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In This Issue

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

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For complete information on the opportunities available at United States Steel for young men of ambition and foresight, send for a copy of our free book—Paths of Opportunity. Doing so may very well be the beginning of a successful and rewarding career for you at United States Steel.

United States Steel Corporation, Personnel Division
525 William Penn Place, Pittsburgh 30, Pa.

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Name

(College) (Course) (Date of graduation)

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

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

This high speed rolling mill is a typical example of the tools equipment, and
power conceived and developed by engineers and made available to the American
workman. From a painting by Peter Helck.

COURTESY GENERAL ELECTRIC COMPANY.

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expressed by its contributors.
To engineering undergraduates

who want to plot a better
career curve...

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- CHEMICAL ENGINEERING
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- MECHANICAL ENGINEERING
- CIVIL ENGINEERING

The next freshman class will be admitted September 8, 1958
CAN YOU FIGURE IT OUT?

In the circuit shown, determine the voltage appearing across the 3 microfarad capacitor. Assume that the circuit has been operating long enough to achieve an equilibrium state.

*Solution*

The voltage across the 3 uf capacitor is: 47 volts This answer may be verified as follows:

Since the voltage across the 91 ohm resistor is 91 volts in the steady state, then:

\[ E_1 + E_2 = 91 \text{ or } E_1 = 91 - E_2 \] (1)

And:

\[ E_1 + E_2 = 91 \text{ or } E_2 = 91 - E_1 \] (2)

Let:

\[ Q_1 = \frac{1}{C_1}E_1 \]

\[ Q_2 = \frac{1}{C_2}E_2 \]

Then:

\[ Q_3 = \frac{1}{3(f+0)}E_3 \text{ or } E_3 = \frac{3Q_3}{C_3} + \frac{C_3E_3}{C_3} \] (3)

By substituting in equation (3) the expressions for \( E_1 \) and \( E_2 \) given in equations (1) and (2), we have:

\[ C_3E_3 = C_1(91 - E_3) + C_2(91 - E_3) \]

Substituting all known values in this equation gives:

\[ C_3E_3 = \frac{3Q_3}{C_3} + \frac{3Q_3}{C_3} - E_3(91 - E_3) \]

Dividing by 3\( f \):

\[ \frac{3Q_3}{C_3} = 100 \text{ or } \frac{E_3}{C_3} = 2 \text{ or } E_3 = 47 \text{ volts Answer} \]

---

FIGURING OUT A CAREER?

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

"What sold me on IBM," says Jerry, "was their approach to engineering. I'd expected rooms full of engineers at desks. Instead, I found all the friendly informal of my college lab." Starting as a Technical Engineer in Product Development, Jerry learned a great deal about electronic computers in a very short time. He was promoted to Associate Engineer after 16 months. Recently, he was made Project Engineer, supervising the development of magnetic cores. "In computer work," he says, "you can actually see electronics at work. This is not the case with all such equipment today. In this new field, you can be an important contributor in a very short time."

* * * *

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

Mr. R. A. Whitehorne
IBM Corp., Dept. 851
590 Madison Avenue
New York 22, N. Y.
Assume a loaded wheel on a typical Asphalt pavement consisting of Asphalt surface, base course and natural sub-grade. The entire load is transmitted to the pavement by the tire. The load, applied at the surface, is distributed downward and outward through the Asphalt pavement and base into the native soil or sub-grade. The load spreads out at an angle of approximately 45° in the manner indicated above.

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

**Design of flexible ASPHALT pavement**

The flexibility of modern Asphalt pavement is one of the great achievements of scientific road-building. It is the planned result of layer-upon-layer construction that "locks" surface to foundation to help spread the weight load, absorb shock and pounding without cracking.

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

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

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

**THE ASPHALT INSTITUTE,** Asphalt Institute Building, College Park, Maryland
Is It Worth It?

In this time of national concern over the strength of energies and capabilities, the editors had planned to discuss the timely subject of engineering education. However, we came upon an article written by Mr. Crawford H. Greenewalt, president of the E.I. DuPont de Nemours Company, concerning the problem of scientific education. The article was so well written and so important to every scientifically trained person, that we realized we should reprint his article for all to read. Realizing that, we, the Editors of the Technic, could never approach the scope of the article in an editorial, happily bow to Mr. Greenewalt, and in turn ask that each of you take time and the opportunity to read “The Fickle Fortunes of Science.”

Mr. Greenewalt is a man who is not only a scientist and engineer by education, but an administrator of several of the largest industries in the country. Recently he was awarded the William Procter Prize for Scientific Achievement, one of the country's highest scientific honors. At that time Mr. Greenewalt presented his address on “The Fickle Fortunes of Science” at the combined session of the Society of Sigma Xi and the Scientific Research Society of America. Read the reprint of his address to find why he says, “The impact of Soviet achievement has been startling and may prove far reaching.”

R. L. T.
The never-ending search for oil takes men to strange places—even to ocean floors.

Here Mobil scientists, the first company team of research geologists trained as skin divers, probe the bottom of the Gulf of Mexico.

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ALL KINDS OF ENGINEERS NEEDED

by

E. H. Cox
Du Pont Representative

At Du Pont, the opportunity for chemists and chemical engineers is only part of the story. There are equal opportunities for many other kinds of engineers. Of course, we can't cover all of the types of jobs available at Du Pont, but I've listed here some of the possibilities.

Civil engineers, for example, design and supervise construction of our new plants. Mechanical engineers design, lay out and plan the purchase of production equipment, and they supervise production and work in research. Electrical engineers lay out and maintain power systems for our plants. They also design production equipment. Sales engineers in every field apply their skills to customers' problems and help find new applications and markets for our products.

Metallurgical engineers develop new metal and semi-metallic products and work on corrosion problems and the selection of materials suitable for industrial processes.

We are also interested in engineers who have specialized in petroleum, plastics, ceramics, safety, sanitation and many other fields of study.

Opportunities in most branches of engineering continue to grow at Du Pont. If you have questions on your own specialty, please see me when I visit your campus. I'll be happy to try to answer them.

Your Classroom Learning Is Applied Immediately to Industrial Problems

Training at Du Pont is tailored to the individual. It begins the day you join the Company and continues throughout your career. Its purpose is to give you as much responsibility as you can handle at the outset, and to prepare you for future advancement.

Personalized Development

When you join Du Pont you are generally given a specific assignment at once. You learn informally in consultation with your supervisor and others assigned to the same project. This headstart on responsibility permits a new man to move ahead according to his abilities. He gets to know Du Pont and his job quickly.

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This approach at Du Pont is supplemented by frequent meetings and seminars and by formal job evaluation reports. Your supervisor, for example, will evaluate your progress on the job at least once a year. The two of you will analyze your performance and outline a program for improvement. From these evaluations often come recommendations for promotion and salary increases.

On occasion, a man may decide that he is better fitted for sales or research than production work, for example. In these cases a transfer to another job may be effected without any loss in Company benefits or without a change in employer. Redirected, a man often will find himself and the work for which he is best suited.

If you have any questions about personnel development at Du Pont, stop in to see the Du Pont representative when he visits your campus.

THERE'S A BIG FUTURE IN DU PONT RESEARCH

In 1956, Du Pont spent $77 million on research. And over the past 25 years, $1 has been spent on research for every $3 invested in new production facilities. This activity promises plenty of room for the young research man to grow.

Right now, Du Pont engineers and scientists are working on hundreds of new research projects. Many work in the Experimental Station near Wilmington, Del.; others are busy in laboratories in nine more states.

SEND FOR INFORMATION BOOKLET ON JOB OPPORTUNITIES AT DU PONT

Booklets on jobs at Du Pont are yours for the asking. The subjects of particular interest to young graduates include: mechanical, civil, metallurgical, chemical, electrical, instrumentation and industrial engineers; atomic energy, technical sales, business administration, research and development. Write, mentioning the subject that interests you. The address: Du Pont, Room 2494-C Nemours Building, Wilmington 98, Delaware.
When I was first advised that your Society had done me the honor of awarding me the Procter Prize, I was, of course, extremely gratified and flattered. It is always pleasant to find oneself in distinguished company, and no one can question the very great distinction of your previous prize winners. I was, however, somewhat puzzled at my election to such a hallowed and worthy institution with such hallowed and worthy associates. It is always pleasant and flattered. It is always pleasant to find oneself in distinguished company, and no one can question the very great distinction of your previous prize winners. I was, however, somewhat puzzled at my election to such a hallowed and worthy institution with such hallowed and worthy associates. It is always pleasant to recall my scientific past is not only comforting, but an important compensation for the transition which chance and circumstance have brought to my daily tasks.

It is fortunate for me that the times and the recent accomplishments of Soviet science have given me a theme, making it unnecessary for me to retreat to an exposition of the importance of science in our modern world. For ever before have science and technology been accorded such a degree of respectful attention. Like the atomic blast at Hiroshima, the question of the satellites is vibrant with emotional overtones and resplendent with sound and fury. I suppose that the American Association for the Advancement of Science has never seemed such a hallowed and worthy institution with such hallowed and worthy goals.

Without in any way deprecating the importance of the sputniks, with or without passenger, it seems to me that we have here a simple reaffirmation of an old and universal truth—that no nation has a monopoly on creative talent, and that no nation can at any time count itself immune to competition. When able men of whatever origin apply themselves to a given objective, it is not surprising that periodically they will produce some major pioneering achievement, in the Soviet Union today and in another country tomorrow.

In the furore set off by the satellites, we have been experiencing one of those outbursts of patriotism which signify our national pride. We all recall the belligerence with which it was maintained during World War I that one American could lick 10 Germans, and we would like to believe today that one American scientist can outsmart 10 elsewhere. Unfortunately, that is not true, for science is not a sparring match between two adversaries, but a fusion of effort and a synthesis of accomplishment by men of many tongues, many beliefs, and in many ages. I am sure that, if the truth were known, sputnik would pay homage to the scientists of many countries, not the least of whom would be the Chinese of the second century who originated the principle of rocket propulsion.

Nonetheless, the impact of the Soviet achievement has been startling and may well prove far-reaching. Already it has put considerable impetus behind a national program of scientific education; it has alerted the necessity of adequate technology; it has brought forth a sober determination to regain whatever stature we may have lost in the eyes of the world; and perhaps most important of all, it has shown us the dangers of overconfidence, of national smugness. Each of these results is a desirable one, and, to the extent that they are intelligently fostered, our scientific progress will be benefited and our national position strengthened. There are, however, some real dangers, the more real as our course is dictated by emotion rather than by reason. Hasty expedients may, while promising immediate advantage, weaken rather than advance our long-range endeavor.

For the immediate situation, we must, of necessity, think of our scientific resources as they are, not what they may be 10 years from now. If our present problem requires an immediate and massive attack, then, of course, we must make that effort, but we must make it with the determination that it shall be temporary and that we shall return as soon as may be to the pursuit of scientific progress on all of its many and varied frontiers. Science, perhaps more than any other area of human knowledge, is inherently dynamic in character. It is dynamic not only in the progress of each of its disciplines, but also in the shifts of emphasis over the years from one discipline to another.

There are fashions in science just as there are fashions in thought and fashions in dress. The pendulum of interest swings from one discipline to another, guided sometimes by progress, sometimes by discovery, sometimes by the demands of national security, often simply by chance. Perhaps the success of the Soviet experiments will cause the pendulum to swing once more and the nuclear engineers and particle physicists of today will find themselves displaced by the astrophysicists, the rocketeers, and the fuel
Fortunes of Science

We have seen emphasis change markedly within our own lifetimes. In the 10-year period, 1898 to 1907, there were as many zoologists who received doctorates as there were physicists—the ratio is now about one to a hundred. There were 10 times as many astronomers as there were metallurgists. During the 20's, the up surge of the American chemical industry brought that activity into prominence with a huge increase in the number of students. Later, this interest declined so that we had as many chemistry majors in the late 30's and early 40's as in the 50's, despite a very large increase in the college population. But, since 1940, the total number of physicists has more than trebled.

Admittedly, sciences with less glamour and less momentary appeal do have their periods of hardship. One university president, for example, noted with some distress that the paleontologists on his faculty were having rough going, with few of those remunerative research efforts which kept his chemistry and physics departments in relative luxury. Fortunately, the gentleman was a determined man with a long-range viewpoint. He would maintain vigor in paleontology, he said, if he had to tap the football receipts.

There is nothing unhealthy about this tendency to switch emphasis from one scientific discipline to another. Departments of Paleontology may get into temporary trouble, but there will always be paleontologists if human beings are allowed to pursue their various bents. If I may pursue a bit further the analogy with feminine fashions, you will recall that sleeves, for example have been long, short, slit, and puffed; skirts have risen to knee cap and fallen to ankle length; waistlines have been high, intermediate, and low, but the essential elements of feminine apparel have always been there and the changes have merely served to keep men interested.

It has been much the same with our scientific development. There has even been a lunatic fringe, such as the scientist who once suggested that the neglect of phrenology was "an example of almost incredible narrowness and prejudice." But science, as a great branch of human knowledge, has always marched on and up no matter what its fashions dictated as to the relative glamour of the various disciplines each of them has always had dedicated followers in sufficient numbers.

This is as it should be, for real progress will be made only if all branches of science move forward together in an unbroken front. I would venture to say that there has been no great advance that was not a synthesis of knowledge laboriously accumulated in many different disciplines—a cooperative fusion of many branches of knowledge. For science, like freedom, is indivisible, and freedom in science is just as essential as freedom in any other area of human endeavor. We have encouraged people to be what they will, to pursue any course that seemed good to them. The inherent variability of human nature will inevitably produce sufficient numbers of practitioners to keep each of our scientific pots at the boil. Should artificial barriers be interposed which cause any of those pots to grow cold, not only that particular discipline but all of science will be the loser.

I would not agree that Soviet science generally has out-stripped our own. Effort in a given area to the exclusion of all others can doubtless produce an occasional extraordinary result, and the satellites would not worry us were it not for their frightening military implications and the suspicion we entertain of Soviet motivations. It is entirely foreign to our natures and to our traditions to be driven to exclusive emphasis on one objective, particularly a military objective. We have learned that sound progress is progress that rests on the free advance of human knowledge in all of its many interrelated disciplines. Herein lies our strength, and I am certain that our scientific sinews are fully adequate to prevail in the long run, whatever short-term setbacks we may encounter.

Just as the satellites have caused us to appraise our competitive scientific stature, so have they brought us to a searching examination of our educational establishment. There is some feeling today that the American school and college system has fallen short of its responsibilities and compares unfavorably with that of other nations, particularly with the Soviet Union. Surely, there is always merit in sober appraisal and careful analysis, but I cannot agree that there is anything fundamentally wrong with our educational institutions, nor that they suffer unduly comparison with the educational process in other countries. It seems to me that here again the

(Continued on Page 34)
FOOTBALL

Rose ended the 1957 season with a 46 to 7 drubbing of Earlham College. To satisfy Earlham, Coach Brown played the game under free substitution rules. What the Earlham coach hoped to be an advantage turned out to be his downfall, as ROSE fielded a fresh team each time the ball changed hands. The bench was emptied to give the reserves valuable experience. Captain 'Rocky' Herakovich scored 4 T.Dd's to lead the ENGINEERS to victory.

The students and alumni of Rose should be made aware of the fine Rose man who lead the ENGINEERS to a 7-1 record for the season. The team captain, Carl "Rocky" Herakovich, was elected by his teammates following the 1956 season. This in itself was noteworthy, for he was only a sophomore at the time. He lead the team through the almost perfect 1957 season, scoring 102 points in 8 games. This feat gave him the honor of being the leading Indiana collegiate scorer. These honors he has accepted with humility and praise for his teammates. This winter he was re-elected captain, which is indicative of the high regard his teammates have for him.

BASKETBALL

With the '57-'58 Basketball season in full swing, Jim Carr's boys are beginning to shape up. With only one senior and one junior on the squad this might be a building year for R.P.I. The loss of several men has left openings on the starting lineup. The job of filling these holes will go to sophomores with little experience or freshmen with no college experience.

The returning lettermen are: Gary Giffel, Larry Grimes, Sherm Smith, Jim Sargent, Larry Berger, Jim Greggs, and Woody Stroupe. As usual, freshmen will provide the reserve strength and a few starters. Mike Smith and John Ray are seeing a lot of action and are proving to be quite capable.

The things that favor the ENGINEERS are their size and depth. Though the team is inexperienced, the round-ballers are expected to make up for this in fire and scrap. Judging from the broken teeth, sore elbows, and bruises these are two qualities which this year's club will not be lacking.

On November 2, Jim Carr's cagers opened the '57-'58 season with a trip to Vincennes. Although seemingly outmanned, the Engineers continually out-hustled, out-rebounded the bigger squad. Hitting from the outside, Captain Gary Giffel led Rose to a 33-22 lead at the halftime. The intermission cooled the squad's shooting eye and Vincennes managed to cut the margin to five points before Rose once again was able to hit from the field. Led by Mike Smith's 22 point performance, Rose easily won with a dashing 59 to Vincennes score of 48.

The first home game on November 26 found the Rose "Quintet" facing a more experienced team, Marion. The first half the teams played on even terms with Marion holding a one point margin as the half ended. Led by Sherm Smith's rebounding, Rose hurried their opponents but again they could not find the mark and were edged out by 3 points, 61-58. Mike Smith was the high scorer for both teams with an accumulation of 20 points.

Illinois College was the Rose and White's first conference competition. During the initial stanza both teams played a slow and deliberate game with Rose out in front by 6 points at the half, 22 to 16. The second half found the "Blue Boys" fired up and they then managed to narrow the gap to 3 points before Sherm Smith broke their backs with two successful twenty-five foot jump shots. After that Jim Carr's boys showed I. C. their heels and were pulling away when the final buzzer sounded. The scoring was evenly distributed with the exception of Mike Smith who once again led the squad by dropping in 16 points. Final score: Rose 54, Illinois College 34.

On December 7, the Engineers faced Eureka. The first half R. P. I. had things on their side. Then the axe fell. Eureka threw up a zone defense and Rose failed to hit from the (Continued on Page 44)
Before the applications of torsion bar springs can be discussed and the advantages reviewed, we must first find what the torsion bar really is. A torsion bar is nothing more than a steel rod which is anchored to the chassis at one end and twisted at the other end. The resistance of the steel to twisting and its ability to return to the original position gives the torsion bar the characteristics of a spring.

A comparison of the torsion bar to other types of automotive springs may also be of use to us in evaluating its merits. A coil spring works on the same basic principle as the torsion spring or bar. That is, the motion of the wheels of the car tend to twist the steel rod which is wound into a helical coil. The traditional leaf spring is a flat steel bar which is fastened at both ends with the axle perched at the middle.

The bar resists being bent and tends to return to its original position. Air springs are a relatively recent development and would take to much space to attempt to explain in this article.

While the torsion bar and the coil spring have very similar characteristics. The torsion bar has several advantages. One of these is the saving of space. The torsion bar can easily be placed directly alongside, or even inside, a chassis frame member. The coil spring however, has considerable bulk and must be placed directly over the member on which it acts. The torsion bar also may easily be preloaded or unloaded as the case may be, in fact this may even be done while the car is in motion. Devices used to accomplish this adjustment will be discussed later in this article.

The torsion bar is by no means a new or an untried method of car suspension. They have been in use for many years in Europe on such popular sports and economy cars as the Jaguar and Volkswagen. On cars of this type the space saving quality and adjustability are particularly advantageous. While the torsion bar was first exploited in sports and racing cars, many European manufacturers are now incorporating them in the designs for family cars.

The first of the American car manufacturers to venture into the field was Packard. The Packard system was unique in that one long bar was attached to both the front and rear wheels of each side of the automobile. This allowed the action of the front wheel to automatically preload the rear wheel, before the rear wheel reached the bump. These cars were also equipped with an electric motor which could be used to preload the springs to keep the car level. The Chrysler Corporation has now entered the field, to become the only other prominent car manufacturer to make use of torsion bars.

A complete comparison of the torsion bar to the air spring is not easily accomplished. The air spring has just been improved and has not yet fully proved to be practical. Many automotive experts believe that air springs, which are now available, were hurried onto the market to use as a selling point to compete with Chrysler’s torsion bars. Whether or not air springs will gain acceptance is a question which only time will tell. The torsion bar, however, has proved itself in several years of use and may well become the accepted form of car suspension in the future.
On Thursday morning, December 5, Indiana State Trooper Floyd A. Davis presented a most interesting and educational program. He spoke primarily on cases in which he had participated involving identification of bodies, tools, and weapons. New scientific methods of identification were explained and their application in police work was discussed. Mr. Davis brought with him a very interesting series of slides which he used to illustrate his talk. Everyone present enjoyed the program thoroughly and we say thanks to Captain Davis and welcome back anytime.

Engineer’s Day was held on the Rose campus Saturday, November 23, under the sponsorship of the Student Council. Blue Key Fraternity furnished guides for the tours through the building and each department furnished displays and exhibits. Visitors were provided noon luncheon in the student center and cafeteria. This year’s program was aimed toward educational, rather than sensational exhibits, the purpose being to give visitors a look at what actually goes on in an engineering school and some of the things an engineering student can expect to do. Students were on hand at each exhibit to explain to the groups the nature, mechanism, and use of the particular apparatus.

A large crop of outstanding Freshmen have helped the Rose Glee Club to present one of its best groups of Concerts, in recent years. For the first time, all the uniform jackets are in use and there is actually a shortage. The club sang for the Homecoming banquets and have presented several programs for schools and local organizations. The annual caroling tour will be Wednesday night, December 18 and several other programs are coming up. Good work men; keep it up.

The ISTC Choir presented a series of Christmas carols and hymns during Convocation hour this past Thursday, Dec. 12.

The seventy member Choir sang a series of very enjoyable songs and then suddenly filed off the stage into the wings. A few moments later a group of fourteen Madrigal vocalists came walking onto the stage singing a Christmas novelty. They followed with a number of entertaining selections and concluded their program with “We Wish You a Merry Christmas”. The whole Choir then sang a number of hymns, putting the finishing touches onto a very fine and entertaining program.

The Freshmen threw away their beanies after winning the second and third events of the annual Freshman-Sophomore games held this past November 26. About 90 Freshman, headed by Bill Carter, succeeded in showing about 60 Sophomores and quite a few spectators that the supposedly weak and unorganized class of ‘61 wasn’t so

(Continued on Page 40)
Molecltrons
By Jack Milnes, fr.

GAS TO ELECTRICITY

The direct conversion of the chemical energy of gases into electricity—long a dream of scientists and for years a laboratory curiosity—has been accomplished with the development of the first fuel cell capable of economically producing thousands of watts of power. Using hydrogen and oxygen as fuel, the new silent source of power has been developed by scientists at the Research Laboratories of National Carbon Company, Division of Union Carbide Corporation.

The secret of the new fuel-cell's success is the chemically treated, hollow, porous carbon electrodes through which the gases enter the cell, and which also conduct the electricity produced by the electrochemical reaction.

The production of electricity directly from hydrogen and oxygen in a fuel cell is inherently more efficient than its production in a conventional steam system in which heat is supplied by burning these same gases. Practical limitations in utilizing all of the heat produced reduce the overall efficiency of a system to approximately 30 or 35 percent, while a fuel cell, which eliminates the intermediate heat step and converts directly from chemical to electrical energy, has a top efficiency of about twice that figure.

This new fuel cell is merely a sealed jar into which are fed hydrogen and oxygen through the special hollow electrodes. The electrochemical reaction of the gases at these electrodes produces an electric current, with only water as a by-product. With the water disposed of by evaporation, the life of the fuel cell is theoretically unlimited. Cells have been operating 8 hours a day, 5 days a week for the past year, with no signs of deterioration. This type of operation was purposely chosen for testing because the repeated starts and stops are much harder on the cell than would be continuous, around-the-clock operation.

The voltage across the electrodes of the new fuel cell is approximately one volt, and it is simply a matter of connecting a number of cells in a circuit to get any voltage desired. The amount of electrical current produced by the cell depends on its physical size, so by varying the number and size of cells, many combinations of voltages and currents can be obtained. Basically, the fuel cell is most desirable for high current, low voltage use.

The new design is also unique in that the cell can operate with hydrogen containing considerable impurities, which means that standard industrial grades of commercial purity can be used.

Present designs call for the grouping of a number of specially catalyzed, hollow porous carbon elect-

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VULCAN MACHINE GUN

The famed Vulcan machine gun has a new and more powerful brother—a 30 millimeter version that can give modern high speed jet aircraft three times the striking power of the earlier 20 millimeter gun.

The new version of the “Gatling gun” the name give last year to the 20 millimeter Vulcan because of its similarity in operation to the original ‘Gatling gun,” invented by Richard Jordan Gatling in 1862, was unveiled at the Air Panorama of the Air Force Association. It was developed in 10 months by General Electric armament engineers of the Missile and Ordinance Systems Department at Burlington, Vt. for the U. S. Air Force.

The earlier Vulcan gun is now used on the Air Force’s supersonic Lockheed F - 104a Starfighter. The new gun weighs the same as the earlier Vulcan, also has a higher rate of fire, but is 8 inches shorter.

Designated the Vulcan T212, the 30 millimeter gun employs the same firing method as the 20 millimeter, mounting six rotating barrels from a central feed and firing housing.

The new Vulcan, which also weighs about 30 pounds, has a barrel weighing approximately 22 pounds, compared to the 20 millimeter barrel weighing 18 pounds. Weight on the T212 was minimized by use of the shorter barrel.

Both versions of the Vulcan can be electrically or hydraulically operated.

NUCLEAR AIRFRAMES

With the development of nuclear power, a great change in our thinking concerning power of airplane motivation has come about.

The giant strategic aircraft, our prime mover of thermo-nuclear bombs, would be the logical first candidate for a nuclear plant. Development of the nuclear airplane, by providing an aircraft of infinite range, would certainly strengthen our nation’s international position. Also, the airframe required for a nuclear plane would offer military crews greater safety from shrapnel than does the chemically powered plane.

In the nuclear plane, there would be no explosive fuel, the reactor area would be very small, and the net gain from elimination of large fuel capacity would be enormous. If the chemical fuel were used only for take-off and landing in the nuclear airplane, it would be possible to purge the entire system near the engines and render it inert during nearly all the mission.

The flight crew is the single most sensitive element in the airframe from a radiation point of view. Unfortunately the determination of the tolerable human radiation dose is very difficult, and may well prove to be one of the most complex research areas in the attainment of operational aircraft.

When the radiobiological people establish exposure criteria for crew personnel, the shielding engineer and air frame designer would then begin their analysis in order to translate the biological specifications into an operational airplane shield. The maintenance situation looks very dark indeed at this point.

A major problem is this: When divided shielding is used, the radiation outside the crew compartment is much higher than inside; thus, maintenance workers, busy about the reactor when the plane is on the ground for repairs, would be exposed to a higher rate of radiation than the protected crew.

Since the maintenance workers should be able to work at least a half-day, five days a week, on nuclear planes, they probably would have to be limited to a much smaller dosage of radiation than the flight crew.

F. A. Cleveland, director of preliminary design studies on nuclear powered planes with the Georgia Division of Lockheed Aircraft Corporation, in his discussion before the Los Angeles section of the Institute of Aeronautical Science offered ideas which sketched an airframe along the following lines:

1. Power plant inside the fuselage instead of on the wings. It is necessary to keep the reactor close to the engine and reduce the heat transfer problem.

2. Thin wings, cleaner, simpler, and more efficient. This would be made possible by elimination of the engine, landing gear, and fuel from the wings.

3. Smaller volume tail. When chemical fuel is removed from the airplane, reduced center-of-gravity travel can be expected, and this will make possible the reduction of tail volume.

4. Few windows. Dangers of radiation will prohibit installation of windows on the sides or rear of the crew compartment. These dangers also will make design of a window even in the front a problem.

5. Stronger landing gear. Landing gear on the conventional plane isn’t designed for full load, since the aircraft reduces its weight by using its...
fuel after take-off. The nuclear plane uses no fuel, so it will weigh as much on landing as on take-off.

The problems of designing an airframe for nuclear power are of course great, but the long-range endurance of nuclear airplanes makes these problems unimportant.

Many problems which seemed insurmountable two years ago have been solved by the use of a rather minor nature or non-existent, while others, unexpected, have appeared. Every year makes the feasibility of the nuclear-powered aircraft more a certainty.

**TEMPERATURE PLUS**

Scientists probing the mysteries of intense heat have produced temperature approaching that of the sun's surface with ordinary motion picture projection equipment.

The arc image furnace, as this versatile research tool is known, is in connection with high-temperature operations. The technique is actually a scientific version of the use of a magnifying glass to set fire to a piece of paper, and was developed in connection with high-temperature studies at the research laboratories of National Carbon Company, Division of Union Carbide Corporation.

The arc image furnace, as this versatile research tool is known, is not new, but an entirely new twist has been introduced that adds immensely to its usefulness and makes practical the high temperatures required in modern-day research. Previous furnaces have used specially-designed parabolic mirrors to focus the arc's energy onto the substance to be heated.

A new design uses two elliptical mirrors of the standard type found in motion picture projection equipment. One mirror directs the energy of the arc at the other, which in turn concentrates the radiation on the specimen being heated, forming a life-size image of the actual arc.

The new equipment is highly compact and portable and can be operated practically anywhere, at any time. It is said to produce results comparable to that of a solar furnace with a 60-inch diameter reflector, which depends on the sun's rays for its energy and can be operated only under favorable climatic conditions.

The arc image furnace now in use uses arc carbons less than one-half inch in diameter, focused by mirrors approximately 18 inches in diameter and placed about 6 feet apart. The arc draws a current of 200 amperes, which is approximately twice the electrical requirement of a modern home. Normal operating voltage is 80 volts. There is no reason why the arc image furnace cannot be extended to larger arcs with higher power to heat larger samples. Work along these lines is already underway.

Highly-polished curved mirrors concentrate rays from a carbon arc into a small but extremely high-energy beam that can produce temperatures above 7,000 degrees Fahrenheit. The technique is actually a scientific version of the use of a magnifying glass to set fire to a piece of paper, and was developed in connection with high-temperature studies at the research laboratories of National Carbon Company, Division of Union Carbide Corporation.

The parabolic heat reflector.

Firebrick subjected to high heat.

In addition to its use of standard equipment, the new system has the advantages of providing a narrow beam midway between the two mirrors where a shutter can be placed to turn the energy on and off very quickly without disturbing the arc. A tilted mirror can be placed at the same point to tip the beam to any desired angle if it is to be used in melting a specimen.

As an extremely 'clean' source of high temperatures, the arc image furnace is ideally suited to metallurgical research where purity is particularly important. The beam can be projected through a transparent window into an enclosed vessel in which the atmosphere can be controlled and which can even be raised to high pressures if a combination of high temperature and pressure is desired. Because of these features, it is a very valuable research tool, and might well become a useful production tool in the future as high temperature operations become more common in industry.

**ROSE CHEMISTRY DEPARTMENT ACQUIRES NEW PH METER**

Not to be left behind by the new developments in their field, the Rose Chemistry Department last summer purchased the latest model PH meter — a Beckman Zeromatic. The Zeromatic has been on the market for less than a year. It has many new features which are firsts for PH meters of this size and price range. The Chemistry Department has every right to be proud of this new addition which compares with the latest meters now being used in industry.

One of these new features is a push-button control system. Six push-buttons on the front panel of the instrument actually serve as multiple switches. One switch controls the relationship of the electrodes to the input of the instrument. Other switches select the function of the instrument. These switches offer a choice between a O-14 PH scale, a O-1400 millivolt scale, and a 700-O-700 millivolt scale. These last two scales are for potentiometric measurements or titrations. Still another switch determines whether the automatic or the manual temperature control will be used. The main advantage of the new push-button controls over the old knob type is that the buttons provide a much more convenient method for

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BORON JET FUEL

20 MULE TEAM FUEL

By Noble Huff, soph., ch.e.

Boron, the fifth element in the periodic table, is a very useful and interesting substance. Also it is one of the less well known elements, so this article is an attempt to describe the discovery, production, chemistry, and uses of boron and some of its compounds.

Boron was first discovered as an element in 1808 by J. L. Gay-Lussac and L. J. Thénard when they heated boron oxide and metallic potassium. Later methods were devised to give greater purity and yield. These methods involve extreme heat or electrolysis, or both; to decompose a boron oxide or halide.

Boron in pure form has a dull metallic lustre, although it is not a metal. In finely powdered form it is jet black. It is chemically almost inert at ordinary temperatures, but at elevated temperatures it behaves like carbon. It is hard enough to scratch carborundum, but is too brittle for tools in its pure form. Boron is never found in nature in its pure form, but rather in the form of borates or boric acid. Pure boron is used primarily in the metal industry. Since it is quite reactive at high temperatures, it can be used as a deoxidizer and degasifier in metalurgical reactions.

Boron forms several oxides, acids, borides with metals, boron carbide, boron halides, boron hydrides, and many organic compounds. Probably the best known of all boron compounds is boric acid, H3BO3, which is a white crystalline solid and is used as a mild antiseptic in solution. Boric oxide, B2O3, is used as a drying agent, and is an important constituent of pyrex glass because of its low coefficient of thermal expansion. Boron carbide, B4C, is an extremely hard, inert black solid; second only to diamond in hardness. It is important as an abrasive. The boron hydrides and boron-organic compounds are generally noted for their very high reactivity and will be discussed later. One of the important recent uses for boron and some of its compounds makes use of the radiation absorption powers of these substances. They may be used in controlling nuclear reactions, and as safety shields to absorb stray radiation. Two boron halides; boron trifluoride (BF3) and boron trichloride (BCl3) deserve mention in that they are extremely useful as catalysts in organic synthesis. Finally, it has been found that boron is a vitally necessary soil constituent for the healthy growth of many commercial crops. Therefore, many commercial fertilizers now have a source of available boron in their make up.

The history of the borax industry in the U.S. is quite interesting in itself. Around 1860 it was found that by evaporating waters from certain springs in California, borax (Na2B4O7·10H2O) could be crystallized from the resulting concentrated solutions.

The real borax industry started in 1872 when a deposit was discovered at Teales Marsh, Nevada. There was a demand for borax as a cleaning agent, so it became commercially feasible to work this deposit. At the same time mining operations were in progress in Rhodes Marsh, Nevada, Fearles Marsh, California, and Death Valley.

It was at this time that the now legendary twenty mule team came into use. They were used to haul borax from the Harmony and Armogosa Borax works to a railhead at Mojave, California. This covered a distance of 107 miles, 60 of which were through arid desert land, and involved considerable wear and tear on man and beast. These secondary sources were a result of leaching and subsequent evaporation. They did, however, yield an important clue to the discovery of original sources in the Calico Mountains near Daggett, California. This clue was “Cotton ball,” a form of fibroces ulexite, having a formula NaCaB3O6·8H2O. The material was incident in the secondary deposits, and showed the way to the more important sources of Colemanite CaB3O6·5H2O.

By this time the demand for borax made it necessary to expand transportation facilities. The construction of the first railroad into Death Valley was accomplished in record time under most adverse conditions of terrain and climate.

The production of borax from Death Valley continued until newer and larger deposits were discovered in the Mojave Desert in California. This deposit is still being mined today. The company has evolved into the U.S. Borax and Chemical Corporation and has recently opened a new open pit borax mine and refinery at Boron, California, which (Continued on Page 38)
Lambda Chi Alpha

Theta Kappa welcomes three new members to the roster. Those initiated December 8 were Don Weidner, senior electrical, and Conrad MacGinnis and John Witcher, both sophomore mechanicals. "Help Weekend" for the recent pledges was held the preceding Friday and Saturday.

The formal Thanksgiving dinner was set down at the house November 17 with the fellow's girls as guests. Naturally everyone filled up because it is not often that one gets two Turkey-Day meals a year.

They have gone and done it again, gotten pinned that is. The two latest victims are junior Larry Brady, who pinned Miss Christine Teak of Free-landville, and soph Tom Feutz (The Heap), who gave his to Miss Sandy Findley of Paris, Illinois. Their pin talks were most informative but it is amazing how much can be forgotten so quickly.

A mixer with Chi Omegas of State was held December 13 at which time the Christmas tree was decorated. There is an interesting story behind that tree but it best not be told. However if you really want to know you can ask Herman Blythe how he caught it.

The annual Christmas party for underprivileged children was the following Sunday with about 35 children in attendance. The student nurses from Union Hospital were down to give some expert assistance. The whole project was under the guiding hand of Jim Massey, who nearly ran his legs off before coming up with a Santa Claus.

Jim Barrick

Alpha Tau Omega

Here's hoping all the Taus enjoyed the holidays. The ATO's spread a little cheer by having several parties. The party for the Glenn Home children was, as usual, a tremendously noisy success. We were disappointed that only eighteen children could come, but that is the way it goes sometime. Anyway the eighteen easily provided enough activity for everyone. Mike Munro was Santa Claus this year. Luckily he had to use little padding in the suit this year.

Several "golden-voiced" Taus led by Jim Stott sang for the annual Christmas party of the Mother's Club, who enjoyed themselves im-measureably.

The Virginia Military Institute Dance was held December 6. The boys put on "tuxes" for the VMI this year. We all thought it was one of the best-looking dances we have seen for a long time. The arrangements for many of the flowers were made by "Flower Boy" Joe Bronnert. Thanks Joe.

The Taus celebrated the coming of the Thanksgiving Vacation with a small party. The prime entertainment of the evening was a number of long-overdue "pin talks".

We congratulate Fred Hall and Rod Baird, who pledged ATO this fall.

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As I sit here gazing into the warm fire, I tell myself it is all a bad mistake. They will be taking the furniture tomorrow but it doesn't matter any more. My world is shattered, but why? Is it possibly conceivable that I made a mistake somewhere along the line?

Nobody can say I didn't have a pleasant childhood. While our family income was modest, we all had one characteristic more valuable than money—we were smart. Father used to amuse us by telling how our neighbors had been “taken” by buying Fords and Chevrolets when any fool knew that our Plymouth was the superior automobile.

After my first few weeks of school, I realized that some of the more stupid kids were Democrats. I tried to reason with them but soon lost my patience. If there is anything I learned from the first grade, it's that Americans are the cleverest people in the world (even by including Democrats).

My first setback came during the seventh grade. One morning in class I simply stated that Parker ball-point pens were the best. A Schaeffer owner immediately donned full war dress and the battle was on. Imagine my embarrassment when at 2 o’clock the next morning my pen ran out of ink first. But, after all, quality and not quantity, is the true gauge of a ball-point. Anyhow, I had probably done more writing previous to our skirmish. Yes, that must have been it.

High school presented a new challenge. In order to be accepted as one of the gang, one had to prove that he thought the whole education business a farce and the only reason he was there was to pacify his parents. And ho hum, once there he might as well make the best of it. I had little trouble meeting the requirement that once outside the classroom, one had to be clever and all-knowing concerning practical things. I even threw in a smorgisbord of pretended dishonesty to add color to my character. But to act stupid in class, when I really knew all the answers was not easy. It wasn't until I was kicked out of English class three days in a row that I finally made the grade.

The junior year was perhaps the happiest time of my life. We had a great basketball team. Perhaps it was inevitable that we would finally lose a game, but why did it have to be to that hick Central team. I bet they had to pay those referees plenty.

College forced a complete reversal of my policy. It was now necessary to know everything again. I took an attitude of superiority so as to make a good impression on students and teachers. Classroom discussions became heated; I must confess there were times I didn’t know what I was talking about, but then neither did anyone else. I would have done better in college if it hadn’t been for those ignorant teachers, the worst of which was the professor of political science, a dyed-in-the-wool Democrat. So what if I didn’t know the Democratic platform; it could only have been a lot of nonsense anyhow.

Graduation gave me a new lease on life. I always knew I was smart but now, now there was a piece of paper to prove it. A new problem arose. Should I waste time talking to proletarians, who had never set foot inside a university door? The answer was clear—only if I stood to gain from it.

My first assignment in industry was to build a better mousetrap. Working zealously, I designed the perfect, electric mousetrap. However, the boss unwisely chose a spring trap designed by a fellow who never attended college. It was so nauseating that I had to go home.

About four years ago I met Jane. It was almost too good to be true. Not only did she belong to my church, but her father drove a Plymouth, and they were loyal Republicans. We had a beautiful Christmas wedding and were set for a life of happiness.

Everything went smoothly until one April morning at breakfast Jane looked up from the newspaper and said, "The Braves will surely win the pennant this year with Spahn in top form." It was a stab in the back. To think I had unknowingly married a Brave fan. With great effort, I brought my emotions under control and hurried off to work. That season was a living hell. I managed to put up with it until my own beloved Cardinals took the final three games of the year from the Braves and thus cost them the pennant. Jane's only comment was, "Who would have known that that bush-leaguer Musial would hit four Chinese homers." She couldn't say this about Stan, the world's greatest ballplayer. I really told her off and due to my better arguments (such

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ATTENDS EDUCATORS DAY

During 1957, the Gulf Oil Corporation held an Educators Day during which leading scientific educators from colleges and universities throughout the country were invited to preview three major new laboratories at their Gulf Research Center, Harmarville, Pennsylvania. The new structures viewed comprise multi-million dollar facilities for research into improving methods of oil production and the handling of well fluids; into better fuels and lubricants for automotive, aviation and marine engines; and into application of nuclear energy to all phases of petroleum science.

The group was welcomed by Dr. Blaine B. Wescott, Gulf Vice-President of Research; were guests of the company at lunch at the Oakmont Country Club and, later, at a reception and banquet at the Duquesne Club, where they heard remarks by Mr. David Proctor, Executive Vice-President of Gulf, and a major address by Dr. J. C. Warner, President of Carnegie Institute of Technology.

Although a complete tour was made of the entire center, the interest of the educators was centered in the following new buildings:

The new William Larimer Mellon Production Research Laboratory, housing 95 laboratory work rooms and offices for investigations into reducing drilling costs and achieving a greater percentage of yield from oil reservoirs. An ultimate staff of 150 scientists, engineers and technicians will be employed there.

As a supplement to the main building, a smaller “Drilling Building,” has been erected around an 80 ft. oil derrick extending through hinged panels in the roof. This permits duplicating field operations with heavy equipment.

The new Richard Beatty Mellon Automotive Products Laboratory, which is electronically instrumented in such minute detail that “push button” research becomes possible in some projects. Heart of the installation lies in 20 room-size engine test cells where gasoline and motor oils of the future are evaluated. A “king-size” cold room permits testing of vehicles up to transcontinental bus size in temperatures as low as —70° F. Through picture windows operators observe the functioning of engines in the cells—which are sound-proof, vibration-proof and specially ventilated—and control them from console type panels. Two men can supervise operations of a whole test wing; and, once set up, tests may run 2 hours a day, seven days a week.

The new Andrew William Mellon Nuclear Science Laboratory, which is assigned to explore the uses of nuclear energy in all phases of petroleum work. Its principle unit is a 3,000,000-volt Van de Graaff particle accelerator, the most versatile radiation source of its type in private industry and the most powerful tool for producing beams of electrons, protons, neutrons and penetrating x-rays for research.

Among promising nuclear studies being pushed are nuclear well logging which may help locate otherwise undiscoverable oil; use of nuclear energy in treating catalysts and as a substitute for heat in refining; and use of isotope “tracers” for controlling, testing and flow analysis in refineries and in investigating product performance.

Among those viewing these facilities was Professor S. G. Bankoff.

JOINS BENDIX AVIATION

Harry McGuire of Seymour, Ind. and Marc W. Broemmelsick of South Bend, have joined Guided Missiles engineering staff of Bendix Products Division of Bendix Aviation Corporation, it was announced in South Bend, Ind. They are 1957 graduates of Rose Polytechnic Institute with a degree of bachelor of science in electrical engineering.

Both men will be participating in a $90,000,000-a-year engineering program which includes a technical staff of more than 10,000 in all divisions of Bendix. The program in-

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Schlieren photographs, above and left, illustrate different phases of airflow investigation. Development of inlets, compressors and turbines requires many such studies in cascade test rigs, subsonic or supersonic wind tunnels.
at Pratt & Whitney Aircraft
in the field of Aerodynamics

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

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

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

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

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.

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

World's foremost designer and builder of aircraft engines

PRATT & WHITNEY AIRCRAFT
Division of United Aircraft Corporation
EAST HARTFORD 8, CONNECTICUT
"Wait! Please wait! Don't let them take me away! Listen! I'm not crazy. Please listen to my story."

"He's obviously another psycho-path, but maybe we should humor him. He's harmless," observed the doctor.

The rest of the crowd, primarily reporters like myself, didn't say anything; but I feel sure they were all itching to hear his story. Why wouldn't they be? One of the greatest young mathematicians of the time, perhaps destined to be another Einstein, was suddenly affected with stories of little men from another world. The doctors first called it temporary insanity; now, after a month, it seemed to be permanent and today he was being committed to the Sunnyside Rest Home.

"Please listen to my story!" he pleaded. "I'm not crazy. Listen to me:"

"It's all right. It's all right," soothed the doctor. "We're all listening: now you can tell your story."

"Please believe me, gentlemen. I'll tell you the story just as it happened.

"It all began one Sunday morning about two months ago, the 16th of May, if I recall rightly. I awoke about seven, as I usually do. I had a small headache, but that wasn't so unusual, and I figured it would wear off. It didn't though!

"I felt terrible during church, and I was so groggy I fell asleep while the minister was preaching. I do remember he was giving one of his usual hellfire-and-brimstone sermons, to which I rarely listen anyway. I felt somewhat refreshed when he finally stopped and I could go outside. The headache didn't go away though, and at times I thought my head was splitting.

"I woke earlier than usual Monday morning, and I felt great. I still had a small trace of the headache, but the improvement overshadowed any pain which might have remained. I must have gotten used to the headache, for afterwards I noticed it only on rare occasions when I thought about it.

"This went on until Wednesday, the 26th of May. At breakfast I felt terrible. I was grochdy and hard to get along with at work; I even yelled at the project director. When I awoke the next morning feeling fine, I attributed my actions to a recurrence of the headache, although I hadn't noticed it at the time."

"Isn't it amazing what a headache can make you do?" chortled one reporter.

"Throughout the next week I noticed a slight tingling sensation in my skull, my wife noticed I was nervous, and my little girl asked me why I was so fidgety. Of course, I had no explanation."

"Then, Saturday, June 5, came. I was scheduled to work from eight until noon, but my head was vibrating so intensely I didn't even venture from bed. Instead of getting up, I turned over and tried to sleep. Tried was all—sleep was an impossibility with my head throbbing so wildly. The situation was somewhat relieved when I didn't think—when I just let my mind go blank. That was the turning point of the story."

"This . . . this . . . thing happened in phases all along. Think back over my story—the first phase was simply a bad headache; the second was a throbbing headache. After that comes the so-called impossible part of my story. But believe me, gentlemen, it isn't.

"After surrendering to the headache, that is, letting my mind go blank, I acted as though I were in a trance. At least that's what everyone with whom I came into contact said. During those next ten days—I guess you've noticed it came in ten day cycles—I was more at ease than I've ever been in my life. I had no worries, no cares of any kind. Life was a big game, and I had a box seat. I felt as though I were walking on air. That wonderful state of mind just couldn't last forever. On Tuesday, June 5, it ended. I can't describe the feeling that came over me that day. It seemed as though all infinity was confined in my head. No!—that doesn't say what I want to say. I don't have the words in my vocabulary to describe it.

"Then something happened. I don't know what it was. I was snapped out of the trance; I could think for myself, which was something I hadn't done for ten days. Still I had that stupendous feeling, even though I could think. Then, I began to dawn upon the awful and horrible truth."

"Who are you? I thought. Nothing happened. Again my mind issued the thought, 'Who are you?' No answer. 'I know you are here, you might as well tell me what and who you are.'"

"I am — of — (no possible English translation)," it said, or rather thought. This gave me little satisfaction, since I only understood three small words of its speech. 'Please explain,' I thought. 'Why,' thought the thing, 'think, think deep;"
Sure we want you...

IF you show potential for success in your field

IF you're anxious to increase your skills and knowledge

IF you can co-operate with others to get a job done

IF you want to do what's expected of you — and more

Union Carbide's engineers and scientists are among the best in industry—and we need top engineering and science graduates to move up with them as Union Carbide expands.

Nuclear energy, extremes of heat, cold, pressure, and vacuum—Union Carbide people work with these basic tools over the entire scale of the physical sciences.

Union Carbide people extend the frontiers of science through teamwork—yet, since technical teams are small, you can achieve individual recognition early in your career.

Union Carbide people like their work, and consistently do more than is expected of them. They develop new products at the rate of two a month—and the rate is accelerating.

ENGINEERS—SCIENTISTS

Do you fit the bill? If so, we'd like to hear from you. There's a place for you at Union Carbide, helping to shape the future in alloys, carbons, chemicals, gases, plastics, or nuclear energy.

We have important openings for liberal arts and business school graduates as well.

Representatives of Divisions of Union Carbide Corporation, listed at right, will be interviewing on many campuses. Check your placement director, or write to the Division representative. For general information, write to V. O. Davis, 30 East 42nd St., New York 17, N. Y.
May we suggest the following titles for your holiday reading. (Even if this article appears late, these are books that are worthwhile reading at any time of the year.)

The Bible.

Bishop, James.

The Day Christ Died.

Davenport, Russell.

The Dignity of Man.

Dickens, Charles.

Christmas Stories.

Ditzen, Lowell.

You Are Never Alone.

Ferris, Theodore.

The Story of Jesus.

Fosdick, Harry.

The Man From Nazareth.

Komroff, Manuel.

Jesus Through the Centuries.

Schoen, Max.

The Man Jesus Was.

Sheen, Fulton J.

Life Is Worth Living, 1st, 2nd and 4th series.

In connection with Mr. Louis Fischer’s convocation address this Fall, we ordered copies of his more important books for the library. At the present time we have received the following titles.

Gandhi and Stalin. A compact book that states the facts of the Russian problem, analyzes them, and sets down a program.

Life of Mahatma Gandhi. In this long, full biography based on a variety of sources, published books and articles, unpublished letters, documents, official files, and personal interviews, Mr. Fischer has attempted to show us how greatness took hold of this little man and made him one of the world’s most striking personalities.

Russia Revisited. This is the account of the author’s return visit to Russia in recent years.

Soviets in World Affairs. A history of the relations between the Soviet Union and the rest of the world during the years 1917-1929.

This Is Our World. This is a report on our world today giving an enlightening and hopeful picture of our present condition. It helps the reader to see the world as a whole, to look back and learn how and why we have arrived where we are, and to look ahead to see where we are going.

NEW BOOKS

A Treasury of Sports Cartoons, edited by Lawrence Lariar.

Some of the nation’s outstanding cartoonists take sly pokes at most of the nation’s favorite pastimes in this mammoth collection of more than 250 sports cartoons Golf, track, tennis, football, baseball, wrestling, hunting and fishing, skiing—none escape the sharply pointed pens of such satirists as Virgil Partch, Stan Fine, Ross, Ned Hilton and Pascal.

The Gentleman from Indiana, by Booth Tarkington.

This delightful volume, sparkling with the warm humor and deep understanding and using the Indiana settings that were Tarkington trademarks, includes three of his novels—Alice Adams, The Magnificent Ambersons and Penrod; seven short stories—“The One-Hundred-Dollar Bill”, “Mary Smith”, “Dolling”, “Mrs. Protheroe”, “Mrs. Dodge, Mrs. Cromwell and Mrs. Roderick Battle”, “Great Men’s Sons”, and “Stella Crozier”; and entertaining excerpts from Gentle Julia, Seventeen, and Little Orvie.

DEW Line, by Richard Morenus.

DEW Line is the story of the three-thousand-mile Distant Early Warning line—America’s electronic Paul Revere. Spanning the northernmost reaches of the North American Continent, it stands as an impregnable radar fence against large-scale attack across North Polar regions by enemy long-range bombers and fighter planes. This is the dramatic account of how the almost impossible task of building this final link in the 10,000-mile warning loop around our country was accomplished.

Racing Sports Cars, by Louis Klementaski and Michael Frostick.

The authors have traced the development of the racing sports car as we know it today. Then by means of a series of unique photographs showing the individual techniques and styles of the most brilliant drivers in action in a variety of British and Continental sports cars, they show how the problems of high-speed control and cornering are mastered. From pit management and control to signalling and driving in the wet is covered in the informal text which accompanies the pictures.

American Painting, by Alexander Eliot.

For the first time the masterworks of America’s painters have been assembled in a continuing story that reflects the full sweep of American life and thought. The 250 carefully selected illustrations clearly demonstrate the stature that American painting has achieved.

Men and Politics. An autobiographical account of the world of the 20’s and 30’s by a man who had an unique opportunity of observing first hand the developments of that period.
INDIANAPOLIS, IND.: (Special) Hundreds of engineers and technicians, applying their academic training first hand, have designed, developed and produced the Allison Model 501 Prop-jet engine and Aeroproducts Turbo-propeller (above) shown in a test cell at the mammoth Allison plants in Indianapolis. These General Motors experts have produced an engine which develops nearly 2.3-horsepower per pound of engine weight. Already in use with Air Force Troop Carrier Wings in the U. S. and abroad, Allison Prop-jet engines and Aeroproducts Turbo-propellers will power America's first Prop-jet commercial airliner, the ultra-modern Lockheed Electra.

Working shoulder to shoulder with propulsion system experts, newly graduated engineers are assuring their futures by carving a niche for themselves on the General Motors team of today. If you would like to know more about this team, write Personnel Department, College Relations, Allison Division of General Motors Corporation, Indianapolis, Indiana.
It is a well-known principle that the chief goal of an engineering curriculum is to teach a man how to solve hard problems. Most engineers measure their ability by the difficulty of the problems they can solve, and point with pride to the tough jobs they have completed. But tougher than any other problem the engineer must solve is an everyday problem he must work on constantly—how to get more done in less time.

Perhaps the biggest difference between men who are even moderately successful and those who advance but little lies in the efficient use of time. Time is the secret of success. The successful man knows how to wisely use both his own time and the time of other people. The engineer who can solve difficult problems will go far, but the engineer who can solve problems just as difficult in less time will go further.

The young engineer must first learn to use his own time well. I once asked a moderately successful businessman this foolish question, “How do you get time to do all the things you do?” He looked at me genially and then said softly, “Son, I never get time to do anything, I take time. If you ever want to get anything done in this world, you must take time to do it.”

This resolution is the first step in the solution of the problem of using your time wisely. Start by determining that you are going to control the time God has given you, and not let it control you. The big step is deciding to do.

The next question is—do what? It is commendable that a person should intend to use his time wisely, but to make this intention produce results he must decide specifically what he can do to make every second count.

Find something to do to use every minute to its utmost; this is the second step in the solution of the problem of using your time wisely. Saving time in this way requires concentrated effort, but must be done. Practice and perseverance will make the job easier.

For example, you can learn to do several routine tasks simultaneously rather than one by one. A study of professional men will reveal that the most successful are those who can do more than one thing at a time. Sir Winston Churchill occasionally amazed his visitors by reading his mail and talking on the telephone about a totally unrelated subject at the same time. This was not a natural talent. It had to be developed. Churchill and many other successful men have practiced doing two things at once until they were proficient at it. Saying five or ten minutes a day by doing two things at once does not seem like much until one contemplates how much total time this saves during a man’s lifetime. The saving of time by methods like this may also seem rather unconventional, but it is well to remember that those who get ahead are seldom conventional people.

The most successful men of industry are those who are not only adept at saving their own time, but also adept at saving the time of other people. Henry Ford was always seeking ways to conserve the time of his workers—for profitable motives, of course. One of his suppliers once became curious why Ford had specified that there should be tolerances on the distances between the screw holes of the crates containing the accessories he was shipping Ford. When the supplier visited Ford’s plant he found “the great tinkerer’s” men mounting the disassembled crating as running boards on Model T’s. The screw holes in the crating lined up perfectly with previously drilled holes in Model T running board braces.

The ability to get a great deal done in a short amount of time is one of the marks of a successful man, especially if he is an engineer; an aspiring young engineer must accomplish this difficult task. The key to success is time—the engineer’s toughest problem.
In almost the twinkling of an eye, electronics handles calculations that would take any person days of work.

The newest — and largest — electronic “brain” (more accurately, electronic data processing system) is Bizmac, developed by RCA.

Bizmac is quickly becoming one of the most powerful allies of business and industry. It “reads,” sorts, catalogs, analyzes, calculates, forecasts—reduces months of paper work to seconds—cuts costs by millions!

For insurance companies, Bizmac can keep its finger on millions of facts daily. It can help department stores keep split-second inventory control. And for the U. S. Army, it keeps track of literally billions of ordnance parts all over the world.

The leadership in electronic research that made Bizmac possible is inherent in all RCA products and services—to help make life fuller, easier, safer through “Electronics for Living.”

WHERE TO, MR. ENGINEER? RCA offers careers in research, development, design, and manufacturing for engineers with Bachelor or advanced degrees in E. E., M. E. or Physics. For full information, write to: Mr. Robert Haklisch, Manager, College Relations, Radio Corporation of America, Camden 2, N. J.
Westinghouse scientists have climaxed an intensive search that promises significant improvements in electrical equipment performance and operating costs. With this new alloy, Cubex®, metal crystals are aligned in ice-cube fashion so that magnetism flows readily in four directions instead of two... actually turns corners with markedly less resistance.

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

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

This work on magnetism is only one of the many interesting jobs engineers and scientists at Westinghouse are engaged in all the time. Other fields include:
- Atomic Power
- Automation
- Jet-Age Metals
- Chemistry
- Radar
- Semiconductors
- Electronics
- Large Power Equipment
- Guided Missile Controls
- and dozens of others.
Laboratories. Dr. Wiener got his B.S. in 1943 from University of Wisconsin. In 1953 he earned his Ph.D. at University of Pittsburgh while working at Westinghouse and studying on tuition-free Graduate Study Program.

**BREAK THROUGH MAGNETIC BARRIER:**

*cube-oriented alloy*

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

**Westinghouse**

*FIRST WITH THE FUTURE*
question is not a comparison of educational communities, but the more significant comparison of free institutions with authoritarian systems of European countries differ quite markedly from that of our own, both in methods and in objective. In most European countries, only a very small percentage of the population is regarded as having sufficient potential to justify professional training, and the selectivity exercised is extremely rigorous. Our school and college system, on the other hand, contemplates the education at college level of a very substantial fraction of our population. Today, one boy or girl out of three goes to college and it is clear that percentage will increase rapidly in the years to come.

We have dedicated ourselves to the doctrine that education is one of the necessities of life. As we regard the process, the objective is not merely one of filling the ranks of the professions, but more importantly to create for a large segment of our population an understanding of the literature, philosophy, history and science forming the foundation of our culture. This is the ideal which has brought into being our enormous educational establishment with its hundreds of universities, hundreds of normal schools, and its long and honored roster of liberal arts colleges.

We might say that the primary function of our educational institution is to spread before our young people the entire array of human knowledge in sufficient detail to permit each young man and woman to choose freely the career to which they wish to devote their lives, and to make their best contribution to that career. On this premise, if young people enter our educational institutions in sufficient numbers, we can safely rely on the laws of probability and the inherent variability of human aspirations to provide us with competence in all vocations and professions.

It is certainly true that the events of the past few weeks emphasize the need for re-examining our facilities for scientific and technical education. It is evident that we shall need more scientists, and more particularly better scientists, if we are to maintain our place in a scientific world. There are many sound ways in which we can move in this direction without departing from basic principle. We can give our children better career guidance; we can improve teaching competence in the scientific area; we can provide motivation for the many talented high school graduates who do not now attend college. All of these are natural processes and will surely produce results. The ultimate choice of a career must, however, remain free. We cannot expect to convert potential writers, historians, or businessmen into creative workers in scientific laboratories. Such a move would add little to the progress of science, while impoverishing all other areas of human activity.

There is, moreover, the same basic interdependence between all intellectual pursuits as there is between the scientific disciplines. I have long felt that an understanding of science should be just as important an element in one’s cultural equipment as English or philosophy or music. Conversely, a scientist will be a better scientist if he has an appreciation of the humanities, literature, and the arts. This requires the educational process to be diverse as well as specific—in short, to have as many facets as there are divisions of human knowledge. If we do the job well, we will have scientists in sufficient numbers and with sufficient competence to maintain a vigorous, dynamic society, without interference with other vocations.

And so we must meet our need for scientists by broadening and intensifying our efforts in behalf of all education, just as we must meet our need for astrophysicists and rocketeers by advancing the cause of all science. We need to improve the standards of our entire educational system, from kindergarten upward, and, most particularly, in the secondary schools.

There are many things which we, as individuals, must resolve to do: To take, as the President has suggested, a more personal interest in our schools. We must improve the incentives of our teachers. We must, as individuals, assume a larger share of the cost of education than we have done, for too many have been content to rely upon endowments, subsidies, and philanthropy to pay costs which were properly those of the student and his parents.

The largest and most critical job to be assayed, however, is that which has its being in our national attitudes. At this time when we are confronted with achievements which, to our shock and dismay, are not our own, it is a temptation to marshal our forces and undertake spectacular enterprises designed to recapture our reputation before the world. I sincerely hope that no scientific chauvinism will lead us down ill-considered pathways toward goals which may be more glitter than gold. Startling as the Soviet accomplishments in outer space have been, they represent, quite clearly, a concentration of effort, manpower, and brains on a single objective, achieved through the detriment of almost every other element of their society. We should not be provoked into similar patterns.

The new emphasis on science, if wisely administered and made applicable to all of our scientific resources, can produce important and far-reaching benefits. Employing, as it does, a new emphasis on education, I think the same premise may be expected with respect to our whole educational system. For as we can improve our standards and embellish our performance in every area of human affairs, we will meet our present responsibilities in science and elsewhere. At the same time, we will fulfill in greater measure than ever before the more important responsibilities we hold to posterity and to the future.
THE HEADACHE
(Continued from Page 26)

you know who you are. Think.'

'Suddenly I did know who they were—they were little men who needed my help and knowledge to conquer our civilization. They were inhabitants of the fifth dimension. They had no physical self, only a mental self. They had chosen me to give them the information they needed. Then they would control other minds and help man destroy himself. I was the vital link in the conquest—or non-conquest—of man. I wondered how I knew this.'

'You wonder how you know this information about us. We have been in direct mental contact with you for the past ten days; and consequently all of your knowledge is now ours, and all of ours is now yours. Naturally you comprehend only a small part of our knowledge.'

'Why the headache?' I asked. 'It is our only way of starting contact with humans. We increased the headache and changed types to force you to release your powers of perception and thereby to allow us to take over,' he said.

'Why the ten-day cycle?' I asked. 'Only for your benefit. There is no time in our existence. It was merely convenient to establish a certain time for the change of conditions.'

A reporter in front jumped up and said, "Come on. We've heard enough. Of all the crackpots I've ever heard, he takes the cake."
The reporters got up and filed out.

"What a nut," said one.
"You said it," commented another.
"Wait! Please wait. There's more—they told me more. Vital things about mankind and its survival. Wait!"

It may surprise you, but down deep I'm really soft-hearted. I stayed and listened to the guy's tall tale. He told me about his conversation with the fifth-dimension men—about how to cure man's diseases, conquer his human enemies, and even conquer his "fifth-dimension" enemies. He tried to explain the fifth-dimension. He said that the fifth dimension is the lack of the four we know—width, length, depth, and time. But he elaborated most on our dangers from the little men. He said to watch out for headaches. Ha! In my book it boils down to this: he's nuts.

All that appeared in my paper the next day about the incident was a small piece reading: Rest Home, Sunnyview. Committed—Dr. John M. Jeffries, former mathematician and research scientist; psychopathic ward.

That ended the affair as far as I was concerned.

I woke up the following morning about seven o'clock. It was a bright, sunny morning. I had a small headache when I awoke, but it would wear off. Funny, that reminds me of that crackpot at Sunnyview. What a character! What a crazy story about headaches! This one will wear off . . . .or will it?

What about you? Did you wake up with a headache?
ALUMNI NEWS

(Continued from Page 23)

cludes new developments in such fields as: aviation, electronics, guided missiles, aviation and automotive components, television and many others.

COLUMBUS, OHIO—Opportunities for engineers in the electric utility industry and the means of increasing and improving them will be explored during a two day meeting of Ohio electric utility company representatives and university engineering professors from a five state area at the Deshler-Hilton Hotel here on December 2 and 3.

The conference meeting is sponsored by The Ohio Electric Utility Institute, an association of the eight investor-owned utility companies in Ohio. The Institute has invited as guests of the electric utility industry chairmen of electrical and mechanical engineering departments and placement officers of universities and colleges in Ohio, Kentucky, Indiana, Michigan and Pennsylvania.

The principal speaker for the industry will be John K. Davis, executive vice president of The Toledo Edison Company, who addressed the conference on Monday evening, December 2. Dean Gordon B. Carson of the College of Engineering of Ohio State University will present the university and college point of view at a morning session on December 3.

A feature of the program will be a panel discussion by four young engineers, reciting their experiences and opportunities in the electric utility industry following their graduation from engineering schools. Moderator of the panel will be Earl Huck, Director of Research and Training of The Cincinnati Gas & Electric Company.

Panel participants will be Richard Tubbesing, The Dayton Power and Light Company; Thomas E. Trusler, Ohio Edison Company, Akron; John J. Sisler, Ohio Power Company, Canton; Paul V. Connell, Jr., The Cincinnati Gas & Electric Company.

A series of group discussions on various aspects of the electric utility industry of interest to engineers is to follow the panel discussion.

Ralph M. Besse, executive vice president of The Cleveland Electric Illuminating Company, and President of the Institute, is to preside at the conference and to summarize conclusions and opinions offered during the two day meeting.

Utility company representatives and their university guests are to be welcomed to Columbus by Frank H. Streit, Production Manager of the Columbus and Southern Ohio Electric Company.

Messrs. James B. Matthews, Darrell E. Criss, and Harold L. Newport represented Rose at the conference.

The Danforth Foundation, an educational foundation located in St. Louis, Missouri, invites applications for the seventh class (1958) of Danforth Graduate Fellows from college senior men and recent graduates who are preparing themselves for a career of college teaching, and are planning to enter graduate school in September, 1958, for their first year of graduate study. The Foundation welcomes applicants from the areas of Natural and Biological Sciences, Social Sciences, Humanities and all fields of specialization to be found in the undergraduate college.

President F. L. Wilkinson, Jr. has named Prof. I. P. Hooper as the Liaison Officer to nominate to the Danforth Foundation two or not to exceed three candidates for these 1958 fellowships. These appointments are fundamentally "a relationship of encouragement" throughout the years of graduate study, carrying a promise of financial aid within prescribed conditions as there may be need. The maximum annual grant for single Fellows is $100 plus tuition and fees charged to all graduate students; for married Fellow, $240 plus tuition and fees charged to all graduate students with an additional stipend of $350 for children. Students with or (Continued on Page 46)

(Continued from Page 46)

President Eisenhower sets the cornerstone of the new AEC Headquarters building near Germantown, Maryland. Participants are (left to right) John A. Derry, AEC, Director of Construction and Supply, Representative Carl T. Durham, Chairman, Joint Committee on Atomic Energy, Congress of the United States, and Lewis L. Strauss, Chairman of the U. S. Atomic Energy Commission. The dedication ceremony took place November 8, 1957. Mr. Derry is an alumnus of Rose; class of 1928.
"They all agree..."

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

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

"Not only that, but the aircraft industry is noted for its good salaries. Generous benefits, too. And advancement in both salary and position is limited only by how far I want to go."

Unlimited opportunities, high salaries, company-paid benefits unheard of until a few years ago — these are only a few of the reasons why so many young engineers with a keen eye to the future are choosing the aircraft industry.

It is only natural that many engineering graduates should consider joining Northrop Aircraft, Inc., because the company shares its many successes with every member of its engineering and scientific team. Advanced projects at Northrop are now in production, and active top-priority projects mean rapid advancement and success for the individual engineer.

Such projects include the famous Snark SM-62, world's first intercontinental guided missile, now being activated in the first United States Air Force missile squadron; the USAF T-38 supersonic twin-jet advanced trainer; and other important missile and manned aircraft weapon systems and components.

Engineers in more than thirty categories contribute to Northrop's success in an ideal environment with the latest tools of science, in its new Engineering Science Center. Here you will work with leading scientists and engineers who respect, acknowledge, and reward your individual ideas and abilities.

Why not write us now... regardless of your class at college. Ask us how you might best gain a career with Northrop. Write to Manager of Engineering Industrial Relations, Northrop Division, Northrop Aircraft, Inc., 1033 East Broadway, Hawthorne, California.
determining the setting of the instrument. Knobs can be deceptive, but one can see at a glance whether a button has been pushed or has not been pushed.

Another first is the optional use of an automatic temperature adjustment control. The Zeromatic can be used in conjunction with the Beckman 19096 Thermo-Compensator if desired. This eliminates the additional fumbling which is necessary to keep the instrument manually corrected for temperature variations in the sample.

The new Zeromatic PH meter.

The Zeromatic has terminals for attaching either a potentiometer-type recorder on a current-type recorder. The records are very convenient for plotting titration curves. Furthermore the instrument gives a far sharper end point and more accurate end point than the use of indicators, all of which change color over a fairly wide PH range.

The Zeromatic derives its name from the fact that its amplifier provides an automatic zero standardization once each second. The meter is accurate to within 0.1 of a PH unit, and readings can be reproduced to within 0.02 of a PH unit. Accuracy is increased by a mirror reflector placed on the meter in order to eliminate parallax errors. Older type PH meters in this price range have not, as a rule, been sufficiently accurate to warrant this innovation.

This PH meter will be available for student use, and before long some of the Rose Ch.F.'s. should have some first-hand knowledge of its operation.

BORON

(Continued from Page 20)

took two years to build at a cost of around $20 million.

One of the most exciting uses for boron is in the new high energy fuels. This fact has been capitalized upon by several gasoline companies who have greatly increased sales by advertising the use of boron compound additives in motor fuel.

The basis for boron fuels is the high energy potential of hydrogen. Hydrogen itself, in liquid form, when combined with a suitable oxidizing agent, such as liquid oxygen, white fuming nitric acid, or ozone, would be theoretically one of the most powerful chemical rocket fuels possible. But hydrogen is too light, and consequently too bulky to use as rocket fuel. This is where boron comes in. Boron, next to lithium, is the lightest element with which hydrogen can combine. It forms hydrides with relatively high hydrogen content. Some of these are diborane (B₂H₆), pentaborane B₅H₅, and decaborane (B₁₀H₁₄). Another advantage is the fact that boron itself releases 25,000 Btu per pound when burned. Thus the combining of boron hydrides with an oxidizing agent releases the tremendous energy of the hydrogen, plus the added boost from the boron itself. This makes for a "super" fuel, or as the Navy puts it, a "zip" fuel. These fuels could replace existing hydrocarbon fuels for jet engines with up to 40 per cent greater efficiency than the existing standard fuel, JP-4.

All is not as rosy as it sounds on the "zip" fuel program, however. There are several disadvantages to be considered. The compounds are very costly, costing from several hundred to several thousand dollars per pound. They are difficult to make and low yields are the rule. The compounds are not too dangerous to handle from an explosive standpoint, but they are quite toxic. Several companies have been working quite extensively on "ironing the bugs" out of boron fuels, and it is hoped that they may be more nearly perfected in the near future.

ME WRONG

(Continued from Page 22)
as, "What do women know about baseball?"") I was gaining ground until she answered this question by pitching a few dishes my way. After retreating into the bathroom, which has a very strong lock, she cooled-off and it was again peaceful (we didn't speak to each other for two weeks).

Meanwhile, things were not going well at work. People simply refused to accept my ideas. Most of the trouble could be layed at the feet of my boss, who couldn't see farther than the end of his nose. It is really trying to work for a man who has less intelligence than yourself. I'm not saying he was stupid, but he always rejected my ideas in favor of his own. It was pure prejudice.

With the Braves winning the Worlds Series, life became impossible at home this last year. I was beginning to crack-up. There was only one way out. Get ahead of or on an even level with my boss. To accomplish this, an interview was arranged with the vice-president, a man who had a reputation for fair dealings.

After shouting my plans for the company at him, I retired confident that my point had been won. He didn't disagree did he? Of course not, I had been too persuasive. The decision given me the following day was almost as distasteful as the Braves. Apparently I was fighting savages on all sides. Oh well, I could find another job; men with my ability don't stand still for long.

But I haven't found another job. Times are hard. Still that was no reason for Jane to leave; she left the day after they repossessed the TV. To think those damn Braves were more important than me. They can all go-fly-a-kite. Stupid people! Why must I associate with them? Perhaps I'll become a hermit. They will say I cracked-up; maybe I have already cracked-up. If so, it's all their fault, because as you have surely seen, I don't make mistakes. I am always right.

THE ROSE TECHNIC
What is an AGE engineer?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

American Gas and Electric Service Corporation, 30 Church Street, New York 8, N. Y. • Ohio Power Company, 301-315 Cleveland Avenue, S.W., Canton 3, Ohio • Indiana & Michigan Electric Company, 2101 Spy Run Avenue, Fort Wayne 1, Indiana • Kentucky Power Company, 15th Street and Carter Avenue, Ashland, Kentucky • Wheeling Electric Company, Wheeling, West Virginia Appalachian Electric Power Company, 40 Franklin Road, Roanoke 9, Virginia

AMERICAN GAS AND ELECTRIC SYSTEM

DECEMBER, 1957 Page 39
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<td>The Sophs, headed by President Bill Brummet, won the basketball game, the first event, 35-29, only after a grueling fourth quarter in which the Freshmen connected with 13 points while the Sophs made 6. During the first two quarters the game was nip and tuck; the second quarter ending 15-12, Soph's favor. In the third quarter, the Sophs succeeded in getting quite a lead and went into the fourth period ahead, 29-15. The Frosch threw in a tough team the fourth quarter and succeeded in gaining many of the lost points back. The time ran out on them, though, with the score 29-35 in favor of the Sophomores.</td>
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<th>MEN</th>
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<td>Give her a Corsage</td>
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<th>HEINL'S FLOWER SHOP</th>
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<td>WILLIAM C. “Bill” BECKER</td>
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<td>129 So. 7th St.</td>
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<td>rodes in a sealed cell containing a solution of potassium hydroxide as the electrolyte. Hydrogen and oxygen enter the cell through the hollow electrodes, and diffuse through the porous carbon to the surface, where they come in contact with the electrolyte. At the hydrogen electrode, the electrochemical reaction with the potassium hydroxide produces water and releases an electron that enters the electrical circuit. The electron flows through the external circuit, and returns to the cell at the oxygen electrode, where in the electrochemical reaction of the oxygen and the electrolyte, the electron is accepted. Ionic conductivity through the electrolyte completes the electrical circuit.</td>
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A concentric tube design has also been developed, in which one electrode tube nestsles within the other, with the electrolyte in between. The tubes are simply made long enough to give the proper cell volume for the current desired.

The inherent advantages of the fuel cell make it an ideal source of silent electrical power in remote locations where conventional fuel or water power are not available. Military communications systems, mobile power units, and stand-by power plants are but a few of the expected applications.

Another possible future use of the fuel cell in connection with the utilization of both solar and nuclear energy. One of the problems in harnessing the energy of the sun is the storage of power. During sunny periods, the energy of the sun could be used to decompose water into hydrogen and oxygen, for later use in fuel cells. Nuclear energy is known to decompose water, and in the present nuclear plants in which the reactor serves only as a source of heat in the conventional steam cycle, efforts have to be made to prevent this decomposition. Perhaps it will work the other way, with nuclear energy directly producing hydrogen and oxygen for fuel cell operation.

Page 40
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December, 1957
FRATERNITY NOTES
(Continued from Page 21)

Wonders will never cease. A whole month has gone by and no one has given up his pin. Perhaps we are running out of eligible men. A pin is a rare item in the house these days.

Robert Hall

Theta Xi

The TX Tigers now have a mascot to inspire them to even greater achievements. He is, appropriately enough, a stuffed tiger who reclines on the mantle in the living room. His influence seems to have already been felt, for the Tigers' interfraternity basketball team has won its first two games, defeating Sigma Nu 45 to 37, and Lambda Chi Alpha, 54 to 44. Great job, mascot, keep us in there fightin'!

Each semester the brothers elect new officers. Elections were held last week with the following results:

President Ken Hollingsworth
Vice-president John Jacobi
Treasurer Larry Wilson
Sr. House Manager Bob Ransford
Jr. House Manager Dan LaGatta
Secretary Dean Brown

Good luck, fellows, and may you fill your new offices as commendably as did your predecessors.

Brothers Blickham and Pierson have instructed me to tell of their recent trip to Chicago to attend the AIChe convention. They claim they had a most wonderful time.

Congratulations to Brother Blastic who recently surrendered his pin to Miss Carol Petty. It must have been quite a struggle—eh, Gene?

Brother Scholle confesses he is planning to exchange vows with Miss Diane Harritos over semester vacation. Lots of luck, Bob, she's a peach.

Speaking of love, etc., I understand Brother Leavitt got lonesome when his gal went to Logansport, so he moved in with Brother Irvin. Seems like Gary came out on the short end of the deal.

The Christmas Party is definitely set for Dec. 14th in the Rec Room. There will be dancing to records, singing of Christmas Carols, and various other entertainment. Gifts will be distributed by—guess who? Professor Tinker and spouse will chaperon the festivities. All the brothers are expectant of a most enjoyable evening.

FLASH! There is a rumor going around that Brother Bock is bringing a date to the Christmas Party! What happened, Bill? No birddogs allowed!

Well, it seems my supply of news is just about exhausted, as well as my pen pinky. So see you in the next Technic?

Eugene Amick

Sigma Nu

Christmas vacation is almost on us and all the snakes can hardly wait for the two “catching up” weeks to come. You know, those are the weeks in which you move all the books you took home with you from place to place—until it’s time to go back to school. Back to the parties, girls, books and the “watch the hand, it never leaves the wrist.”

In the sports world we of Sigma Nu are coming along in fine shape. We now have a tally of two won and one lost in round ball, and are now leading the Interfraternity league. This is due mainly to Brother's Kutrz, Crumb, Light and Neal. Brother's Brown, Onnen and Levene also are in there slithering the ball through the hoop. Looks like we have the spark to pick off the Basketball trophy again this year.

Another phase of sports seems to have hit us this winter. Somebody went to a bowling alley once, and came back to spread the news about this strange new game. Now the ten pins are flying every which way. There are almost enough bowling enthusiasts to start a house bowling league.

This Friday, one day prior to vacation, we are having an informal gathering and party with the Lambda Chi's. All snakes plan to be there, and it should prove to start out the vacation in fine shape. That's about all for this month, neophites, so I'll see you in next month's column.

Fred Ryker

Members of the Sigma Nu fraternity at the recent Virginia Military Institute Ball, held jointly with Alpha Tau Omega fraternity.
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You can grow faster in a company that supplies the basic needs of growth! Power, construction and manufacturing must grow to supply the needs of our population which is increasing at the rate of 50,000 per week. Allis-Chalmers is a major supplier of equipment in these basic industries.

But there's another factor of equal importance: Allis-Chalmers Graduate Training Course offers unusual opportunities for the young engineer to:

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Or, if you have decided your field of interest and are well qualified, opportunities exist for direct assignments on our engineering staff.

In any case—learn more about Allis-Chalmers. Ask the A-C manager in your territory, or write Allis-Chalmers, Graduate Training Section, Milwaukee 1, Wisconsin.
LOCKER RUMORS

(Continued from Page 14)

field. To seal the Engineers fate, Strickland, a Eureka forward, kept himself busy dropping in a total of 47 points from all over the floor. This one-man team hit an amazing 80 percent of his shots from the floor which caused the downfall of the Engineers' defeat with a score of 74 to 63. Gary Giffel was high for Rose with 16 points.

McKendree, the only team to beat last year's conference co-champions twice, faced this year's squad with the same team in a conference tilt. The first half proved fatal to Rose this game. The hot and cold Engineers could not get out of low gear and the halftime score was R.P.I. 27, McKendree 43. Led by Larry Berger's rebounding Rose matched the home team bucket for bucket and played its best of the season. Mike Smith copped scoring honors for Rose with a 17 point performance. The game ended with Rose still 16 points behind, 55-71.

The Engineers returned home December 20 to face Vincennes for the second half of the season. The visiting squad was no match for the Rose team, the first half ended with the score at the rest period 36-26, Rose. The Engineers then caught the familiar "second-half jitters" and Vincennes slowly closed the gap. What followed was a real thriller. The lead changed three times before James Sargent gathered six points to put Rose in front to stay. John Ray proved to be a big factor in R.P.I.'s third win by scoring 23 points and also leading the squad in rebounds. The final score was Rose 69, Vincennes 66.

The team is improving all the time and with some good backing from the student body could have another outstanding season. What do you say — let's all attend the home games.

INTRAMURAL BASKETBALL

The intramural basketball program has provided good competition for approximately 60 men. The league has six teams battling for the championship. At the beginning of Christmas vacation, the Seniors lead the league with a 3-0 record.

The battle for the All-Intramural Trophy goes on! The trophy will soon be ordered for all interested men to see. From all reports it should be worth the work expended to win the trophy. This trophy indicates to the winning unit that they are the best in an overall sports program. This is an honor that could be likened to the team trophy in a track meet; for it is given not to the team which excels in only a few sports, but to the team which excels in many sports.

The fraternity league has provided some exciting games as well as some routings. Theta Xi leads the league with a terrific 4-0 record. Sigma Nu is second with a 3-1 record, Lambda Chi, 1-3, and ATO, 0-4.

The intramural program has named three champions already this year. They are: Football-Seniors, Cross country-B.S.B. II, Fall tennis— Deming Hall.
Marquardt Means Opportunity

The Marquardt Aircraft Company was founded in November, 1944 to conduct research, development, and manufacturing operations in ramjet propulsion. From the beginning, the principle company objective was to establish and maintain a high level of competence in engineering.

Both because of the national need and the inclination and experience of the key people, Marquardt has continued to pioneer the development of products containing a high content of scientific and engineering newness. Prominent examples are the supersonic ramjet, providing cruise power for the Boeing Bomarc interceptor missile and the Lockheed X-7 Test Vehicle; ram air auxiliary power packages, on the Chance Vought F-8U and the Lockheed F-104A; thrust reversers; afterburners; and a wide range of ramjet and turbojet controls and accessories.

Since the technical areas available to a company specializing in advanced controls and propulsion work are numerous, you will find a broad range of engineering opportunities at Marquardt. Check your Placement Office for dates when Marquardt representatives will visit your school, or write Dock Black, Professional Personnel, Marquardt Aircraft Company, Van Nuys, California.

Roy E. Marquardt, 39, is the youngest chief executive officer in the aircraft engine business. A graduate of the California Institute of Technology, he was Director of Aeronautical Research at the University of Southern California prior to founding Marquardt Aircraft Co.
without financial need are invited to apply. A Danforth Fellow is allowed to carry other scholarship appointments, such as Rhodes, Fulbright, Woodrow Wilson, Marshall, etc., concurrently with his Danforth Fellowship, and applicants for these appointments are cordially invited to apply at the same time for a Danforth Fellowship.

All Danforth Fellows will participate in the annual Danforth Foundation Conference on Teaching, to be held at Camp Miniwaca in Michigan next September.

The qualifications of the candidates as listed in the announcement from the Foundation are: men of outstanding academic ability, personality congenial to the classroom, and integrity and character, including serious inquiry within the Christian tradition.

All applications, including the recommendations, must be completed by January 31, 1958. Any student wishing further information should get in touch with our Liaison Officer.

C. H. Huthins, Vice President and General Sales Manager, Wabash Fibre Box Company, Terre Haute, Indiana, has been elected a Director of the Fibre Box Association.

A native of Pawtucket, Rhode Island, Mr. Hutchins received his education at Rose Polytechnic Institute and was graduated from the U. S. Naval Academy in 1936. He resigned his commission in 1938 and joined the Sales Department of Wabash Fibre Box Company in 1938. In 1941 he re-entered the Navy as a Lieutenant (j.g.) and was released to inactive duty in 1946 as a Commander. He was made Vice President and Sales Manager of Wabash Fibre Box Company in 1946 and was made Vice President and General Sales Manager in 1956. Mr. Hutchins is a Director of the Wabash Fibre Box Company, the Indiana State Bank, the Country Club of Terre Haute and the Indiana Manufacturers Association. He is a member of the Indianapolis Athletic Club, Bob O'Link Golf Club, Lake Shore Club, Clearing Club and Aero Club.

Mr. C. H. Huthins

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**ALUMNI NEWS**

*(Continued from Page 36)*

You can repair CONCRETE without chipping or priming, and without curing!

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Page 46
How to keep the world's biggest ripper ripping

The machine at right does a job that dynamite used to. Weighing 17 1/2 tons, it's the world's biggest ripper. In designing this monster, engineers faced a load problem. The axles of the steel drum wheels had to take tremendous shock loads as the machine ripped five foot furrows in solid rock strata. And they had to take the heavy radial and thrust loads of cross-country travel. To handle all the loads, the engineers mounted the wheels on Timken® tapered roller bearings.

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

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

Want to learn more about job opportunities?

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

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TAPERED ROLLER BEARINGS

December, 1957
"Ah wins."
"What you got?"
"Three eights and a pair of kings."
"No you don't, Ah wins."
"What you got?"
"Three sevens and a razor."
"So you does. How come you is so lucky?"

Following is an excerpt from a letter received in this office some days ago:

Dear Sir:

In the coming months, you'll be reading many job recruiting ads. We thought that you might need some help in wading through this maze of placementology or jobalony. Here are a few between-the-lines daffynitions to help you understand what these ads are all about:

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<th>TERM</th>
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<td>Many</td>
<td>opportunities—We need help.</td>
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<tr>
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<td>potential—Know how to write your name so that no one can read it.</td>
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<td>position—A title in lieu of a raise.</td>
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<td>problems—Now that we've made it, we don't know what to do with it.</td>
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<tr>
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Cultural and entertainment facilities—Movies and bars available.
Job interest—Good looking secretary.
Stimulating assignments—Office party.
Stable company—We lived through the depression.
Full quota of golfing, We're really running a country club; swimming, riding, etc.—manufacturing is just our hobby.

Two duck hunters were sitting behind their blind, one drinking from a thermos of coffee, the other from a jug of whiskey. After some hours of sipping they spotted a lone duck winging through the sky. Taking quick aim, the coffee drinker rose, let fire, and missed. The whiskey drinker rose, let fire and brought the bird down. His companion, properly amazed, complimented him on the shot. He replied, "Aw, it's nothing. I usually get five or six in a flock like that."

The young, inexperienced druggist was asked by a young lady for some cough medicine. Looking on the shelf, he could find none. "Please — cough — cough — you've got to do something—cough —cough — for — cough, cough—me."

So he gave her his own idea of a remedy. Soon the owner returned and asked how business was. He reported that he had just cured a woman's cough. "I gave her a malted with 4 oz. of mineral oil and 5 oz. of castor oil. She doesn't dare cough."

Finding her husband in a bar, she sampled the highball he was drinking and demanded, "How can you drink such horrible stuff?"
"See," said the husband, "and all the time you thought I was out having fun."

He rounded the bend at close to 40. A sudden skid and the car overturned. They found themselves sitting together, unhurt, alongside the completely smashed car. He put his arm around her waist.

"It's all very nice," she said, "but wouldn't it have been easier to run out of gas?"

Two glamour girls boarded a crowded street car, and one of them whispered to the other: "Watch me embarrass a seat from one of the men."

Pushing her way through the standees, she bore down on a gentleman who looked substantial and embarrassed.

"My deah Mr. Brown," she gushed, "fancy meeting you here." "Am I glad to see you—you're getting to be almost a stranger. Oh, am I tired!"

The sedate gent looked up at the girl he'd never seen before and as he arose, he said for all to hear, "Sit down, Berth my girl, we don't often see you out on wash day. No wonder you're tired. By the way, don't deliver the washing 'till Wednesday. My wife's going to the district attorney's office to see if she can get your husband out of jail."

Stolen By Bill Johnson, soph.

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

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

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

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

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

EASTMAN KODAK COMPANY, Rochester 4, N.Y.
Mr. Hill, what can I do to get the most out of my job interviews?

A. You know, we have the same question. I would recommend that you have some information on what the company does and why you contribute. I would recommend that you have some information on what the company does and why you contribute. I would recommend that you have some information on what the company does and why you contribute. I would recommend that you have some information on what the company does and why you contribute.

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

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

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

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

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

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

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

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

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

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

Q. How do military commitments affect your recruiting?

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

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