy of design. The objective is to learn more about people's design preferences, and the trends behind new concepts in industrial design. This new assignment came after Denton gained several years of experience in various kinds of civil engineering at Du Pont.

Are you interested in research work? About 2000 Du Pont scientists and some 3500 other employees are now engaged in research. Laboratory facilities of the highest quality are available at the Du Pont Experimental Station near Wilmington, and elsewhere throughout the country. Full information about research work at Du Pont is given in "Du Pont Research." Write for your copy of this free booklet to E. I. du Pont de Nemours & Co. (Inc.), 2507C Nemours Building, Wilmington, Delaware.

April, 1957
Are We To Grow?

An enrollment of seven hundred and fifty, here at Rose? Do not be absurd, you say, impossible! However, as unexpected as it may be to each of us, plans are now being considered to enlarge the enrollment of Rose by some 70%. The increased birth rate of the war years has thrown a tremendous burden on the educational system of the United States. This large increase in people under twenty years of age will soon manifest itself in the colleges and universities of the nation.

The Administration and the Board of Managers of the Institute have been pondering several questions before they decide what course Rose should take in regard to the large increase of college students. First comes the question of carrying the load. Is Rose doing her rightful share in the education of scientists and engineers of tomorrow or are we shifting the responsibility on to someone else’s shoulders? However, if this plan were to be carried out, would we be able to maintain the quality school and friendly attitude that we now enjoy? Of course the student body, as well as the Administration, is asking itself the question of the cost per student. Would costs be increased to such a point as to be prohibitive to many of us? Oh yes, the biggest problem is “Whence comest thy help”, four million dollars of help, that is.

As to the problem of informality and friendly atmosphere that we now enjoy here at Rose, it is generally felt that such a small increase would not materially change this arrangement. Many feel that Rose is definitely not sharing the responsibility of higher education with other colleges and universities. And indeed, if it is true, the only way that we may remedy this is to increase our enrollment. Many of the larger universities anticipate an increase of over 150% in the next ten years. The big question in every student’s mind and to those that will follow is the annual cost per student. The total enrollment of seven hundred and fifty students was arrived at in order that the per capita cost would remain unchanged. This is certainly reassuring to those who might oppose such an expansion on the grounds of increased cost to the student.

It is my feeling that if this money can be found then Rose should by all means take advantage of the situation and enter into this expansion program. It is our responsibility to society to provide the educational facilities for more engineers which will be in even greater demand in the years to come. In order to survive as a quality institution we will find it increasingly necessary to offer not only more but different courses. To do this will demand a bigger faculty, increased physical plant, and, of course, an enlarged student body. Also we do not wish to become so small by comparison that prospective students will be fearful of gaining entrance into our, seemingly, sacred doors. Anything of this scope and importance can hardly have any effect other than one of a shaking and an invigorating nature. Surely no one can do anything but gain from such a move. If you are truly interested in such a plan, as each of us should be, I heartily suggest that you not only discuss such a plan openly among yourselves but with the Administration and Faculty as well. They are sincerely interested in your views and ideas on this plan which could so vitally affect the “GROWTH OF ROSE”.

Have you heard about linear programming? It's a new tool of Management Science—a mathematical technique devised to help management make decisions more quickly and accurately than ever before.

Suppose, for example, you are a manager faced with a veritable jungle of figures—schedules, machine loads, cost inventories. A decision based on these must be made. Once you would have had to be satisfied with an educated "guesstimate," or perhaps recourse to trial and error. But now, with linear programming and electronic computation, you can get not merely "an" answer, but the best possible answer—and get it fast.

**The computer's the key**

Key to the success of linear programming is an electronic computer—IBM's 704. Its tremendous calculating speed and data capacity solve complex management problems often in a matter of minutes.

If you are preparing for an engineering career, or are majoring in math or physics, perhaps you would enjoy helping IBM create electronic computers such as the 704. The potential of this phase of electronics presents one of the brightest chances today for a rewarding career. Why not ask your Placement Director for a copy of IBM's brochure? Or write direct to our Manager of Engineering Recruitment:

R. A. Whitehorne, Room 3304,
International Business Machines Corporation
590 Madison Avenue, New York 22, N.Y.

**Transportation costs cut**: Shippers use linear programming and the IBM 704 to map most economical routes. One reports a 50% yearly cost reduction.

**More profit per plant**: Manufacturers use electronic computation to determine which combination of machines and products means minimized costs, maximized profits.
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...and grow with 3 growth industries

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- Develop engineering skill
- Choose from a wide range of career possibilities

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...there's security in the company's $2 Billion backlog of military and commercial contracts!
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and you'll be in both the income level and geographical location to enjoy life to its full.

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There was McOat, stuck in the sand, while the boat moved on to interesting new horizons. Every day of standing and watching, and waiting, left him just a little more frustrated.

McOat was an engineer with imagination, training and talent. Off to a bad start. Stuck where he couldn’t make fullest use of what he had.

Fortunately, this wasn’t fatal for him. It was merely discouraging, costly and wasteful.

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Such engineers have helped us develop many distinguished automotive firsts, including push-button driving... the first practical automotive gas turbine... and many others, all the way back to all-steel body construction and hydraulic brakes. Now they are helping us pioneer beyond the automotive horizon in the fields of atomic power and solar energy.

We’d like you to have the facts about an engineering career at Chrysler Corporation. Whatever your particular field may be—research, metallurgical, chemical, electrical or mechanical— we will gladly give you a complete run-down on the opportunities awaiting you.

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New York City — MECHANICAL ENGINEER John Trillinghast confers with manufacturer and colleagues on supercritical steam pressure unit.

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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 900 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

Page 14

The Rose Technic
FORECAST: There's a world of aluminum in the wonderful world of tomorrow

NEEDED:
Imagineers with a sense of adventure

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The men who will make this forecast come true are in college today. Perhaps it's the man who sits next to you in Advanced Phys Met or Machine Analysis or Heat Power Design or Chem Engineering Kinetics or Marketing or Cost Accounting. Or maybe it's you.

If you have that extra spark of imagination . . . creativity . . . adventurousness . . . take the first step: see your Placement Director or write for your copy of Alcoa's Career Guide. It tells an exciting story . . . of the future of the young Imagineers who join up with the men who built the aluminum business.
Arne Steivang and Charles Baumann of Federal Bakery Co., Winona, Minnesota, receive engineering service and product data from Stan Nelson (left), of Standard Oil, to help keep maintenance costs low on Federal’s truck fleet.

How to write a success story

STANLEY NELSON, automotive engineer, is typical of many young men we like to tell about in the Standard Oil organization. He keeps proving to be the right man in the right job as he advances with us.

Stan likes engineering, of course. He graduated from the University of Minnesota with a B.S. degree in Mechanical Engineering in 1950.

He likes people. He especially likes to get into business problems with them where he and his company can help. Truck maintenance, lubrication, and fuel consumption are big items to fleet operators, large and small, who have found that help from Stan pays off—for them.

And he likes selling. He functions frequently as a key man for the sales department. His intelligent analysis of a problem in his field may either improve our service to a valued customer or help us to secure a new one.

He likes to keep moving, too, and he’s done that. He held several sales positions in Minnesota and attended Standard’s intensive Sales Engineering School in Chicago before being promoted to his present position in which he works out of the Mason City, Iowa, division office.

As men like Stanley Nelson earn their way upward in our organization we have frequent openings for ambitious college men to follow them. You might find a career in engineering, research or sales with this stable and progressive company rewarding, too.
How to make the most of your engineering career
ONE OF A SERIES

go where engineers are free to do creative work

One of the things that irks engineers most, surveys show, is getting burdened with dull, routine chores. This takes the fun out of engineering, and slows you down.

You'll be ahead, therefore, if you select a company that helps you avoid this kind of career impediment.

Take Boeing, for instance. Boeing frees engineers for creative assignments by hiring engineering aides and draftsmen to handle routine jobs. Boeing engineers concentrate on engineering.

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NOW is the time to start planning ahead.
Consult your Placement Office, or write:

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Engineering Personnel Administrator
Boeing Airplane Co., Seattle 24, Washington

FRED B. WALLACE,
Chief Personnel Engineer
Boeing Airplane Co., Wichita 1, Kansas

BOEING
Aviation leadership since 1916
Seattle, Washington Wichita, Kansas Melbourne, Florida

April, 1957
Work with the **GAS** industry...

the nation's sixth largest

The Gas industry—the sixth largest in the nation—has a total investment of over $15 billion. Last year the industry set a new all-time record in number of customers, volume of Gas sold, and dollar revenue. In fact, Gas contributed 25% of the total energy needs of the nation as compared with 11.3% in 1940. The Gas industry is a major force in the growth development and economic health of this country.

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**American Gas Association.**
Chemical progress is autoclaves, test tubes, distillation towers . . . hydrocarbons, heterocyclic compounds . . . processes, polymerizations, products.

But mostly, chemical progress is thinking . . . men thinking. Little men, big men, medium size men . . . in lab coats, business suits, overalls . . . all of them, always, thinking.

Thinking up new products . . . new ways to make chemicals and new ways to use them. Thinking up more comfort, more convenience, better health, for everyone.

Always, the old things have to be improved, and the new things have to be proved. It takes more thinking. The thinking never stops. And so chemical progress never stops. It’s that way at Koppers.

You can be one of these men, thinking. You can create some of the chemical progress that’s made at Koppers. The products are many . . . the opportunities myriad. Consider a career with Koppers; send the coupon today.
LIGHT AMPLIFICATION BY TV

The first time I heard of light amplification was about seven years ago. I was reading one of the popular type of science magazines and noticed an article about a video tape recorder. It had been developed at the RCA research laboratory, and the next thing the article said they were going to try to develop was a "true light amplifying device." I remember thinking at the time that light amplification is impossible. Of course, I should have known better. Several "devices" have been developed by different companies in the last few years that do amplify light.

There are two principal methods utilized to amplify light. The obvious way which would probably occur to you after a little thought is by the means of a closed circuit television system. The other method depends on a peculiar property of certain phosphor compounds that causes them to emit light when they are placed in an electric field. This phenomenon is known as electroluminescence. I will first briefly discuss amplification of light by television and then cover in somewhat more detail the amplification of light by electroluminescent phosphors.

Closed circuit television systems have been built specifically for amplifying light, and of the two methods mentioned, it is the one that has progressed more toward becoming a commercial product. In the amplification of light by television the objective is to have the picture focused on the pick-up screen of the camera tube. Very good results have been achieved by the television light amplifier.

Television light amplifiers now available are capable of amplifying light 40,000 to 50,000 times. This system has a camera and a monitor similar to regular television equipment, but it uses a special high-gain low-noise amplifier which produces a picture on the monitor that is 40,000 to 50,000 times brighter than the scene viewed by the camera.

The U. S. Air Force has a similar system which they call a "cats eye light intensifier." It can reproduce a high quality picture with good resolution from a subject in a room that would appear totally dark. The light intensifier is capable of sensing and amplifying the always present photons unseen by the human eye. Photons are bundles of electromagnetic waves which in sufficient numbers appear to the eye as light.

These television systems are very expensive and cumbersome. Both of these undesirable characteristics greatly reduce their possibilities for widespread use. The device that will be described next could overcome the two drawbacks of the closed circuit television light amplifier.

AMPLIFICATION OF LIGHT BY ELECTROLUMINESCENCE

The amplification of light by electroluminescent phosphors is based on the phosphors property of emitting light when subjected to an electric field. This electric field can be established by applying a voltage across the phosphor. The amount of light emitted by the phosphors de-

![Fig. 1: Basic Photoconductor-Electroluminescent Light Amplifier.](image-url)
scent Panels

By Max Hippensteel, jr., e.e.

Depends largely on the voltage across it. Two different types of light amplifier utilizing phosphors have been developed. One is called photoconductor-electroluminescent light amplifier and the other is the photoelectroluminescent light amplifier. Don’t let the four dollar words throw you. The photoconductor amplifier will be discussed first.

Electroluminescent light amplifiers are solid state devices that do not utilize electronic circuits or large vacuum picture tubes. The photoconductor-electroluminescent amplifier utilizes sandwiched layers of photoconductor and electroluminescent phosphors between glass. A photoconductor is a substance whose electrical resistance decreases in a regular fashion when it is exposed to light.

The first photoconductor-electroluminescent light amplifier was a panel type device composed of a photoconductor and a phosphor layer sandwich between two plates of glass. Fig. 1 shows this type of amplifier. A glass plate (1) was coated with a transparent conductor (2). On top of that was spread a uniform layer of electroluminescent phosphors (3) that emits light in a strong alternating electric field. The next layer was a photoconductor (4) which must necessarily have a high dark resistance. On top of this was placed another glass plate (6) coated with a transparent conductor (5).

To operate the screen, an alternating voltage in the audio-frequency (60-3000 cps, 600-800 volts) is applied to the transparent conductor layers (2) and (5). The resistance of the photoconductor must be high enough that most of the voltage drop will be across it when the screen is not illuminated. As the illumination of the screen is increased, the resistance of the photoconductor decreases and therefore the voltage across it decreases and the voltage across the electroluminescent phosphor layer increases. When the voltage across the phosphor reaches a certain level it begins to emit light. If the light emitted by the phosphor is greater than the light incident upon the photoconductor, the desired result for a light amplifier is obtained.

One of the first panels that was made in this way was about three inches square and achieved a brightness gain of approximately two. This intensification was achieved with a primary image in the visible region. The low gain factor of two was attributed to the way the particular photoconductor used responded to light in the visible region of illumination.

In a device such as described above, unless some provision is made to prevent the light emitted by the phosphor from illuminating the photoconductor, this emitted light will act as the controlling signal to the photoconductor and the phosphor will continue to emit light independently of the applied illumination. This is called feedback.

The simple sandwich type light amplifier has numerous shortcomings. A relatively thick layer of photoconductor is required to control the phosphor layer and the opacity of the photoconductor severely limits the gain of the amplifier. Several different types of amplifiers have been built in trying to overcome the drawbacks of the sandwich type amplifier. One of the best devices that has been developed is shown in Fig 2. It started with a plate of glass (1) on which had been placed the transparent conductor (2) and the phosphor layers (3). A thin opaque layer (4) was placed on the phosphor to prevent feedback. Next came a layer of current diffusing powder (5) and then the layer of photoconductor (6). The photoconductor was sprayed with silver paint and fine “V” grooves were cut in the photoconductor. The bottoms of the grooves cut slightly into the current diffusing layer and the tops of the grooves were left with narrow conductor silver lines (7) which were connected together and served as one electrode.

The ridges of the photoconductor provide continuous conducting paths for the photocurrents from the electrode at the apex of the photoconductor to the bottom of the photoconductor grooves. By means

(Continued on Page 42)
What Is Happening To The Rose Campus?

By Gerald C. Rose and Robert D. Strum

Rose Polytechnic Institute is an engineering college. Here, students spend a great deal of time learning how to analyze difficult problems and learning how to come up with reasonable answers. At the same time, Rose men develop a genuine pride in the engineering profession and in the Institute. If you don't believe this pride exists, ask any Rose student what he thinks of basketweaving majors in other educational institutions. He's very proud to be a Rose engineer.

It is not surprising then that the students and faculty are alarmed at the apparent chaos in which the campus has been for the past few years. Tourists driving by Rose in midmorning of a typical school day could easily decide that our campus looks like the parking lot for a General Motors plant or a Canadian logging camp.

When parking the increasing number of automobiles on campus became a problem about three years ago, action was immediately taken. Parking lots were built. These lots are located in areas where they are prominent eyesores on our once beautiful campus. In addition to this, they are poorly constructed parking lots. As all good military engineers know, a good subgrade is essential. Gravel over turf hardly constitutes good engineering practice.

Now we come to another sore spot among the “Preservers of the Rose Campus”. On almost every day since last November, the resonant tones of the professors’ lectures have competed with the angry whine of a power saw. A large number of trees have been cut down and hauled away from the campus in the past four months. The claim is made that the majority of these trees are hollow, and are being removed so that younger trees can grow. But one can see logging trucks leaving the campus each day with quite a few strong, healthy trees that have been slaughtered in the process. Certainly the Institute is receiving some

(Continued on Page 51)
A very successful and interesting AIEE meeting was held in the auditorium on February 20. The program was presented by Charles Lotze (RPI '30) and two of his associates from Bell Telephone Company at Indianapolis.

The first portion of the program consisted of demonstrations of new types of communications equipment and many interesting devices were shown. Special telephone lines were run into the auditorium for the evening. Using a new direct dialing long distance system, contact was made with Joe Leppert (RPI '56) in New Jersey. Joe carried on an interesting and amusing conversation with Dean Moench which was carried to the audience through loud speakers.

Refreshments were served, after which a new film on the laying of the transatlantic telephone cable was shown. The meeting was open to guests and a total of 150 were in attendance.

MIXER

Rush weekend turned out to be a really full one this year. Campus Club held a mixer with girls from St. Mary's on Friday night, March 8, in the student center.

Entertainment included dancing to some great hi-fi along with songs by a quartet from St. Mary's and some tremendous magic by freshman Jim Montgomery.

The evening was very successful with one exception. We were slightly outnumbered (sort of embarrassing) and a few fair damsels spent a restful evening asleep in a corner chair. The situation improved a little as the evening wore on, with recruiters pulling in all males in sight.

BLUE KEY

At the honors convocation February 28, three men were "tapped" to become pledges in Rose's chapter of Blue Key. The three new keys were displayed prominently on ribbons around the necks of Max Hippensteel,

Crone Knoy, and Dick Trueb. Congratulations fellows.

TAU BETA PI

Gold medallions were displayed on February 28 by seven new Tau Beta Pi pledges. Those honored were Le Roy Friel, Bob Overpeck, Chuck Skidmore, Tony Eubank, Leon Cole, Dick Wegrich, and Ken Denny. Congratulations to the new pledges.

RADIO CLUB

Rose Radio Club lent a helping hand to senior Floyd Koontz recently. Floyd was ill and confined to his home in southern Illinois. Since he is a licensed operator and has his own home transmitter, he received assignments over the air with Radio Club members alternating on the job at the RPI transmitter.

ASCE

Civil engineers at RPI have selected officers to head their organization through the next year. Ken Denny is the new president and has (Continued on Page 53)
LAMBDA CHI

Annual elections of Theta Kappa's officers were held February 26. Results were: Frank Molinaro, President; John Jardine, Vice President; Dan Mook, Secretary; Larry Logue, Treasurer; Dick Brown, Rush Chairman; Carl Herakovich, Social Chairman; Marlan Hildenbrand, Ritualist; Jim Massey, Pledge Trainer; John Kenedy, House Manager; and Hugh Griffin, Steward.

After the rush week end of March 2-3, Lambda Chi Alpha was happy to have the following men as pledges: Bob Doom, Tom Feutz, Bart Gronberg, Terry Hallcom, Noble Huff, Jim Kincaid, Bruce McDowell, Vern McKenzie, Chuck Overbey, Gary Phipps, Fred Schaefer, Bill Schaper, Bob Stevens, and Bill Young. We welcome the new pledges, but wish they would not follow the example of last year's pledge class in stealing the silverware.

A date party was held the Friday after rush. Attendance by actives, pledges, and guests swelled the house to overflowing and everyone enjoyed themselves greatly.

The committee in charge of the White Rose dance, headed up by Dick Brown and Carl Herakovich, is busy at work on plans and preparations for that social event. A band from DePauw will provide the music.

Now that spring has finally sprung, the time for interfraternity softball is not far behind. Lambda Chis have high hopes for retaining the championship, but we are not underestimating our rivals.

Cupid must have broken his bow-string because there are no pinnings or engagements to report this month.

SIGMA NU

Sigma Nu is proud to announce that we pledged 14 men in a very fine and successful rush season. The men pledged are Gary Anderson; James Bauch, Jim Boles, Kenneth Brown, Kirk Brownell, Johnny Kirk, Harold Miller, Jim Onnen, John Obst, John Rule, Don Scott, Lanny Snapp, Joe Waldbieser, and Tom Wilson. Elected as pledge captain was Gary Anderson and the secretary is Don Scott.

Sigma Nu won the basketball trophy this month and it improves our mantel greatly. We have already started softball practice for the coming season.

On Friday, March 8, the brothers had a very enjoyable time with the ATO's at a mixer. We have several more planned in the future.

Congratulations to Brother Richard “Don’t worry about old Hirsty” Hirst on pinning Miss Ann Atwood. The story goes that it was a very memorable occasion.

Kent Sharp

THETA XI

Well, that “lost weekend” called rush has come and gone. Many of us thought for a while there it would last forever. All the TX'ers worked like fiends the Friday previous to make the house spotless and shining. Then on Saturday and Sun-
day the Frosh succeeded in getting it dirty again. They trooped all around, upstairs and down, meeting the members and their respective habitats. Seriously though, the TX men really enjoyed entertaining their guests. Besides the introductions, tours, “hot boxes”, and refreshments (complete with females for the guests to look at), there was also a fine film on the Cummins Diesel. We all hope everyone enjoyed himself on his visit to Kappa chapter of Theta Xi.

And our efforts weren’t in vain! We got some really great guys for pledges! We held a small party in the Rec Room after formal pledging. Besides many other fine assets, we found our new pledges are not only good singers, but possess eloquent speech-making power, too! And they also have a reserve of new jokes! About the only discerning note in their characters that the actives have found thus far is their size. Man, we’ve got some real monsters! Not only do they reach far up into the stratosphere, but a few have trouble getting their shoulders thru a door! After noting this fact, a majority of the actives are in favor of postponing the annual active-pledge laking party until we have taken a few body-building courses. We are confident our new pledges have the potential to really lift TX to new heights. Here are all our pledges:


We’re really glad to have you with us, pledges. Now it’s up to Pledge Trainers Mrava and Coma to keep you in line.

It seems two more proud TX’ers have fallen before the feminine onslaught. Ray Gompf has pinned Pat-Carlyle and Bob Brier has pinned Nancy Lyon.

I guess that’s all the news for now, so look for this column in the next Technic for some more on TX.
MEET THE FACULTY

A Look at "Hoop"

By John C. Hunt, jr., m.e.

Professor Irvin P. Hooper is a very modest man who insists that he is just an "average" person. Yet those who know him will insist just as strongly that he stands far above his description of himself. "Hoop" declines to discuss any philosophies which he may have formed and is open-minded in his relationship with students. He feels that there are too many philosophers around as it is.

He comes from Lynn, Massachusetts where he graduated from high school. He then worked for two years before entering Tufts College near Boston, and there, worked his way through while earning a B. S. in Mechanical Engineering. He won scholastic honors and was initiated into Tau Beta Pi honorary fraternity.

He spent his college summers working as a crewman on large sailing yachts. Although he enjoyed sailing very much during his college years, it is just one of several water sports in which he has taken an active interest.

Upon his graduation from Tufts, he was employed by Atwood Morrill, and worked on steam specialty equipment. He worked there for two years and then entered graduate school at the University of Vermont. It was there that he met his wife, who is a graduate of the University of Rochester. She received her M. A. at Vermont. Before "Hoop" obtained his degree though, Dr. Prentiss, then president of Rose, asked him to teach here. He accepted the offer and left graduate school to set out for the mid-west. His teaching career was soon interrupted by the threat of war, so "Hoop", who was, is, and always will be a loyal marine reservist, was activated. He belonged to the Fifth Marine Division in Washington, D. C. and then saw action in the Pacific, including Iwo Jima. He was promoted to Chief Engineer Officer of his unit while on active duty and is now a major in the marine reserves.

After the war, he returned to graduate school and finished his work for his M. S. in 1949.

"Hoop" enjoys vacationing with his family in the east and usually chooses a place where he can do plenty of fishing and boating. He has also organized several mountain "hiking" expeditions in Mountainview, Massachusetts. He seems able to adapt his interests to his locale.

Recently, he has spent his summers working for General Electric on gas turbine analysis for small aircraft. He also does consulting work for insurance companies in Terre Haute.

Presently, he devotes most of his spare time to his children, Jane 6, and James 3. He also spends a great deal of time around the house, building, repairing, and sometimes making toys for the kids.

He spends most of his evenings on school work but often takes time to enjoy music. He generally prefers the light classics and especially the performances of the Boston Pops orchestra. He has joined in the hi-fi craze by building his own set.

"Hoop" is now Acting Head of the Mechanical Engineering Department, and is a member of the American Association of University Professors, the American Society for Engineering Education, the American Society for Mechanical Engineers, in which he has held a variety of offices, and is a member of the local chapter of Alpha Tau Omega fraternity.

He has enjoyed his teaching career at Rose, and is confident of the school's ability to produce high caliber engineers.

Prof. Irvin P. Hooper

THE ROSE TECHNIC
BASEBALL:

Jim Carr's Baseballers have begun workouts for the coming spring season. Pitchers and catchers have been working out in the RPI fieldhouse for several weeks. With the arrival of warm weather the squad has expanded and moved outside to begin preparation for the season opener against Franklin College on April 4. The season schedule is as follows:

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<td>April 4</td>
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May 8 Marion T 1
May 11 Ill. College H 2

Good luck to the baseball team in its coming season. Let's all turn out to cheer them at their home games.

TRACK:

The RPI cinder-men face a long and tough schedule. With 3 indoor meets and 6 outdoor meets stretching out over 2 months the thinly-clads are shooting to repeat as the Prairie College Conference track champions. The squad is boosted by several returning lettermen, including captain Ned Kurtz who last year scored more points than any RPI man ever, and was chosen outstanding individual in the Rose relays. A good crop of freshmen promises to aid the team in several events. The running engineers had a good season last year, let's get out and boost them to a better one this year. The schedule is:

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<td>March 14</td>
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<td>March 21</td>
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<td>April 27</td>
<td>Rose Relays</td>
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<td>May 8</td>
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<td>May 18</td>
<td>Prairie Conference</td>
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By Larry Logue, soph., m.e.
Schlieren photographs, above and left, illustrate different phases of airflow investigation. Development of inlets, compressors and diffusers requires many such studies in case of test rigs, subsonic or supersonic wind tunnels.
at Pratt & Whitney Aircraft
in the field of Aerodynamics

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

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

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

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

Modern electronic computers accelerate both the analysis and the solution of aerodynamic problems. Some of these problems include studies of airplane performance which permit evaluation of engine-to-airframe applications.

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

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

World’s foremost designer and builder of aircraft engines

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NEW TYPE DIGITAL COMPUTER USED ON FLIGHT TRAINERS

Sylvania Electric Products Inc. is developing UDOFT—the first Universal Digital Operational Flight Trainer — under contract for more than a million dollars with the U. S. Naval Training Device Center, Port Washington, N. Y., a field activity of the Office of Naval Research, it was announced today.

This program is under the joint sponsorship of the U. S. Air Force and the Department of the Navy.

A new “very quick-thinking” type of electronic “brain” will be used in the trainer to simulate a wide variety of aircraft, including the most recent supersonic jet fighters.

UDOFT is based on six years of basic research performed by the Moore School of Electrical Engineering, University of Pennsylvania, under the direction of Morris Rubinoff, under contract with the U. S. Naval Training Device Center.

In this operational flight trainer, the pilot sits in an actual airplane cockpit, as he would in flight. But his controls and instruments are connected with floor-to-ceiling banks of computing and other electronic equipment next to the plane section. With the cockpit canopy closed, all the trainee can see are the instruments and controls with which he would operate the plane in actual flight. Although the cockpit itself does not move, the electronic “brain” simulates flight by setting appropriate readings on the instruments.

The trainee’s teacher has a duplicate set of instruments and controls at the computer panel, from which he can determine what the trainee is doing. He can also introduce new conditions — engine failure, air turbulence, and storms, for example— which the electronic “brain” translates into appropriate readings on the cockpit instruments, and which the trainee must meet through use of his “stick”, throttles, and other controls. How well he accomplishes this is shown by the changed instrument readings which the electronic “brain” has altered after calculating the effects of his actions.

The UDOFT system will provide the additional speed and versatility in ground training devices needed in simulating the characteristics of the growing number of supersonic planes which U. S. pilots will be flying.

The UDOFT system is centered around a new large-scale digital computer of great flexibility, speed, and accuracy. This will make it possible to shift the trainer from the simulation of the flight of one plane to the flight of another, as well as to change ‘flight conditions’ or aerodynamic characteristics to test their effects on the flight of the simulated plane and the response of the pilot.

The UDOFT computer will eventually be able to solve the equations for several cockpits simultaneously, allowing a group of trainees to receive simultaneous instruction, either in independent flights, in flight formations, or in simulated combat.

MAGNETIC LOG JAM

Working with invisible iron dust,” General Electric researchers have created a revolutionary and potentially super-strong magnet.

Dr. T. O. Paine, of the company’s Instrument Department at Lynn, Mass., told the American Association for the Advancement of Science that the unique properties of this magnet are achieved by precisely controlling the size and shape of individual iron particles so small that there are more than a billion billion in a pound.

Dr. Paine said that, theoretically, the ultra-fine particle iron magnet can be made ten times stronger than the best available magnets. Already experimental magnets have been made equal to the strongest commercial magnets, he added.

The new magnet will result in electric instruments that are smaller, lighter, more accurate and more rugged, making possible significant advances in instrumentation. It will help us make better photographic exposure meters, aircraft instruments and other products using permanent magnets.

Although it will be quite some time before the new magnets are commercially available, the door is now open to new magnet applications as significant as those that followed the introduction of Alnico — the most important permanent magnet material now in use.

This development opens whole new vistas to the design engineer because the iron particles can be embedded in plastics, metal, rubber or glass. The magnets are easily machined, drilled, tapped, soldered, and molded precisely into any desired shape.

Ordinary iron is used in the form of sub-microscopic elongated particles to make the new magnet. This
leads to another far-reaching benefit, the saving of strategic metals like nickel and cobalt — heavily used in making most magnets. Elimination of cobalt makes possible the application of magnets in nuclear reactors, where magnets containing cobalt cannot be used because of high induced radioactivity.

Dr. Paine went on to say that work on the development has been carried on by a small creative group in his organization. The research team started with only the speculation of theoretical physicists that ultrafine elongated iron particles might have a high resistance to demagnetization. But because iron particles tend to grow round, all efforts to produce elongated shapes had failed.

Dr. Paine and his group faced a seemingly insurmountable obstacle. How could they control the shape of iron particles finer than the smoke from a cigarette, smaller than the wave length of light, invisible under a conventional microscope, so small that there are more than a billion billion in a pound?

Experiment after experiment failed. Then finally the “breakthrough” came. They produced a few particles with significant elongations. The most powerful electron microscopes — through which the iron “dust” can be seen — confirmed these results and subsequent experiments brought full success.

“The magnetic and mechanical properties of this material can be controlled precisely,” Dr. Paine said. “Not only can the qualities of available magnets be duplicated, but we can achieve characteristics previously unattainable.”

As in the case of most new developments, said Dr. Paine, “the full impact can be measured only in retrospect.” Meanwhile, he added, work will continue toward the theoretical limit of magnetic energy.

NEW INLAND STEEL OFFICE BUILDING

The Inland Steel Company’s new 19-story office building is being erected in Chicago’s Loop district.

The building, representing the first use of welded construction in Chicago’s multi-story office structures, contains some striking architectural innovations. Welding proved to be the only practical way of fabricating the 4-foot deep exterior, exposed columns which permit girders 36 inches deep to span the 58-foot interior, giving a column-free unobstructed floor area.

The main vertical element of the column is an 18-inch wide flange beam, positioned with the web facing outward. To the center of the outer web face and at right angles to it is welded a 1 inch standard plate, 4 feet deep. To the latter’s outer edge is welded a 16-inch plate, 2 inches thick. Web stiffeners are welded to the 4-foot center plate opposite the flanges of inside tube girders. The columns will be exposed on the exterior and sheathed in stainless steel.

The shop fabrication of the columns was accomplished with multiple arc-submerged arc welding. Field joints were made in the heavy sections using a new iron powder type, low hydrogen electrode. The field erection was by John F. Beasley Construction Company; shop fabrication by Joseph T. Ryerson & Son, Inc. The General Contractor was Turner Construction Company; Architects were Skidmore, Owings and Merrill.

POCKET-SIZE TV CAMERA FOR CLOSED CIRCUIT APPLICATIONS

A pocket-size live television camera has been developed by the Radio Corporation of America for military airborne, mobile, and field closed circuit TV applications, it was announced today by Theodore A. Smith, Executive Vice-President, RCA Defense Electronic Products.

Mr. Smith said that the ultraminiature TV camera, developed by engineers of the RCA Surface Communications Department, was made possible by a new design approach which combines transistors, specially developed transistor circuitry, and a new RCA half-inch vidicon camera tube.

The pocket-size TV camera (JTV-1) weighs less than a pound and measures only 1-7/8 by 2-3/8 by 4½ inches; yet surpasses standard vidicon-type industrial TV cameras in sensitivity. Used with an F-1.9 lens, it requires only 10 foot candles of scene illumination for clear, contrasty pictures.

“The RCA pocket-size television camera,” Mr. Smith said, “represents a significant advance in the

(Continued on Page 43)
The power from nuclear reactions has been harnessed and put to work generating electrical power in the United States. Our sun is one colossal nuclear reaction some 93 million miles away. How can we harness the tremendous energy released by this reaction? Science has pondered the subject for centuries. Many years ago, it was known that the sun's rays could be focused with a magnifying glass and be used to ignite certain materials. In 1722, Lavoisier is credited with building a solar furnace using a five foot lens that created a temperature of 1700 degrees Centigrade. Archimedes is alleged to have destroyed a Roman fleet at the siege of Syracuse in 212 B.C. by focusing the sun's rays on it in a mirror or burning glass.

Solar power is considered for use in several applications. Primary consideration has been given to home and commercial heating by use of sun power. The sun is used in the solar furnace to produce very high “pure heat” temperatures. The solar battery is also a new development in the use of the sun's radiation energy.

First, let us consider the heating aspect of the use of solar power. While a tremendous amount of energy falls upon a surface in the course of a day, much of this energy is unusable. It has been estimated that about one horsepower of energy can be captured in one day for each square yard of surface exposed. To provide for power in useful quantities would require tremendous areas of collecting equipment. Even then, the system would only operate when the sun is shining. We can use much less collecting area if some means of storing energy can be found. There are several commercial systems, each utilizing the same general principles.

Several layers of overlapping glass plates spaced one quarter of an inch apart are mounted in rows on the roof of a building. This glass is of a special non-reflecting type. The backing plate is blackened to absorb heat. An air stream, moving very slowly, is passed over the plates. This air stream is passed into the house if heating is required. If the house is sufficiently warmed, the air passes into a heat storage bin located beneath the house. This storage bin is the primary obstacle to the operation of such a unit. One such means of storing heat uses small pebbles. The pebbles are arranged in a bed, either vertical or horizontal. The warm air passes into the top of a vertical bed or the end of a horizontal bed. The warm air passes through between and transfers most of its heat to them. The air leaves the bed at about the same temperature as the pebbles at the end of the bed, having lost most of its heat to them. The air is then recirculated to the collector for reheating. At night, the air in the house is circulated through the heat storage bin to absorb the heat from the pebbles in the reverse of the cycle. One advantage of this type is that heat lost by the pebbles can be made to flow through the floor of the house thus warming it.

Another heat storage unit utilizes the heat of fusion of certain chemicals. Heat of fusion is the heat required to change a solid to a liquid at constant temperature and pressure. Sodium sulphate decahydrate, \( \text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O} \) is a crystal which melts at 90 degrees F. If a temperature rise of 30 degrees is realized, it is possible to store 11,900 Btu in a cubic foot of this substance. About 1,080 Btu can be stored in a cubic foot of pebbles. This chemical is a waste product of certain chemical processes so it is quite cheap and easy to obtain. The search is still on for other materials exhibiting this property which might be more efficient or more economical.

There are certain chemicals which undergo a chemical reaction in the presence of sunlight and reverse the reaction in the absence of light. At present, these reactions cannot be utilized because of high cost, low efficiency and other difficulties.

In industrial heating, water, is sometimes circulated between the collector plates and used to provide heat, but this still requires some means of storing heat for nighttime use. An office building in Albuquerque, New Mexico uses such a system to provide heat. It also uses water to store the heat.

One of the primary uses of solar heat is the solar furnace. This device is used to attain the very high temperatures required to test ceramic materials and certain metals and plastics used in aircraft construction. Aircraft and missiles of today must withstand very high temperatures, particularly with respect to the engine components. The conventional means of producing high temperatures fall short of the necessary range so the solar furnace must be used.

A parabolic mirror, perhaps five feet in diameter, is used to focus the sun's rays on a point. In an area smaller than a dime, temperatures of 8500 degrees F can be attained.

(Continued on Page 34)
Research Engineers

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April, 1957
JOHN MORAN, who joined Western Electric's engineering staff at the Kearny Works recently, is now studying for his M.S.M.E. under the new Tuition Refund Plan. Western Electric expects to refund the tuition for John's graduate study at the Newark College of Engineering this year.
Western Electric’s new TUITION REFUND PLAN can help you continue your studies while launching an exciting career

Under the new plan, Western Electric will refund tuition costs for after-hours study at graduate or undergraduate level, up to a maximum of $250 for each school year.

Say, for example, that you decide on a career at Western Electric in one of many rewarding phases of telephony—electronics, development engineering, design, manufacturing production, plant engineering, or some other. You may be eligible for financial assistance to help defray the cost of graduate or other study from the very first day. Choose engineering, science or any course that is appropriate to your job or that adds to your ability to accept greater responsibility, and the Company will refund to you up to $250 a year for tuition. (You’ll note from the map on this page that Western Electric’s work locations are well situated in terms of major population areas. That means that many of the nation’s best schools are close by.)

Plus values, like the new Tuition Refund Plan, give Western Electric engineers many opportunities that other never have. There’s specialized training both in the classroom and on the job—a formal program of advanced engineering study that includes full-time, off-job courses of up to 10 weeks’ duration—a retirement and benefit program that’s one of the best known and most liberal in industry... low-cost life insurance that would appeal to any man with his eye on the future. And of paramount importance is the chance to work alongside top men in the field of communications.

There’s a good deal more for which there isn’t space here. Why not write us or contact your placement office to schedule an interview when Bell System representatives visit your campus.

As one of us, you’d help engineer the manufacture, distribution or installation of the equipment needed for the nation-wide communications network of 49 million Bell telephones.

Here—where transistors were first developed for production; where repeaters for the new transatlantic telephone cable were tailor-made—there’s a constant need for new products and new processes. Two-thirds of the equipment we make today for the Bell telephone companies is of types developed since World War II.

Besides telephone work, Western Electric—over the years—has been responsible for a continuous flow of defense jobs for the government such as the Nike guided missile system and the DEW Line.

There’s plenty of room for advancement... whatever your field of specialization. So—whether you’d be helping with our telephone job, or working on a major defense project like guided missile systems—with Western Electric you can expect to grow!

For our College Tuition Refund Plan booklet and additional information about Western Electric write: College Relations, Room 1030, Western Electric Company, 195 Broadway, New York 7, N. Y.
THE JUSTIFICATIONS FOR HIGH-FIDELITY SOUND

Why Hi-Fi?

By Bill Perkins, Jr., and James Tubby, Jr.

In the last ten years the human ear has been exposed to the rapidly-growing popularity of high-fidelity reproduction of sound. Even though its beginning goes back much farther, only in this last decade has high-fidelity equipment gained its deserved recognition — high-fidelity equipment for the home has been mass-produced economically, making it available for everyone — high-fidelity has been introduced to the motion-picture industry — high fidelity has been increasingly used by recording companies.

What is the reason for this rapid switch to hi-fi? How is it an improvement over ordinary "table-model" sound? Why does the public appreciate it? Why hi-fi?

Hi-fi is fundamentally concerned with the accurate reproduction of all types of sound, whether it be called noise, speech, or music; in other words, to create the illusion of original sound in the new setting.

To discuss why hi-fi we must delve slightly into the nature of sound.

The type of sound comprising only a single frequency is said to be a pure tone, but the sounds encountered in nature are ordinarily much more complex. A musical chord, for example, contains a number of tones of different frequencies.

More than that, we must consider that two different musical instruments playing tones of the same frequency will sound very noticeably different. The distinguishing differences in the sounds are due to the shape of the sound waves produced. Thus each instrument is generating not only its basic pitch tone, known as the fundamental, but also a series of secondary vibrations known as overtones or harmonics. It is the specific combination of fundamental and harmonics which give each individual instrument its tone quality or timbre.

A dictionary meaning of high-fidelity would read "a great degree of trueness." This is just what hi-fi is — it recreates sound, including the harmonics or overtones, just as it was originally heard — it retains the identity of sound.

High-fidelity, in contrast with ordinary "table-model" sound which includes only the basic fundamentals and a limited range of overtones, encompasses the fundamentals plus their whole range of harmonics and overtones. Not only does it retain these complex wave forms in their original relationships, but it also responds to the original dynamic levels, or amplitudes.

That, in simple terms, is the why of hi-fi. High-fidelity captures the original sound and plays it back to us unchanged — nothing added or nothing subtracted.

This accurate reproduction of sound is important, too. To show what difference it can make, consider a recording of an orchestral number. The "A" string on the violin has thirty-three overtones, many of which an ordinary "table-model" omits. Multiply that by the number of violins; then consider the many overtones that every other instrument in the orchestra will have. Add them all together — the number of overtones on any chord will number well into the thousands. Recall that without hi-fi, most of these overtones are missing. It is easy to see that hi-fi with its subtle overtones and wider tonal quality is more pleasing to the human ear.

Why hi-fi? High-fidelity is true sound.
Keeping water out in the rain

MASONRY WALLS made of brick, stone, or concrete have long stood the test of time. But today, they can be made even better with a coating of silicone water repellents. These amazing materials prevent damaging rainwater from entering the countless tiny pores or openings in masonry structures.

When the water freezes after penetrating, it can cause spalling—cracks off small pieces. And, if it seeps all the way through to the inside of a building, paint peels . . . woodwork warps . . . plaster stains and cracks.

Now, silicone water repellents provide the answer. Brushed or sprayed on the surface, they line—not seal—the pores in masonry. Even heavy rain driven by hurricane winds cannot break through this invisible raincoat . . . yet, because the pores are not sealed, moisture from within can evaporate freely.

The people of Union Carbide produce silicones for other uses, too . . . automobile and furniture polishes, lubricants, electrical insulation, and new rubber-like products . . . all of which help bring more and better things for all of us.

STUDENTS AND STUDENT ADVISERS: Learn more about career opportunities with Union Carbide in ALLOYS, CARBONS, CHEMICALS, GASES, and PLASTICS. Write for "Products and Processes" booklet C-2.
Library Notes

By Carson W. Bennett and Anita Walden

The Rose Library was recently the recipient of a $300 grant from the United States Steel Foundation for the purpose of adding to its 20th century literature collection. Over the past years the technical literature of the library has been greatly expanded but additions to the general literature collection have been meager. With this generous grant we hope to remedy this situation. We shall welcome any suggestions from the faculty or students on books to purchase from this fund. Following is a list of the books, already in the library, purchased from the United States Steel Foundation grant (we have others on order).

Anderson, R. W. Tea and sympathy
Axelrod, G. Seven year itch
Miller, A. Crucible
Nash, N. R. Rainmaker
Patrick, J. Teahouse of the August moon
Williams, T. Baby Doll
Williams, T. Streetcar named Desire

If you have been in the library lately, you have probably noticed that something new has been added. Directly in front of the doors is our new newspaper rack. The rack not only frees the table originally used for newspaper display, but also allows us to leave out more than one issue of each paper. We shall enjoy hearing any comments any of you have regarding this new addition.

NEW PERIODICALS

The following magazines have been added to our subscription list for 1957. (For a complete listing of the magazines received in the library, see the February Library Newsletter)

American Aviation

Applied Scientific Research, Section A and B
Barron's
Books Abridged (formerly Omni-book)
Cost Engineering
Diesel Progress
East Europe
Human Events
IBM Journal of Research and Development
International Journal of Physics and Chemistry of Solids
Journal of Fluid Mechanics
Journal of Organic Chemistry
Journal of the Aeronautical Sciences
Manchester Guardian
Mechanix Illustrated
Metal Products Manufacturing
Missiles and Rockets
National Review
Nuclear Science and Engineering
Photogrammetric Engineering
Public Works Magazine
Theatre Arts Monthly
Tool Engineer
USSR (Russian pictorial magazine)
Water and Sewage Works
Western Electric Engineer

FROM THE NEW BOOK SHELF

The Tribe That Lost Its Head,

by Nicholas Monsarrat

Thirty-two hours from London — five thousand miles away — years apart in culture and tradition—the Maula island of Pharamaul lay just off South-West Africa. A hundred-odd years of comfortable British rule had smoothed the edges between natives and whites and life pursued a lazily accustomed pattern. No one thought of Pharamaul as a trouble spot. Even later, with the acute perceptions of hindsight, no one could say just how it started.

Perhaps trouble came riding in with the shabby old Dakota, winging its indolent way toward Pharamaul with four passengers on board.

Andrew Macmillan seemed the last man in the world to court disaster. He was Resident Commissioner of the native capital, on good terms with the Maulas and devoted to the country. But as retirement approached he was a little set in his ways, a little unprepared for crisis.

Tulbach Browne was everything Macmillan was not. A yellow journalist whose livelihood depended on disaster, Browne took a rare delight when other people’s lives went wrong, and a country in eruption was his dream come true.

David Bracken and Dinamaula completed the quartet. They had youth and ideas in common. In England they might have met on equal terms. But from the moment they landed in Pharamaul, Bracken was an official irrevocably bound to the small white governing group. And Dinamaula was returning to Africa to become Chief of the Maulas.

These four key figures in a novel that attacks the inflammatory issue of the century — race itself, and the status of primitive peoples. Urgent, eloquent, persuasive, it is a firebrand of a book that will compel you by its narrative intensity, refresh you by its insight and its call upon

(Continued on Page 46)
IMPORTANT ON-CAMPUS INTERVIEWS FOR POSITIONS AT

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Contact your Placement Office for an appointment with North American representatives.

Or write: Engineering Personnel Office, Dept. COL, North American Aviation, Columbus 16, Ohio.

NORTH AMERICAN AVIATION, INC.

NORTH AMERICAN HAS BUILT MORE AIRPLANES THAN ANY OTHER COMPANY IN THE WORLD

April, 1957
COLOR TV

By Joe Bronnert, soph., e.e.

Since the beginning of the human race, man has conveyed his ideas through pictures. Man first drew pictures on the walls of his cave with charcoal. But his world was an array of many different colors; the blue of the sky and lakes, the green of the leaves and the red of his campfire. So he wanted to take these colors and put them into his drawings. When he found out certain pigments could be used, he incorporated them into his drawings. Man didn't progress very much in art until the "renaissance." During that period he wanted to make his work look as realistic as possible. In order to do this he had to conceive the method of using oil paints on canvass. Although man could spend years on one painting, only a few people could have the opportunity to see what he had to offer. Therefore the process of printing pictures with ink was invented. At first the prints were in black and white, but in man's quest for realism color was soon adapted to the printing press. As time progressed, the camera captured the mood of the scene instantly. Yet with all these improvements, man needed a means to convey his pictures faster and more efficiently than ever before. That was the inception of Television.

Color picture tubes of various sizes and technical arrangement have been developed and tested. The RCA 1-inch color tube for example, has three electron guns — one for each primary color — which can stimulate color phosphors on the viewing screen. The tiny phosphor dots are arranged in clusters of three, a red-glowing, green-glowing, and blue-glowing in each group. A shadow-mask between the guns and viewing screen has tiny perforations in it so positioned that the stream of electrons from each gun can fall only on its appropriate color phosphor. The beam that "paints" red information will only strike the red phosphors, and so forth.

The size, picture quality, and contrast of this tube are comparable to the present black-and-white tubes; the colors are brilliant and of excellent fidelity, the light weight of the color tube makes the tube easy to handle in manufacturing.

Another color picture tube is being tested by A. B. Du Mont Laboratories Inc. It is the Lawrence tube that was dreamed up by Ernest O. Lawrence of the Radiation Laboratory of the University of California. The Lawrence tube doesn't use a shadow mask. Instead of having its phosphors arranged in dots, they are printed in very fine horizontal lines, about 1/100 inches thick, across the face of the tube. Behind the phosphor grid is a corresponding grid of fine wires or printed conductors. The grid is so arranged that alternate conductors can carry differing electrical charges. The charge on the grid wires both focuses and redirects the beam of electrons from the single electron gun. So by changing the charge on the grid, you can make the beam of electrons strike one, two, or all three colors. That produces the same optical effect, from the viewer's standpoint, as the shadow mask and three guns of an RCA tube.

Because the color selection operation of the tube is performed entirely electronically rather than by the geometric arrangement of guns and mask as in current tubes, the Lawrence tube doesn't require as close dimensional tolerances as the three-gun tube. Some engineers claim that a tube that is slightly out of mechanical alignment can be corrected electronically by adjustments in the receiver.

An ideal color tube therefore should be capable of producing three separate color fields, each having perfect color purity and uniform brightness. If these three fields were produced simultaneously in the proper relative brightness, the result would be a uniform white field. This last consideration is extremely important, since in the present color tubes must be capable of producing high quality black-and-white pictures.

Installation of a color set in the home is only a little more difficult than to install a black-and-white set. The cost will also be somewhat higher than an installation of a black-and-white set. Antennas that were usually used for black-and-white may be used for color sets. In addition, all color sets will be able to perform in UHF just as well as in VHF areas. They will also contain additional controls, but this will vary according to make.

The growth of Color T.V. has been very exhilarating. As of today N.B.C. broadcasts approximately 55 hours of color each month. That (Continued on Page 46)
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April, 1957
of the current-diffusing layer, photocurrents which would otherwise enter the electroluminescent layer in narrow regions near the groove bottoms are caused to spread, or diffuse slightly, before entering the phosphor layer. Since the amount of diffusion is limited to about the width of a single photoconductive groove, all of the phosphor layer can be excited by the photoconductive layer and at the same time the resolution of this device is not significantly affected. This arrangement enables both efficient illumination of the photoconductor and efficient excitation of the phosphor to be obtained.

Amplifiers such as shown in Fig. 2 were made up to 12 inches x 12 inches in area. In terms of resolution their output pictures were comparable in quality with commercial TV pictures and had very good uniformity.

This light amplifier panel also has shortcomings. The response time of these panels varies from 0.1 second to several seconds. This time is basically determined by the photoconductors response to different levels of light intensity, the brighter parts of the picture coming through first.

Further development of electroluminescent phosphors will directly benefit the light amplifier. The sensitivity of the photoconductive powder is considerably lower when operated with ac voltage as compared to dc. Since this effect is not inherent in photoconductors but a property of the particular powder, substantial increase in light gain can be expected with improved photoconductors. In addition, the non-linearity of the photoconductive powder further limits the effectiveness of the present amplifier. Increase of the photoconductor breakdown voltage should serve to produce substantial increase in gain because of the rapidly increasing light output of the phosphor with voltage. The response time of the amplifier could be greatly improved with new photoconductive materials.

This particular light amplifier achieved energy gains of 14 when exposed to a light source whose spectral distributions were identical to the output light of the amplifier, but about 60 when exposed to an incandescent source.

**PHOTOELECTROLUMINESCENT LIGHT AMPLIFIER**

The photoelectroluminescent light amplifier differs from the photoconductor-electroluminescent light amplifier in that it requires no photoconductor layer to control the light output of the phosphor. This amplifier is also made in a panel as shown in Fig. 3. A transparent conducting layer (2) is applied to a glass plate (1) and the photoelectroluminescent phosphor layer (3) is placed directly on top of the conductor. A metallic electrode (4) completes the amplifier.

The phosphor film used in this amplifier has a different luminescent property than the other electroluminescent phosphor. This film will not luminesce when direct or alternating voltage is applied, but in the absence of field will luminesce slightly upon excitation by ultraviolet light. Application of a field simultaneously with irradiation by ultraviolet light produces as much as an eighty-fold increase in brightness. Not only does the ultraviolet trigger the electroluminescence, but the phosphor emits more light as the ultraviolet radiation is increased. In this way the incident radiation controls the amount of electroluminescence. Because the incident beam contains the information to be reproduced and amplified, image reproduction, let alone amplification, could never be achieved without this additional property. The amplification is nearly linear. Thus good contrast is maintained during amplification.

Another difference between the photoconductor light amplifier and photoelectroluminescent light amplifier is that the photoelectroluminescent amplifier requires a dc voltage with the metal electrode negative.

**APPLICATION OF LIGHT AMPLIFIERS**

A light amplifier could be utilized any place there is a visual picture.
of low intensity that must be observed.

The most probable application of light-amplifying phosphors in the near future will be to intensify fluoroscopic screens. This application is attractive not only because of its importance to human welfare but also because the requirements are less stringent than for most other applications; the necessary brightness level is modest, a response time of a tenth of a second is satisfactory for most fluoroscopic work, and the color of the emitted light is not critical.

The application of light-amplifying phosphors to television belongs to the more distant future. The brightness level, response and afterglow times, and color requirements for television received pronounced improvements in light-amplifying phosphors. In principle, these phosphors have attractive possibilities for color television.

The most interesting possible application of the phosphor light amplifiers is to build a new type of television set. The standard type of TV has a high price tag for two main reasons. A large expensive vacuum tube is required to present the picture, and this tube requires high voltages to make it function. These two sources of expense could be minimized by the use of a phosphor light amplifying screen. The picture could be received and reproduced on a very small picture tube. This tube could be run at low voltages because it would not be necessary to have a bright picture on the tube. This dim light from the picture tube could be magnified by a system of lenses and prisms and projected onto a phosphor screen and the phosphor would amplify the picture to make it visible. This screen could be hung on the wall like a picture or placed in any other convenient spot. The size of the screen could be as large as desired. All that would be required is a suitable optical system to project the light onto the screen.

The light amplifier has almost unlimited possibilities for application, especially the phosphor type of amplifier. The breadth of application depends upon the degree of refinement that can be reached with the amplifier, which in turn is based on the development of phosphors and photoconductors that will produce the desired results.

Research & Development

(Continued from Page 31)

military television art. Its ultra-miniature size, simplicity, and flexibility will open new fields of application for closed-circuit television, permitting direct observation and reconnaissance in places and locations heretofore inaccessible to existing TV camera equipment. In airborne and mobile use, the ultra-miniature camera promises quality television with important savings in vital space and power. The camera literally places in the hand of the military services an important new medium for tele-observation."

The new military TV camera, Mr. Smith explained, incorporates numerous design and performance features for maximum flexibility and operating convenience:

1— The camera can be operated in the palm of the hand, used with an attachable pistol-grip handle, bolted to wall or floor, or mounted on a tripod.

2— It is the first TV camera of its type to incorporate a photoelectric iris control, which automatically activates specific camera circuits to compensate for changing light levels. The photoelectric iris control enables the camera to accommodate changes in the order of 100 to 1 in scene lighting.

3— Designed for maximum power economy, the camera system operates from a 115-volt, 60 cycle AC source, and draws less than 350 watts. Camera dissipation is only three watts.

4— Made rugged for military airborne, mobile, and field requirements, the pocket-size camera has a high level of resistance to shock and vibration. For unusual shock and vibration conditions, the camera design permits encasing of the complete internal construction in standard potting compounds.

(Continued on Page 46)

Fig. 3. Photoelectroluminescent Light Amplifying Screen.
Once only "waste rock"... now a new source of Nickel

How Inco's mine engineers utilize a panel-caving method in order to recover nickel from huge ore deposits that formerly were not practicable to mine.

Panel caving is one of the newest mining methods put into use by The International Nickel Company.

The tonnage of ore handled by this method is immense. Sometimes a single block measures 200 by 800 feet. It may weigh as much as 1½ million tons.

As these heavy masses move downward they break into pieces small enough to drop through chutes and into machine crushers deep inside the mine. From crushers the ore goes a quarter mile by conveyor to hoists that lift it to the mine head.

From there, the ore is milled as fine as sand. The concentrate is then pumped to the Inco reduction plant 7½ miles away.

Panel mining; new concentrating machinery; new, continuously improved operating practices; pipeline transport. Add them together and you can see how they make possible production of nickel from ore deposits once only "waste rock."

Inco has prepared a full-color sound film—Mining for Nickel—that shows the operations of modern nickel mines. 16mm prints are loaned for showings before technical societies, engineering classes of universities and industrial organizations.

For details, write Dept. 130f, The International Nickel Company, Inc., New York 5, N. Y.

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Library Notes

(Continued from Page 38)

the best of human resources — intelligence and spirit and love.

The World's Great Religions,
by the Editors of Life

Here — in magnificent photography and art reproduction, with 190 pages of full color and more than 175,000 words of lucid text — is a sweeping panorama of mankind's spiritual heritage. This book was prepared with the help of many religious authorities throughout the world.

Two years of intensive work went into the original Life series, which won a Benjamin Franklin Award. A third year of planning and research was then spent in adding 160 pages of material that had not appeared in the magazine series. The additions include a carefully chosen anthology of 65,000 works—an average length volume in itself — drawn from the scriptural writings which form the foundations of each faith.

Almost half of the book is devoted to Christianity, the largest and most widely spread religion on earth. Also thoroughly presented are Judaism, Hinduism, Buddhism, Taoism, Confucianism and Islam. The study of Judaism covers its origins and traditions, and provides an intimate view of the way Jews the world over approach their God. Hinduism's subtle, complex teachings and the various branches of Buddhism are explored. So are the searching philosophies of China and the doctrines preached trenchantly by Mohammed in founding Islam. The late Paul Hurchinson provided an introduction contrasting all of these great faiths and relating each to the whole concept of religion from primitive nature worship to modern secularism.

The Christianity section includes the life of Christ as interpreted by great artists, an account of the Bible, the Holy Land as shown in a specially created fold-out map and striking color photographs, the history of Christianity, the Sistine Chapel frescoes of Michelangelo as the greatest religious art ever produced. The many aspects of Christian worship include the story of the sacraments as they are practiced now, have been and will be for future generations. The whole section contains a treasury of paintings, photographs and eloquent essays that document the basic teachings, tenets, and development of Christianity. The editors have labored to express visually and in thoughtful text the depth, grandeur and fervor of the Christian faith.

The American Story, edited by Earl Schenck Miers

The American Story is the work of sixty leading American historians — Pulitzer Prize winners, Bancroft Award recipients, leading educators, authors and editors — each represented with a chapter on the person or period in America's past that is the contributor's particular field of interest. The sum of this hitherto-unpublished material is an excitingly readable history of the nation from the time of the Viking explorations to the era of Cold War. The book has been edited by Earl Schenck Miers, whose connective commentary makes it a remarkably complete and cohesive work. It is illustrated with drawings, photographs, and contemporary cartoons.

It is a uniquely informal, anecdotal volume. Reading it is somewhat like conversing with each contributor, and hearing each in turn describe the outlines and dimensions, the features and facts of the American story. At times the focus is on men who shaped the nation: Carl Bridenbaugh on William Penn, Thomas J. Wertenbaker on Benjamin Franklin, Dumas Malone on George Washington, Bruce Catton on Grant and Lee, Frank Freidel on Franklin Roosevelt.

At other times the writers' viewpoints are events and the collision of concepts: Claude G. Bowers tells of the Alien and Sedition Acts, Carl Carmer relates the building of "Clinton's Ditch," Agnes Rogers Allen discusses the changing status of women, Waldemar Kaempffert analyzes the effects of the Atomic Age.

Research & Development

(Continued from Page 43)

ELECTRON TREATED TAPE

Moving from pilot research to full-scale production in less than three years, General Electric has announced plans to increase by 500 percent its present capacity for producing a revolutionary new irradiated plastic.

The plastic, called Irrathene irradiated polyethylene, is the first commercial product of electron irradiation—the science of bombarding materials with high-velocity electrons to produce chemical changes.

Louis E. Newman, of the company's insulating materials department, said Irrathene has had "a remarkable market growth." He cited numerous applications in the electrical and communications industries and the promise of new uses in other fields such as packaging.

Newly-constructed facilities at Pittsfield, Newman said, will up production beginning this month, from 300,000 pounds to 1,600,000 pounds annually.

"These new facilities will allow us to double the 1,600,000 pound capacity, and this is the best evidence of General Electric's confidence in future applications throughout industry," Newman said. He added that research is continuing to develop varieties and grades of Irrathene that will meet special requirements.

The irradiated plastic was introduced on a developmental basis in March, 1954. By June of that year, a pilot plant was completed for limited commercial production. The business has grown to such a volume that, effective Jan. 1, it was transferred from the Chemical Development Department to the new insulating materials operation.

It is now being used to insulate telephone and power cables switch-
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Through its leadership in electronics, RCA contributes a great deal to the success of this new and broader kind of education. In fact, helping our oncoming generation to see, to hear... to understand... is one of the most important jobs we do.

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• TURQUOISE DRAWING PENCILS: With 100% “Electronic” graphite. 17 grades, 6B through 9H.

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APRIL, 1957
FTL’s

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"The more a man knows the faster and taller he grows"—in electronics or any other profession!

Federal Telecommunication Laboratories, knowing the value of developing its engineering personnel, provides for reimbursement of two-thirds of tuition costs upon completion of approved graduate level courses—plus another one-half of tuition upon award of degree—plus time off with pay to attend classes.

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Opportunities for relaxed living and career-building also at FTL’s West Coast Laboratories: San Fernando, Cal., 15191 Bledsoe St. —openings in Digital Computers, Inertial Navigation Systems and Infra Red Systems.
Palo Alto, Cal., 809 San Antonio Road —openings in Carrier Systems.

The results of the annual house elections are: Dick Trueb, President; Crone Knoy, Vice President; John Williams, Treasurer, Norman Grimshaw, Historian; Tom Reese, Secretary; Augie Larr, Usher; Chuck Skidmore, Sentinel; and Bob Mewhinney, Fiscal Assistant.

Alpha Tau Omega is pleased to announce the recent pledging of twenty-two men. We feel that these are the outstanding men of the Freshman Class of 1960. They are David Riegel, Indianapolis; James Sargent, Gary; Robert Franzqa, Terre Haute; Lowell Shepler, Brazil; Sherman Smith, Indianapolis; James Burns, Terre Haute; Robert Berger, Culver; Louis Roehm, Terre Haute; William Perkins, Lebanon; Gary Grimes, Terre Haute; Charles Theodore Jaenke, Cleveland; Marshall Garino, Terre Haute; Alan Crumbaker, Cleveland; William Washburn, Culver; Herbert Gormong, Terre Haute; James Godwin, Terre Haute; Jack Smith, Terre Haute; William Johnson, Robinson, Ill.; Ronald Staggs, Terre Haute; Robert Schukai, Vincennes; Charles Sechrest, Lawrenceville, Ill.; and Elwood Stroupe, Louisville, Ky. Congratulations to all of you from the members of the Chapter! Now about this light bulb snatching business—Fess up! Who dunit! The returning actives were greeted upon their return from State Day by a light-bulb-less house. Surprise from the pledges. Ah me, they’re still young—They’ll learn.

Tom Reese

Alpha Tau Omega Pledges.

(Continued from Page 25)
Controversial Corner
(Continued from Page 22)
money for this timber and will prob-
ably put this money back into cam-
pus improvements. But how is it
possible to improve upon the natural
beauty of a thick woods?

These two situations are making
the campus unsightly today. What
will it be tomorrow? Is there going
to be something all the time which
will keep the campus in a continual
upheaval? There has been some talk
doing the size of the school.
Will things be twice as bad if this
is done? Before proceeding any
further in our present haphazard
fashion, let’s stop and analyze our-
selves. To keep out of trouble, plan-
ning should be several years ahead.
Blindly dealing with problems as
they arise will only result in larger
and more complicated problems.
Careful planning is certainly one of
the tenets of good engineering prac-
tice.

The majority of the students and
faculty are not in a position to know
the complete story on all of the prob-
lems with which the administration
is faced. But when there is a situa-
tion which greatly concerns stu-
dents, faculty, and the state of the
Institute, it seems that the opinions
of students and faculty should be
heard. The parking lot and timber
situations certainly fit this category.
Perhaps the students would have
preferred to use the east parking
lot and the one at the field house
rather than have had the campus
chopped up as has been done. Per-
haps not. At least they should have
been consulted.

A Planning Committee, much like
the present committees on Athletics,
Attendance, etc., with both student
and faculty members, should be es-
established to study problems of this
nature and make recommendations
to the administration. We feel that
the faculty, students, and alumni de-
serve the assurance that nothing
further will be done to diminish the
natural beauty of our campus. There
are one hundred twenty-three green,
wooded, rolling acres on the Rose
campus. Let’s be certain they are
not all ruined.

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your first job
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That important first job can start you off in
the wrong direction—or it can lead you straight toward your
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ance, radar, and microwave. The door is wide open at Motorola,
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needs men in Missile and Military equipment systems analysis and design.

Contact your Placement Officer for further information regarding interview
date on your campus or write to one of the above addresses.

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Research & Development
(Continued from Page 46)

gear, small electronic coils, large motors, and generators and other types of electrical apparatus. Its unique bonding and sealing qualities make it useful for coil encapsulation and wire harnessing; for rubber mill motors, where the sealing properties of insulation are important, and for food and drug containers that are heat resistant and sterilizable.

Newman said insulating materials engineers are currently developing a semiconducting tape for power cables, an extrusion compound for wire coating and insulating, and a new grade of tape to withstand physical stress at temperatures higher than 350 degrees centigrade.

Irrathene is a conventional polyethylene which has been bombarded by electrons traveling more than 600 million miles per hour. This knocks a few hydrogen atoms out of the plastic's long-chain molecules and causes the molecules to "lock arms," forming a new plastic that is tough, moisture resistant and chemically inert. Because of irradiation and added filler material, Irrathene is able to maintain its shape under high temperature conditions where ordinary polyethylene flows like soft putty.

Other advantages of the irradiated insulation are: ability to "shrink-fit" under high heat to precise contour of almost any object; high corona starting voltage and low corona intensity; excellent voltage endurance; high dielectric strength; and improved insulation resistance.

Highly flexible, the tape can be applied around turns and bends without bunching, and it provides a tight, uniform wrapping that minimizes the possibility of voids. More compact and less bulky than previous insulation material it requires less space to tape connections, making it easier to tape terminal terminations.

G. E. POWER PACK

A small "black box" may soon outmode household dusting. It is being built by the General Electric Company for use with a special electrostatic filter in room air conditioners.

While providing this effective filtration, the power pack uses less current than three Christmas tree lamps, or about ten watts, according to G. E. engineers.

The "black box" is over 300 percent more effective than ordinary mechanical filters, filtering out particles so small that 400 such tiny bits packed closely together would be only barely visible to the naked eye.

An electrostatic air filter uses the General Electric power pack to do its housecleaning by building up an electric charge on the filter. This charge captures dust the same way bits of iron and steel are drawn to a magnet. The power pack operates on regular household circuits, 115 or 230 volts, 60 cycles.

Campus Survey
(Continued from Page 23)

for his officers, Ernie Boot, Vice President, and Larry Grimes, Secretary Treasurer.

SEASONAL ACTIVITY

Spring has definitely arrived on the Rose campus. Much activity has been evident as the warm sunny afternoons are definitely not conducive to studying. The tennis courts are occupied regularly and the front lawn is used for everything from baseball to golf.

We have a few aeronautical enthusiasts who have started something which seems to be growing in popularity. Who said college guys were too old for kites? At least one or two, ranging from carefully engineered models to the twenty cent drug store variety, can be seen flying high over the front lawn almost any afternoon.

Plans are underway to bring out the diving float from storage and get the lake ready for swimming. It won't be long until a cool dip will really feel good.
As a comparison, the flame of an oxyacetylene torch is 5800 degrees F. Some additional advantages of the solar furnace are the absence of interference from electric or magnetic fields or from gases. Other types of heating may produce one or more of these undesirable effects. For example, with the solar furnace, a test can be conducted with a controlled atmosphere to prevent impurities in the air or combustion products from combining with the material under test.

Material to be tested is held at the focal point by a metal jaw. Since the jaw itself is outside the focal point, it is not subjected to the very extreme temperatures existing at the focal point. It is interesting to note that some specimens are shattered by the thermal shock when moved into the focal point. A steel bolt can be melted in a few seconds in a good sized solar furnace.

Still another advantage of the solar furnace over more conventional types is its inherent safety. There are no high-voltage leads to short; no refractory materials to hold the heat after the furnace has been shut down; and no radiation hazard as in the case of atomic piles.

One of the primary disadvantages to the solar furnace is the fact that the parabolic mirror must be rotated to be facing in the proper direction in relation to the sun. The mechanism used to direct its motion is quite similar to that used in the giant telescopes to keep them focused on a particular star. This equipment is very costly to purchase and maintain. This disadvantage is offset by the high temperatures and favorable operating characteristics of the solar furnace.

The question of direct conversion of solar power to useful work by means of a solar engine has been investigated at great length. In this case, many practical considerations limit the usefulness of solar power. At present, it is not economical to attempt to utilize engines of more than ten to fifteen horsepower. Even these small engines are very inefficient when compared to a gasoline engine.

Bell Telephone Laboratory has successfully manufactured several versions of a solar battery which can generate enough power to supply a telephone circuit. However, much development work is yet to be done on this form of utilizing solar power.

Twenty years ago, scientists would have predicted that solar power would be more fully exploited before nuclear power. It took a World War to bring nuclear power to the fore. It is hoped that a new era of world peace will give rise to even greater achievements in the development and application of solar power to supplement our dwindling supplies of fossil fuels.

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**Terre Haute, Indiana**
How to keep a portable airport rolling

This portable semi-trailer is used to haul and launch jet fighters and missiles. One problem engineers faced in designing it was making sure the wheels and axles could take the heavy radial and thrust loads. That's why they ended up specifying Timken® tapered roller bearings.

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

Because of their tapered design, Timken bearings can take radial or thrust loads or any combination. And because the load is carried along a full line of contact between rollers and races, Timken bearings have extra load-carrying capacity. And they practically eliminate friction.

Want to learn more about bearings or job opportunities?

Some of the engineering problems you'll face after graduation will involve bearing applications. For help in learning more about bearings, write for the 270-page General Information Manual on Timken bearings. And for information about the excellent job opportunities at the Timken Company, write for a copy of “Career Opportunities at the Timken Company”. The Timken Roller Bearing Company, Canton 6, Ohio.
A circle is a round line with no kinks in it joining up so as not to show where it began.

Sweet young coed: “Stop it. Where’s your chivalry?”
Amorous swain: “I traded it for a Ford. Let’s neck.”

Rose’s are red,
Violet’s are blue,
Lillie’s are pink—I know. I saw them on the wash line.

Love makes the world go round; but then, so does a good swallow of tobacco juice.

ROHM ON THE RANGE
Opus 314—In Three-Phase Time
Oh give me an ohm
Where the impedances roam,
Where the fields are not fluxing all day,
Where you’ll never see a field without phi,
And the flux is not leaking away.
Ohm, ohm on the range,
Where the flux is not changing all day,
Where never is seen a shunt field machine
With the armature running away.

He: “Pardon me, but you look like Helen Brown.”
She: “Yeah, and I don’t look so hot in blue either.”

E.E.: “How do you keep drinking that coffee?”
M.E.: “I take a spoonful of Drano every week.

Sergeant: “Stop worrying, Mes-enjoukiskiwitzburgerhofer, there’s no bullet with your name on it.”

“I draw the line at kissing.”
She said with fiery intent;
But he was a football hero,
So over the line he went.

The slowest thing in the world is a nudist climbing over a barbed wire fence.

We are Tau Bates
Tried and true,
We get no dates
Our girls are few;
But we are smart,
You bet your life—
We’ll make some dough
And BUY a wife.

A certain dog won a prize show and so went out to a bar to celebrate. However, he didn’t have enough money to pay for the drinks so he had to leave his first prize for collateral. When he got home he took some money out of the sugar bowl and gave it to one of his puppies to pay the bartender. So the pup walked into the bar and the bartender asked, “What’ll you have?” and the puppy said, “Pap’s Blue Ribbon.”

The difference between illegal and unlawful is that unlawful is against the law and illegal is a sick bird.

It takes 3,000 bolts to hold an auto together and only one nut to scatter it all over the countryside.

It doesn’t matter how watchful and vigilant a girl is: if a fellow kisses her it is ten to one he will do it right under her nose.

A man was getting a shave from a barber who flourished considerably. Suddenly he said, “Barber would you mind getting me a glass of water?”

The barber stopped and asked sympathetically, “What’s the matter, something in your throat?”

“No, I just want to see if my neck leaks.”

“What was the explosion on Casper’s farm?”

“He fed his chickens some ‘Lay or Bust’ feed, and one of ’em was a rooster.”

Hard work never killed anyone—but why take a chance on being the first victim?

First engineer to second engineer. “You drive; you’re too drunk to sing.”

Nurse: “Doctor Jones, I believe that engineering student has passed his crisis.”
Doctor: “How can you tell?”
Nurse: “Well, when I left him he was trying to blow the foam off his medicine.”

A preacher recently announced that there are 726 sins.

He is being besieged with requests for the list, mostly from college students who think they’re missing something.
In the Arma Visual Computer, a single control selects the desired chart from as many as 700 photo slides. Each slide contains punched code holes which automatically tune in the corresponding Omni Bearing Distance station. The image of the plane is governed by a combination of the radio signals and the plane’s gyro instruments.

Photography teams with electronics and adds new certainty to flight

Now a visual computer pictures a plane’s precise position and heading on projected photos of aeronautical maps.

Arma Division, American Bosch Arma Corp., working with the Air Navigation Development Board and C.A.A., has developed a valuable new aid in air navigation using photography.

With it the pilot, high above the weather, flicks a switch and before him appears a map of the area he’s over. On the screen a tiny shadow of a plane moves and shows exactly where he is, where he’s heading and whether he’s on course.

This spells added certainty. Even more! It can mean savings in time and money, too. For the flight can proceed by plan rather than by dog-legs on the beams.

So again we see photography at work helping to improve operations—doing it for commercial aviation just as it does for manufacturing and distribution.

Photography works in many ways for all kinds of business, large and small. It is saving time, saving money, bettering methods.

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.

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How General Electric stacks up on your job check list

- **COMPANY REPUTATION**—As an engineer, the names of Thomas Edison and Charles Steinmetz should be known to you. These men, who so greatly influenced the industrial surge of our country since the 19th century, are symbolic of General Electric’s past and present technological leadership.

- **SALARY**—General Electric’s salary program is planned with a long-range view for your career; a well-considered starting salary and merit increases based on your contributions. Through regular counseling by your supervisor you know just "how you are progressing".

- **OPPORTUNITIES FOR ADVANCEMENT**—Through the Company’s Personnel Registers, and individual appraisal of your qualifications and preferences, you are considered for all new or related jobs and promotions throughout the Company.

- **TYPE OF JOB**—Based on your personal preferences and abilities, you will work in various marketing, manufacturing or engineering fields. Your technical or managerial experiences may be in any of nearly 100 product departments where you contribute to the engineering, manufacturing or marketing of some of the more than 200,000 G-E products.

- **PERSONNEL DEVELOPMENT PROGRAMS**—General Electric, a pioneer in industrial training programs, hastens your professional development through classroom and on-the-job assignments as a part of the Company’s marketing, manufacturing and engineering programs. Specific position placement is also available if your interests are already formulated.

- **JOB LOCATION**—There are opportunities for you as a G-E engineer in 150 cities in 45 states, plus many foreign countries.

- **ADVANCED STUDIES**—General Electric offers to technical graduates the Tuition Refund Program and Honors Program for Graduate Study wherein you may take graduate courses at nearby universities. In addition, G.E. sponsors graduate-level Company courses where top professional men teach in their respective fields.

- **TRAINED COLLEAGUES**—As a G-E engineer, you may be working with outstanding men who are responsible for the envisioning, production, and distribution of such new products as man-made diamonds, high-speed rocket and jet engines, the new heat pump, commercial atomic power reactors and electronic ovens.

- **EMPLOYEE BENEFITS**—General Electric’s outstanding benefit program for you and your family includes all the usual life, accident and illness insurance and pension plans, plus a Savings and Stock Bonus Plan and discounts on G-E home appliances.

- **THE COMPANY’S FUTURE**—General Electric’s investment in research can mean much to you. Forty-two major Company laboratories, dedicated to invention and innovation, will play a major role in doubling the Company’s sales during the next eight years. Only through research is a company assured of future growth. For you, this growth at General Electric means new and challenging technical and managerial positions.

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