In This Issue

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It is men and women working together to provide new and better materials that gives full meaning to Union Carbide. And the people of Union Carbide, backed by 128,000 stockholders, will go on bringing you the necessities and conveniences that will help keep our standard of living the highest in the world.

Periodic Chart ©Welch—Chicago

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Learn more about the products of Union Carbide and its work in atomic energy. Visit the science exhibit at 270 Park Avenue, New York, or write for booklet “The Exciting Universe of Union Carbide.” Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. In Canada, Union Carbide Canada Limited, Toronto.

...a hand in things to come
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IMPORTANT DEVELOPMENTS AT JPL...

PIONEERING IN SPACE RESEARCH

The Jet Propulsion Laboratory has been assigned responsibility for the Nation's program of unmanned lunar, planetary, and interplanetary exploration. The objectives of this program are to contribute to mankind's fundamental knowledge of space and the space environment and to contribute to the development of the technology of space exploration. For the next ten years, as larger booster vehicles become available, increasingly versatile spacecraft payloads will be developed.

JPL will conduct the missions, utilizing these spacecraft to orbit and land on the moon, to probe interplanetary space, and to orbit and land on the near and far planets. Earliest of these spacecraft will be the "Ranger" series now being designed, developed and tested at JPL. The mission of this particular series will include first, exploration of the environment and later the landing of instrumented capsules on the moon.

Never before has such a wide vista of opportunity, or a greater incentive been open to men trained in all fields of modern science and engineering. Every day at JPL new problems arise, new theories are advanced, new methods tested, new materials used and new principles discovered. This creates a stimulating work atmosphere for trained individuals and an unlimited field for constructive development of a long-range and rewarding career. Wouldn't you like to take part in it?

Illustrated is a "Ranger" proof-test model undergoing design verification testing in one of the laboratories at JPL. Here design features are tested and proved, operational procedures developed and handling experience gained for the actual construction of the initial flight spacecraft. These spacecraft will be among the earliest pioneers in the development of space science.

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Are We Overworked?

Perhaps one of the most frustrating problems in this modern day and age is that of acquiring sufficient time to accomplish one's daily tasks in a twenty-four-hour period. Yet, there doesn't seem to be much hope for putting more hours in a day, so self-discipline and efficient management of time seem to be the only solutions.

Quite often students here at Rose tend to feel they are being overworked in some of their courses. Admittedly, Rose Poly is not an easy college from which to graduate. If it were, why should we bother to attend? High standards are necessities for progress in any field of endeavor.

Requiring each individual to discipline himself and work out his study schedule teaches many valuable lessons not obtained by merely attending lectures. Contrary to popular belief, the amount of mental work an individual can do very seldom depends on his physical characteristics, but on his ability to discipline himself to the tasks before him. Too many of us waste a large percentage of our study time thinking about unrelated subjects or feeling sorry for ourselves because we seemingly have so much to do. We are not overworked—we are merely inefficient and poorly disciplined. We are content to lean back in our chairs and complain about everything in general, but we fail to realize that we are contributing very little to remedy the situation. This applies not only to that supposedly “unfair” test that we didn't prepare for well enough, to the fact that “everyone else” doesn't support the basketball team.

The first step to the solution is to realize that we are solely responsible for our actions—the education we receive depends on us alone. This is not to imply that extra-curricular activities should be eliminated. Conversely, they should increase considerably. Random or abstract thought has its place—but not during study hours. It is indeed unfortunate that every individual cannot be pushed to his mental capacity and be forced to discipline himself; the reward of such labor would be beyond imagination. However, cruel as it may seem, self-discipline must be achieved individually.

I.C.C.
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PEOPLE INVOLVED IN BROADCAST AND AMATEUR RADIO TELL ME THAT THIS COMPANY MAKES EQUIPMENT THAT'S... UH... 

THEY ARE ALSO LEADERS IN MISSILE ELECTRONICS AND SPACE EXPLORATION. THEY WERE FIRST TO BOUNCE VOICES, TELETYPING, WIREPHOTOS, AND I DON'T KNOW WHAT ALL, OFF THE ECHO SATELLITE.

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Ever since October 1957, when Sputnik I was first launched by the Russians, there has been confusion over the use of the words "science," "scientists" and "engineers." The confusion in the press has spread even to those who are vitally affected, the practicing scientists and the practicing engineers. It is further compounded by the fact that many persons who are educated as scientists are actually performing engineering functions in their work.

A good engineer, today, must be most proficient in the scientific disciplines of chemistry, physics and mathematics. The extent of his knowledge must be comparable to that of the scientist himself. In addition, the engineer has as his ultimate objective the production of a particular machine, device, or process which is useful to man.

The difference between a scientist and an engineer becomes apparent from the objectives of their work. The scientist's primary interest is uncovering the laws of nature for the sake of the knowledge gained without any other objectives. As soon as the scientist narrows his activities to the production of a specific device, process, or machine, he then becomes a scientist engaged in an engineering project.

From an educational standpoint, today's students must possess a better grasp of the basic sciences than was the case just a few short years ago. This is true whether the undergraduate major happens to be one of the branches of engineering or whether the undergraduate major is in one of the basic science fields. Any student who plans to make his career in research and development should plan to continue his formal education through at least the Master of Science Degree and, if he is going into basic research or fundamental design, he should plan to go on to the Doctorate. Likewise, the man who starts in engineering with a Bachelor's Degree in any other field than research and development must, either formally or informally, continue to study or become technically obsolete in a few short years.

In short, we are learning today that unemployment is an inverse function of knowledge. The more unemployment, the less knowledge the people have.

This is the time of year when the Freshmen will be asked to select their majors for the next three years at Rose. Each man should select his major on the basis of what he believes his future course will be. The decision, fortunately, is not critical because the facts show that less than half of the practicing engineers are operating in the particular specialty in which they majored as undergraduates. A good undergraduate record in whatever is selected is more important than the particular field of specialization.

RALPH A. MORGEN
President
PART V: PERSONNEL RELATIONS

by J. W. DREHER
Manager, Personnel Administration
Military Systems Section
Defense Systems Department
General Electric Company
“OBSERVATIONS OF SUCCESS” is a series of eight articles written by outstanding alumni of Rose—men who are truly giants in their fields—to describe for you the nature of their particular field of engineering, the elements of their college training which were most helpful to them, and the traits of their personalities which were invaluable to their success. The fields of engineering to be discussed in later issues in addition to Personnel Relations will be Sales, Research, Design, Production, Executive Management, Teaching, and Purchasing.

Because ultimate job satisfaction cannot be obtained unless the philosophy of the man parallels that of the organization for which he works, it would be well to consider the values which these authors attach to things as evidenced in their writing in the thinking that precedes your selection of a field of engineering.

This momentous series will represent the most current, the most broad, and the most highly authoritative opinion available on any college campus of activities emanating from Engineering.

In one of his poems, Robert Burns wrote:

"Man’s inhumanity to man
Makes countless thousands
mourn."

It has been the somewhat belated recognition of this fact that has generated the development of personnel relations functions in businesses today. But real emphasis on the establishment of this area of work did not take place until the last thirty or forty years. The growth of organized labor, labor problems, and federal and state laws on employment spurned initial developments. Subsequent personnel research by industry, labor, and other organizations has fostered many innovations. Contributing significantly to this growth has been the recognition by industry of the need to make greater use of human resources and to improve relationships between management and the employee.

Although it has not quite achieved the status of other functional areas of today’s business organization (i.e., manufacturing and sales), the personnel relations function has developed in stature commendably. The well-being of the employee on his job and his opportunity to develop and grow are a must if any industrial organization is to remain competitive.

The relations area, known by a variety of names from company to company, includes, at least, the following general elements of work:

Benefit Programs — Concerned with the establishment of realistic hospitalization, pension, vacation, insurance, savings, and an ever-increasing number of programs which provide for the well-being of the employee and his family.

Education—Concerned with the development and execution of training programs to provide basic skills and to provide for self-improvement in the skilled or professional areas.

Employment — Concerned with recruiting, placement, transfers, and promotions of employees and the establishment and maintenance of personnel records.

Safety — Concerned with providing a safe environment for the employee to work.

Salary and Wage — Concerned with the establishment of defined jobs and positions, their evaluation and proper compensation. Equally important is the concern for the establishment and execution of adequate performance appraisal systems upon which proper individual compensation is based.

Union Relations — Concerned primarily with the negotiations and executions of contracts between organized labor and management. The resolution of grievances is an extremely important element of this work.

The description following each of the work elements offers a brief review of the work that is involved. Every industrial employee will be affected some way by each of these elements with the possible exception of union relations. Very few engineers who have by education and/or performance achieved professional status are associated with unions. Many of those who have been in the past have voted to release themselves from union ties in the last year.

A review of the work elements demonstrates quite clearly that a straight forward engineering education provides the engineering graduate with few, if any, qualifications for personnel relations work. True, the logical approach to problem solving that is instilled in every engineering student is an asset, but a straight forward approach does not always provide the solution to personnel problems. The two areas where an engineering education is most desirable are those involving personnel or professional development, especially as applied to engineering and scientific types, and professional recruiting. It is more desirable, and sometimes an absolute necessity, in the former.

A sizeable share of relations work is handled within the relations organization, itself, but much is also put into practice through management channels. Policies and procedures developed by the relations organization guide the supervisor in his day-to-day contacts with his employees. Assisting management, through advice and counsel, in solving troublesome personnel problems, is an equally important activity.

The size of the company will have a great deal to do with the manner in which the work elements are distributed. In a very small firm, the owner and/or manager may, of necessity, have the entire responsibility for them. Larger firms will require specialists in any or all of the aforementioned elements.

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The United Services Organization (USO), a recipient of United Fund contributions, performs a vital defense function in supplying morale-boosting entertainment to overseas units of the Armed Forces. Professional entertainment such as small bands, singers, and solo entertainers is constantly being supplied to otherwise forgotten servicemen. This worthy function seems to come to the eye of the general public only when “big stars” announce their intentions to “entertain the boys overseas.” However, the call is heeded more often by less illustrious people hoping to offer the stalwarts of our freedom a new face, a new personality, and an attentive ear. Whereas many of the groups of entertainers come more or less on their own, some of them represent the colleges from which they originate.

Four years ago, the USO instituted a program whereby college drama groups tour various defense areas presenting cultural entertainment displaying the theatrical and dramatic arts. Colleges are chosen by a panel of USO officials which considers the standards and accomplishments of the drama departments of the colleges which make application.

During the summer of 1960 it was my pleasure to take part in this program while accompanying the St. Mary-of-the-Woods Players of St. Mary-of-the-Woods College, Terre Haute, Indiana. Our assigned area is known as the Northeast Air Command and included five Air Force bases and one Naval base in Greenland, Labrador, Newfoundland and Iceland. For the nine women and five men in the company, the tour began with one week of final rehearsal at Immaculata Junior College in Washington, D.C. then five weeks of actual performance in the Northeast Air Command.

Thule, which is a Greek word meaning the most northerly region in the world, is an Air Force base lying on the edge of the ever-present Greenland ice cap 900 miles south of the North Pole. In this barren land on the shore of an often ice-packed sea the only variation the airmen can depend upon is the change from 24 hours of sunlight per day in the summer to total darkness during the winter. Living conditions at Thule are more unlike those we enjoy in the States than those of any other base we visited. However, this is necessary due to the weather conditions of this extremely arid region.

From the serviceman’s point of view, the main detraction from serving at Thule is the fact that families are not allowed. This makes entertainment such as the play, “I Remember Mama,” which we presented, even more appreciated.

The acceptance of our group at Thule was beyond our fondest hopes. Advance publicity had the base teeming with the news that the first real live cat, a member of our company, ever to explore the cold desolation of the northern outpost was soon to arrive. At the termination of each performance we invited everyone interested back stage and response to these invitations was very encouraging. We had a policy of frequenting the three social clubs,
the Officers’ Club, the NCO Club, and the Airmens’ Club, and engaging ourselves in conversation with the men. At the same time the airmen seemed to have a policy of going to the clubs and associating with the girls. This left the rest of us with plenty of time to investigate the technologies of an air defense base.

We often received invitations to review various establishments in the vicinity of the base. During our second full day at Thule we were invited aboard the Westwind, an icebreaker operated by the United States Coast Guard, for refreshments as well as a guided tour. Toward the end of our stay at Thule we were taken a few miles south to Camp Tuto, a small Army outpost which serves as the Army Polar Research and Development Center. It is from this post that operations are planned to maintain Camp Century, the “City under the Ice” in the middle of the Greenland ice cap.

Thule Air Force Base played host to the St. Mary-of-the-Woods Players for five days in which time we gave four performances and innumerable personal appearances on radio and at various gatherings on the base. Living on this base with its nearly unique pump-handle plumbing is an experience one could hardly imagine.

Greenland is actually a Danish colony so each base had its Danish settlement nearby. Sondrestrom, an Air Force base 3 1/2 air hours due south of Thule, provided a very modern Danish culture that captivated all of us immediately. The Danes of the area operated a modern hotel for passengers which offered the tourist a varied assortment of handmade Danish goods.

Sondrestrom had the first vegetation we had seen since leaving the States. Although the area is very rocky (the base is surrounded on three sides by huge rock mountains) grassy stubble does grow around the deep blue fresh water lake that supplies the base. This area also abounds in caribou so one of our many keepsakes was a caribou antler.

Service and appreciation were also the keynotes at Sondrestrom as the welcome mat was prevalent from the time we arrived until our departure. The base vicinity housed a group of 200 engineers who were working on radar sites within a one-hundred fifty mile radius of the base. A few of these engineers built a grill one afternoon and invited us over for steaks. Then on our final day at Sondrestrom we viewed an Army port and also the beautiful Royal Yacht of Denmark which was to take the king and queen along the western coast of Greenland to visit the small Danish settlements.

We spent four full days at Sondrestrom and gave two performances as well as a half hour television show before winging toward Labrador.

Goose Bay, Labrador, is deep-set in the wilderness of the Canadian northeast; when you approach by air, the base appears as a dot in a forest of green. It is the first base we attended where families were allowed and the first one where plentiful water became scarce. It offered our first and only opportunity to view a radar site in operation. Goose, as it was called, was the first base where we could enjoy night (night being that invigorating time before which the sun goes down and after which the sun comes up). Although Goose did not display the striking plainness of Thule or the striking beauty we were to find in Newfoundland, it had, as did all the bases, its own peculiarities which made it interesting in itself and in-

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In the near future the United States may undergo a complete renovation of its power industry with the installation of atomic power plants and the development of the fuel cell. Imagine that some day our steam turbine and hydroelectric generating plants will become obsolete. These energy sources are nearing their maximum levels of efficiency, and we must be thinking in terms of new energy concepts. For example, in the case of the steam turbine generator, the most efficient method of producing electricity known to date, only 40% of the chemical energy in the coal is transformed into electrical energy. At least 60% of the energy content of coal is lost through combustion, friction, and thermodynamic decreases. Some new system is needed which bypasses the intermediate stages and converts directly from chemical to electrical energy; such a device is the fuel cell.

The fuel cell is not a new idea. As early as 1839 Sir William Grove of England invented a chemical battery which combined hydrogen and oxygen to produce water and electrical energy. About 1890 chemists Ludwig Mond and Carl Langer improved upon Grove's device and called it a fuel cell. However, the dynamo, just coming into its own in the late nineteenth century, provided the quicker means of getting electricity to the public. As a result, the fuel cell was ignored; major research on the fuel cell was not resumed until after World War II.

By definition, a fuel cell is a device which converts chemical energy into a direct electric current. A voltaic cell or battery might be classified as a fuel cell, but these use expensive fuels, such as mercury, zinc, lead, and the like. Supposedly, a true fuel cell should use a basic fuel, such as coal, natural gas, or crude oil. The fuel cell theoretically should be 100% efficient. Actual efficiencies of 75% have been realized. It might be worthwhile to investigate several specific fuel cells and their individual characteristics.

To date, the most consistent fuel cell has been the hydrogen oxygen, or Hydrox unit. In this process, hydrogen and oxygen are combined by electrolysis in reverse to form water and release electrical energy. The cell consists of two porous electrodes separated by and electrolyte, and either concentrated sodium hydroxide or potassium hydroxide. The electrodes may be porous carbon covered with a catalytic agent, such as palladium or platinum in the hydrogen electrode and cobalt oxide, platinum or silver in the oxygen electrode. A thin film of paraffin prevents water from flooding the pores. Electrodes are arranged in concentric cylinders or adjacent plates in order to speed the reaction. Hydrogen enters the cell at one terminal, oxygen at the other. At the hydrogen terminal, hydrogen diffuses throughout the electrode and is converted into hydrogen ions aided by a catalyst. The hydrogen ions in turn react with hydroxyl ions (OH-) in the electrolyte to form water and release electrons. Electrons in turn accumulate in the electrode, making it the negative terminal; water molecules formed go into solution.

If the two electrodes are then connected by an external circuit, the electrons will flow to the opposite electrode and initiate the oxygen half of the cycle. On this positive side of the cell, oxygen diffuses into the electrode and, again aided by a catalyst, reacts with water and the electrons to form the hydroxyl ion. The cycle is completed when the hydroxyl ions go into solution and migrate to the hydrogen electrode. If the external circuit is open, the hydrogen electrode cannot get rid of its excess electrons. These electrons attract positively-charged potassium or sodium ions, which form a barrier around the electrode and prevent any further reaction. When the external circuit is hooked up, these electrical ion layers provide the potential to force the electrons through the circuit.

An important consideration in determining the efficiency of the Hydrox is the amount of external resistance. With high external resistance the reaction releases most all of the energy as electricity; very little is lost as heat. Nevertheless, there must be some internal heat loss expended as energy to force chemical reactions over the barrier of the activation energies of the reaction inside the cell. Now as the external resistance decreases, the
current increases and more energy must be consumed in overcoming the energy barriers. If the external resistance equals zero, the reaction occurs so quickly as to be almost exclusively a combustion, releases only heat, and does little or no work. Other energy is lost in transporting hydroxyl ions, in compressing gas molecules into the pocus electrodes, and in overcoming internal resistance of the cell. Until these difficulties can be remedied, the Hydrox unit will not be over 75% efficient.

Although the low temperature Hydrox cell has been shown to be workable, hydrogen is expensive and the cell is too bulky, producing only one kilowatt-hour per cubic foot. One way to increase its output with little additional sacrifice in size or weight is to operate it at higher temperature and pressure. Operating at temperatures up to 250°C and pressures up to 800 psi., the recently developed Bacon cell utilizes its own waste heat to maintain the temperature of the cell. Named after Francis Bacon of the University of Cambridge, the Bacon cell is a hydrogen-oxygen cell containing two circular, porous, nickel electrodes approximately 1/16 inch thick, and a 40% potassium hydroxide solution occupies only a two millimeter thick space between electrodes. The cell is closed so that hydrogen and oxygen can be forced into the large pores under pressure. The smaller pores permit the see-page of electrolyte, bringing it into reaction with the gas. Already the Bacon cell has delivered an astounding 150 watt-hours per pound and six times as much power per cubic foot as any low temperature cell. Sustaining an internal pressure of 400 psi., the plates are expected to last indefinitely. Altogether comprising forty cells in series, the Bacon cell is a compact unit of dimensions 24x18x15 inches. While the Bacon cell is larger than a storage battery, it delivers ten times as much power per pound. Depending upon the load, the efficiency of the Bacon cell approaches 60% for high resistance loads.

For production on a large scale, the Hydrox generator would be uneconomical. A fuel cell using cheap fuels and air for the exidizing agent would be more suitable for use in a power plant. Processes using these agents would require temperatures exceeding 500°C. and a molten electrolyte, preferable a carbonate of sodium or potassium tempered with lithium carbonate. The fuel need not be combined directly with oxygen but might first be combined directly with oxygen but might first be cracked into hydrogen and carbon monoxide. In the actual electrochemical reaction, hydrogen and carbon monoxide are piped into the negative electrode. They react with carbonate ions in the electrolyte to produce carbon dioxide and water and emit electrons, which flow through the external circuit to the positive electrode. Air or oxygen, whichever the case may be, absorbs electrons at the positive electrode and forms carbonate ions to replenish the solution. Finally, the migration of carbonate ions from the positive to negative electrodes completes the cycle. There exists one drawback, however. High temperature cells perform very poorly at present.

(Continued on Page 31)
The "Science of the Stars"

ASTRONOMY

In the previous selection we initiated a discussion of our neighbors in the Solar System that, for reasons of space, was limited to Mercury, Venus, Mars, and the Asteroids. In this issue we shall complete the discussion of the Solar System by discussing the aspects of Jupiter, Saturn, Uranus, Neptune, Pluto. This issue will complete the discussion of nearby objects and next time we shall begin to delve into "deep space."

JUPITER—THE GIANT PLANET

Jupiter is the largest planet and is more massive than all of the others combined. In our skies, Jupiter appears brighter than any other planet with, perhaps, the exception of Venus and sometimes Mars. The mean distance of Jupiter from the Sun is approximately five times that of the earth and it revolves around the sun in a period of twelve years, making an eastward path through one constellation of the zodiac. The banded discs and four main satellites of Jupiter are visible through a small telescope. In fact, under favorable conditions, the author has observed this phenomena with the aid of powerful binoculars. Viewed with a large telescope, Jupiter exhibits a variety of changing detail and color in its cloudy atmosphere. Brown bands parallel to the planet's equator appear on a yellowish background. The banded structure is associated with the rapid rotation. Jupiter's period of rotation, less than ten hours, is the shortest for all the principal planets; the speed of the rotation at the equator exceeds 25,000 miles per hour. Irregular cloud markings and bright and dark spots break the continuity of the bands. Some are short-lived and change noticeably from day to day, suggesting considerable turbulence beneath the cloud levels. Other spots persist for a very long time. Especially remarkable in this respect is the Great Red Spot, which has been visible for at least a century. This appears in Figure 1 in the upper left-hand corner. This elliptical brick-red spot has been as long as 30,000 miles and drifts about like a solid floating in a near liquid lower atmosphere.

By observation, we have been able to determine the atmosphere of Jupiter. Radiometric measures show that the temperature above the cloud levels is -130°C, so that water vapor cannot be present. The spectrum analysis of the planet discloses that molecular bands near infrared absorbed by methane and ammonia gas are the most predominant. Methane remains gaseous at this low temperature, and ammonia gas freezes at -78°C. This constituent must be present in the clouds in crystal form, similar to the ice crystals to be found in our own cirrus clouds.

The amount of the bulging of Jupiter's equator provides one clue to conditions in the interior. With its swift rotation the planet would be even more oblate than it is observed if its mass were not highly concentrated toward its center. Other indications of what is hidden beneath the clouds are the low temperature and low average density of the whole planet, which requires very light material in the outer parts.

Jupiter's twelve known satellites are sharply divided into three groups; the inner satellites and the two groups of outer satellites. The inner satellites are the only to be discussed here since they are the only that will be likely to be encountered by the reader. The five inner satellites, revolving from west to east in orbits that are nearly circular and nearly in the plane of the planet's equator.

The first and second satellites are about as large as the moon, the third and fourth are fifty per cent greater in diameter; they are the largest of all satellites and are comparable in size to the planet Mercury. The fifth satellite varies from the others in its group due to its small size. Nearest of all to the planet and more difficult to observe on this account, it is the swiftest of all satellites, revolving at a rate of 100 miles a minute.

Fig. 1. Jupiter, showing Great Red Spot.
PART IV: THE SOLAR SYSTEM

By Jay Hirt, Sr. Math.

SATURN AND ITS RINGS
Saturn is the most distant of the bright planets from the sun and was the most remote planet known to early astronomers. At nearly twice the distance of Jupiter, it revolves around the sun in a period of 29.5 years. This planet ranks second to Jupiter in size, mass, and number of known satellites. Saturn has the least mean density and the greatest oblateness of any principal planet. It is unique in the possession of a system of rings that encircle the planet and make it one of the most impressive of celestial objects viewed with the telescope.

Saturn is encircled by three concentric rings in the plane of its equator. They are designated as the outer ring, the middle or bright ring, and the inner or crape ring. The rings are invisible to the unaided eye and were therefore unknown until after the invention of the telescope. The diameter of the entire ring system is 171,000 miles. Because they have nearly twice the diameter of Jupiter and are about twice as far from us, the rings appear to have the same diameter as that of Jupiter. Figure 2 shows the planet with its ring system.

The origin of the rings is associated with their nearness to the planet. According to a theory that was invoked in this respect long before the spectroscopic evidence was available, a solid ring so close to the planet would be shattered by the gravitational strain to which it would be subjected, whereas a ring of many small pieces would be reasonably stable. A liquid satellite of the same density as the planet would be broken into small fragments by the tide-raising force of the planet if its distance from the center of the planet is less than 2.4 times the planet’s radius.

All parts of Saturn’s rings are well within this critical distance, but the nearest satellite is safely outside. Because a stable satellite could not have formed at the distance of the ring, the ring must have formed directly as such. The mass of the ring system is not known from observation but may be similar to that of the innermost satellite of Saturn.

URANUS AND NEPTUNE
Uranus, the first planet to be discovered of the two, is barely visible to the naked eye. It revolves in a period of 84 years at 19 times the earth’s distance from the sun and rotates once in 10.75 hours, having its equator inclined nearly at right angles to the ecliptic. A major planet nearly 30,000 miles in diameter, it appears with the telescope as a small disk on which markings are not clearly discernible. The spectrum shows dark bands of methane and also a broad absorption band in the near infrared, identified to be molecular hydrogen. This is the first direct evidence of hydrogen in the atmospheres of the major planets.

Uranus has five known satellites. The fifth, which is fainter and nearer the planet than the others, was discovered by Kuiper in 1948. Their nearly circular orbits are presented to the earth at various angles as the planet revolves; they were flatwise to us in 1945 and will appear edge-wise in 1966. The planet and its five satellites are shown in Figure 3.

Neptune has nearly the same size as Uranus and seems to resemble it closely in other respects. It revolves once in 165 years at a distance 30 times the earth’s distance from the sun, and it rotates from west to east once in 15.8 hours, according to the spectroscopic measures. Always invisible to the naked eye because it

(Continued on Page 32)
No, our shutter flapper has not gone in for illusion photography. There are no mirrors involved in photographing this twosome; they are our Miss Technics for February, Mary and Kathryn Farmer.

Mary and Kathryn are juniors at I.S.T.C.; they transferred from I.U. this year but are old-timers in Terre Haute, having graduated from Wiley High. In one short semester they have firmly established themselves in the doings at State. They are both Chi Omega pledges, both are members of the Dolphin Club and Canterbury Club, and both are majoring in Elementary Education. At first we were surprised that both girls were together in almost everything but then we discovered that it is almost necessary, as they have only one means of transportation. They both have to make do with one 1960 white Corvette.
Kathryn convertible . . . poor things.

Mary has brown eyes, is five feet two inches tall, and has a total of 47.67 kilograms of strategically located protoplasm.

Strangely enough, Kathryn also has brown eyes, is five foot two inches tall, and has a total of 47.67 kilograms of strategically located protoplasm.
What would **YOU** do as an engineer a

Development testing of liquid hydrogen-fueled rockets is carried out in specially built test stands like this at Pratt & Whitney Aircraft’s Florida Research and Development Center. Every phase of an experimental engine test may be controlled by engineers from a remote blockhouse (inset), with closed-circuit television providing a means for visual observation.
Regardless of your specialty, you would work in a favorable engineering atmosphere.

Back in 1925, when Pratt & Whitney Aircraft was designing and developing the first of its family of history-making powerplants, an attitude was born—a recognition that *engineering excellence* was the key to success.

That attitude, that recognition of the prime importance of technical superiority is still predominant at P&WA today.

The field, of course, is broader now, the challenge greater. No longer are the company's requirements confined to graduates with degrees in mechanical and aeronautical engineering. Pratt & Whitney Aircraft today is concerned with the development of all forms of flight propulsion systems for the aerospace medium—air breathing, rocket, nuclear and other advanced types. Some are entirely new in concept. To carry out analytical, design, experimental or materials engineering assignments, men with degrees in mechanical, aeronautical, electrical, chemical and nuclear engineering are needed, along with those holding degrees in physics, chemistry and metallurgy.

Specifically, what would you do?—your own engineering talent provides the best answer. And Pratt & Whitney Aircraft provides the atmosphere in which that talent can flourish.

For further information regarding an engineering career at Pratt & Whitney Aircraft, consult your college placement officer or write to Mr. R. P. Azinger, Engineering Department, Pratt & Whitney Aircraft, East Hartford 8, Connecticut.
Electronic Highway System

An electronic highway system capable of performing any of the ordinary driving functions has recently been demonstrated at RCA’s David Sarnoff Research Center at Princeton, New Jersey. Utilizing the latest and most advanced concepts of electronics and automotive engineering, this automatic vehicle control apparatus is expected to increase driving safety and convenience and extend our traffic handling capacity manyfold.

During the actual test, three automobiles were used; one was conventionally driven, and the other two were equipped with a radio receiving device and Unicontrol system, combining steering, acceleration, and braking into a “single stick” control. As the conventional car pulled onto a closed, quarter-mile asphalt circuit, the two remaining, specially-equipped vehicles with no one at the wheel were set in motion behind it. The two trailing automobiles mimicked the lead car in every respect, their ghost drivers performing flawlessly.

Embedded within the concrete pavement are (1) successive, car-length, rectangular wire loops, (2) a continuous, guidance cable in the center of the road, and (3) a chain of transistorized detector circuits along the road shoulder, each connected to one of the rectangular loops. A small current is passed through both the guidance cable and the loops. When a car passes over a loop, there is an increase in the magnetic field surrounding the wire, caused by the metal of the automobile. The corresponding transistor unit detects this changing field and transforms it into an electric impulse, which may turn on a light or activate a warning signal behind the vehicle. Meanwhile, a strong, steady signal in the center cable, at a frequency different from that in the loops, keeps the car on course.

As the three automobiles whizzed around the track, all of them were followed by a “flying tail” of lights and radio pulses, in other words, the three cars activated the detector circuits, thus, producing illumination at a distance of 200 feet behind each car and generating radio pulses in the loops to the rear. With this arrangement, the highway is suitable for use by either conventional or electronically equipped automobiles. Under conditions of poor visibility, the conspicuous trail of moving light constitutes a warning to approaching drivers of conventional cars. On the other hand, one need not worry about weather conditions with an electronically equipped car. The radio receiver senses the trail of radio pulses from the preceding car and automatically applies the brakes in order to maintain a safe distance from it. In addition to regulating the power steering mechanism to keep the car on course, the guidance cable can also be used to relay pertinent information via radio to drivers on the electronic highway.

Certain elements of the system are presently in use to count vehicles, measure their speed, and to space traffic flow. One particular installation is planned to determine the timing of a traffic light in Nebraska; another is contemplated to “trip” a traffic light in New Jersey. Practically the entire system of loops and detectors is in use at National Aviation Facilities Experimental Center in Atlantic City, New Jersey, to observe and route the movement of aircraft on the ground. While there are still imperfections to be ironed out, the system has adequately demonstrated its “technical feasibility.” Before the new sys-
tem becomes a reality, highway and traffic authorities must first decide in favor of its adoption. Costs are of primary consideration but are difficult to determine at this time. Obviously, an urban freeway requiring many access roads and overpasses would be more costly to build than the same freeway in an outlying area. Nevertheless, it is estimated that installation of the electronic control in a new expressway would increase the cost of construction by the per cent, or approximately $100,000 per mile. Likewise, private motorists might have to dole out $100 to $1000 for installation of the automatic control in their automobiles.

**Aerosol Silicone Rubber**
A liquid, room temperature vulcanizing (RTV), silicone rubber has been marketed in aerosol spray cans by General Electric Products Division. Just a thin coating of this substance on electronic assemblies or molded plastic parts, where therfal, shock absorbant, or non-conductive coatings are desired, will provide heat resistance from $-65^\circ$ F. to $600^\circ$ F. and corrosion resistance to most solvents and to ozone. After it becomes cured within a few hours, the silicone coating exhibits excellent bonding properties.

**High Resolution Camera**
A research camera, capable of reproducing the Bible on an area no greater than one-fourth square centimeter, smaller than the size of Lincoln’s head on a penny, has been invented by the National Bureau of Standards. Basically a “microscope in reverse,” the delicate camera projects 50,000 parallel lines per inch, equivalent to approximately two lines per micrometer. It is hoped that the gadget will develop some standard method for determining the resolving power of photographic materials.

**Optical Maser**
“Coherent” light, produced by the optical maser, or “laser,” will make possible long distance communication by light waves. Signifying “light amplification by stimulated emission of radiation,” the “laser” has been cultivated by Hughes Aircraft Company. Excited atoms of a synthetic ruby crystal actually generate the intense ray, said to be “brighter than the sun.” This single-frequency light wave is so directional as to focus on an area less than one mile in diameter at a distance of 100,000 miles. At the same range (Continued on Page 30)
The Civil War was the greatest test our country ever faced. Built of the heroism and endurance that were drawn from men and women of both sections by devotion to principles valued more than life itself, it was our most profound and tragic emotional experience.

BRUCE CATTON

On January 8, 1961, one day short of one hundred years after the first cannon was fired on the eve of the war between the states, the nation launched a commemoration of the fateful struggle — the Civil War.

To understand the centennial one must somehow understand the War. There is no quick way of saying what started it — slavery, economics or what ever — it should be realized that both sides were composed of Americans who were absolutely convinced of the rightness of their cause.

There will be a flood of Civil War books — novels, histories, etc. which could easily double the rate at which material has already been printed on the subject. We of the library looked through our collection on the subject and have the following to suggest:

The Coming of the Civil War
by Avery Craven

"Why did it happen?"

Here is an analysis of the Civil War which thoroughly rejects the picture of the South as united in 1860.

The author takes issue with the view that the Civil War was the product of discord over slavery and States Rights and shows that the real causes were far more complex.

A Stillness at Appomattox
by Bruce Catton

Winner of Pulitzer Prize in History for 1954.

This is the story of the last desperate, heartbreaking, cruel year of the Civil War, in the final volume of three on the Army of the Potomac.

"Everyone knew that there would be little glory in victory, little pity in defeat," and Mr. Catton takes the reader through the battles of the Wilderness, the Bloody Angle, and others to the truce at Appomattox. He makes Grant, Meade, Sheridan, and McClellan come alive in all their failings and triumphs and humaneness.

The Civil War at Sea
by Virgil Carrington Jones

Mr. Jones presents some of the most thrilling sea adventures that our country has ever experienced. This account draws the reader into the heart of events and provides him with a vivid picture of the daring and unsuccessful attempts to get provisions to Fort Sumter.

The Civil War at Sea is a narrative history of naval operations during the Civil War and the beginnings of the modern U. S. Navy.

The Road to Appomattox
by Bell Irvin Wiley

Professor Wiley sketches the course of the Confederacy's decline and reappraises the influences leading to its defeat.

Contained in The Road to Appomattox is a section devoted to Jefferson Davis, the elected President of the Confederate government.

The Copperheads in the Middle West
by Frank L. Klement

The story of opposition to Lincoln's administration in Illinois, Indiana, Ohio and other midwestern states has been one of the most misunderstood aspects of the Civil War. Modern historians have invariably looked on Copperheadism as a pro-southern and even treasonable movement — accepting as fact the Republican propaganda of the time.

Mr. Klement has re-examined the Copperhead movement in the upper Midwest and has come to some interesting conclusions on movements such as the Copperheads and others who made conservative protests against changes which the war was bringing to the United States.

Lincoln and the Civil War
by Courtlandt Canby

Mr. Canby has compiled selections from the "more important" works already published on this period, elaborating on the basic theme "that Lincoln and the Civil War are inseparable." It is Mr. Canby's belief that one has little meaning without the other, and for this reason his book focuses upon the war years, the years of Lincoln's presidency.

Lincoln and His Generals
by Harry Williams

This is not a military history of the Civil War, but the story of the top direction by the President. We see Lincoln as a war director, and how he steadily increased in stature until he stood above his generals.

(Continued on Page 30)
What's it take to make the right connection?

Plenty! Consider the problem. Western Electric manufactures the switching systems which connect some 60-million Bell telephones throughout the U. S. The average call over today's electromechanical system requires 420 relay operations. All together, this interconnecting equipment makes up the heart of what is, in effect, the world's largest machine.

That's where Western Electric and you come in. The switching equipment for this "machine" involves an enormous manufacturing job carried on by our plants throughout the country. Because of the size and service requirements involved, we require quality standards far exceeding those of ordinary manufacturing. The size of this job presents an unusual challenge to the engineer who may save the Bell System many thousands of dollars by even a small cost-reduction step.

While today's switching calls for a priority on engineering, tomorrow's will be even more exciting. For even now the revolutionary Electronic Central Office is under field trial and promises to remake the world of telephony. Future Western Electric engineers, working closely with their counterparts at Bell Telephone Laboratories, will concentrate heavily on developing manufacturing methods for this ECO equipment.

Your Western Electric assignments may cover many of our other responsibilities as the world's leading communications manufacturer. Perhaps you'll work on advances in microwave transmission, or even on satellite communications.

Joining Western Electric may well be your right connection.

Opportunities exist for electrical, mechanical, industrial, civil and chemical engineers, as well as physical science, liberal arts, and business majors. For more information, get your copy of "Western Electric and Your Career" from your Placement Officer. Or write College Relations, Room 6105, Western Electric Company, 195 Broadway, New York 7, N. Y. And be sure to arrange for a Western Electric interview when the Bell System recruiting team visits your campus.
Alpha Tau Omega

Congratulations to Jim Godwin for being awarded the National ATO Scholarship Award from Gamma Gamma chapter.

It seems that Dick Cordill, our Rush Chairman this year, has a pretty good line of talk. Because recently Dick was able to persuade Miss Lyndal Ludwig of Terre Haute to swallow his spiel and accept Dick’s fraternity pin. However, John "Waldo" Walden must have a better line as he recently induced Miss Judy Jensen, a Junior at Ball State Teachers College, to accept an engagement ring from "Waldo."

Ned Hannum decided it was about time to take a shower this year and presented his pin to Miss Mary Lou Leachman of Terre Haute. Miss Leachman is a Freshman at ISTC and is a member of the Gamma Phi Beta pledge class. Joe Snyder was able to coax Miss Judy Rader of Elnora, Indiana, into accepting his pin. Miss Rader is a junior voice major at ISTC and a member of the Alpha Omicron Sorority. Maybe Judy will teach Joe how to sing. Last, but not least, Bob "Cug" McCoige is pinned to Miss Jeanette Berger of Culver, Indiana. Miss Berger is a Sophomore at Indiana University and active in the Kappa Delta Sorority. "Cug" must have a long spiel since it’s a known fact he doesn’t have any looks.

The IF basketball picture isn’t too rosy for the ATO squad. The opening game found the Tau’s on the bottom end of a 33-28 score against Theta Xi. In the second tilt the team ran into a warm Signa Nu five and lost 45-29.

Scott Herrin

Lambda Chi Alpha

With finals and other end-of-semester worries out of the way, the brothers (those who were able) undertook some minor improvements around the old house. Everything from installing new sinks and tearing out walls to paint and fix-up projects was attempted over the welcomed vacation and (we have to say) finished in some fashion — some better — some worse.

The installation of the new sinks has caused quite a little controversy among the brothers. It seems each will be installed with a plaque — "Dedicated to Darby Ballantyne, House Manager ’59-’61. Slave Driver, Villain, Scotchman," in memory of all the pennies he filched.

One of the general fraternity Traveling Secretaries recently paid our zeta an official visit. Bill Shoppers was with us for three days during which he looked over the chapter, its officers and practices. We escaped with no major scars this time, but he did give us some new and beneficial suggestions.

Social life has been very interesting in the recent past. The AXΩ Penthouse with the Chi Omegas, a “come as you are called” party with the Sigma Kappa’s, and a “roaring 20’s mixer with the Zeta Taus were enjoyed by all.

It’s with a sad heart that we make the next announcement. Brother Richard Pike (the formerly well-known, well-liked, light-hearted “Piker”) has passed the point of no return. On January 28 Dick was wed to Miss Donna Pound. We’ve braced up to the loss and now realize that we are not losing a brother but gaining . . . oh well! Congratulations Dick and Donna.

Somewhat in this safe vein, congratulations are also in order for Mr. and Mrs. Gary Phipps. Mrs. Phipps gave birth to a girl, Deborah Lynn, on January 26. See Gary for the cigars.

Bill Nicewanger
Dave Dumford

Sigma Nu

Although the blessed event occurred a couple of months ago, I am happy to report that Tom and Barbara Hormuth had their second child, a girl, whom they named Beth Ann. Congratulations, Tom.

Among the vacation marriages was that of Wilbur Decker and Miss Mickey Perryman of Brazil. They were married January 31.

Sigma Nu is now in second place
in I-F basketball competition, with three wins and one loss. Coach Fred Morgan seems to be doing a fine job with the members of the team, who are: Dick Landenberger, Dick Shade, Gary Reynolds, Don Hurst, Alan Raquet, Mike Johnson, and Tom Hormuth.

It seems that I have failed to mention our social functions, of which Brent Lower, our social chairman, is very proud. This being the case, I would like to inform the alumni that we ARE upholding the tradition, and have had mixers with St. Mary's, Gamma Phi Beta, Delta Gamma, and Chi Omega, with a couple of date parties thrown in.

Two of our brothers recently came into “prominence” so to speak. Dick Landenberger, famous world traveler, gave a convocation on his trip to Europe last summer, and Rod Herrick is now Co-Editor of the Explorer.

Bob Carter

Theta Xi

Kappa Chapter’s new officers for the spring semester are: Jim Malone, President; George McLellan, Vice-President; Chuck DeWeese, Treasurer; Steve Kern, Senior House Manager; Vic Risch, Junior House Manager; Lynn Roberts, Secretary; and Bob Brown, Scholarship Chairman.

Harold P. Davison, Executive Secretary of Theta Xi, has announced that he will visit Kappa in the near future. Since there are, at present, twenty-three men living in the house and by coincidence, twenty-three beds, there is some conjecture about with whom Brother Davison will sleep.

Coach Larry Cunningham’s TX Tigers are currently undefeated in I-F basketball competition. This year’s squad will be seeking a fourth consecutive championship for Theta Xi.

Congratulations to Brother Vern Gross, whose engagement to Miss Linda Hawkins, of Olney, Illinois, was announced recently.

In connection with the contemporary editorial policy of this column, we would like to discuss a grave problem of long-standing at Rose. To wit: the grade report sheets.

Although there has been much controversy concerning the contents of these innocuous-looking little slips, there has been little or no criticism of the physical shortcomings of the sheets themselves. We devoutly believe that the slips possess several inherent faults which, although grave, could be easily corrected.

The physical drawbacks are:

1. The sickly bile color — the shade is not only reminiscent of intestinal queasiness, it actually promotes acid indigestion. Have you noticed how many become sick from one glance?

2. The size — they are too small for the fabrication or aerodynamically stable paper airplanes, too large for effective spitballs. (That is to say, spitballs with devastating fire power.)

3. They are indigestible.

4. The texture of paper is far too rough to make the sheet a satisfactory bathroom accessory.

5. Low tensile strength — the sheet tears too readily, often resulting in incomplete release of pent-up emotions.

6. They possess a high degree of toxicity for United States postal officials. This drawback can be easily recognized by the snail-like pace with which they travel through the mail. (Did you receive your semester grade slip this vacation? We didn’t.)

We humbly offer the following solution. Make the slips of edible, high tensile strength, Scott tissue (the gentle pink color of soothing Pepto-Bismol). The sheets should be 8 x 11, perforated into segments of convenient spitball size. The tissue itself should be scented with special “Postman Aphrodisiac No. 5” by Chanel.

Having again displayed our willingness to crusade for worthwhile collegiate reforms, we remain, Don Niedringhaus and Bob McCardle
The Royal Yacht of Denmark

U.S.O. ON THE GO
(Continued from Page 13)

Interesting as a part of a whole.

Since Goose allowed families of the servicemen to live there, our purpose on the tour was somewhat altered or, at least, made more difficult to accomplish. Our main objective, of course, was to entertain the personnel by an enjoyable presentation of "I Remember Mama." With the influx of children into the audience we were faced with presenting to them a play not designed for them. Also, the need for outsiders to associate with the servicemen was not nearly as widespread. These are two situations we encountered from this time on except at the base in Iceland; however, we never ceased to meet interesting people or to be accepted with the same vigor and anticipation.

It was my idea to bring a safety razor on the tour realizing water would be available everywhere whereas a power failure might prevent use of electricity. As it happened, a power failure never occurred but Goose, built on the bay it was named for, with a superabundant, visible water reservoir, encountered a break in a water main which created havoc for the "safety-minded" gents.

Our mobility, due to the fact that we carried all necessities for the play in four cases, allowed us to perform at otherwise inaccessible locations. One of these was a radar site known as Pine Tree. Pine Tree sits high above Goose and some five miles from it and is manned by about one-hundred fifty men. The auditorium where we performed seated eighty and least of all filled our needs; costume changes were nearly impossible, and staging was entirely unprepared. For me, the Pine Tree performance was the most interesting of the entire tour.

We were in Goose Bay four days and gave four performances, our heaviest schedule during the entire tour, before making the short hop to Newfoundland.

Ernest Harmon Air Force Base, located on the southwestern shores of Newfoundland near Stephenville, did not have the uniqueness that the previous bases had displayed. Living conditions were entirely "stateside" and women and children were prevalent everywhere. A supermarket serves the families and a golf course entertains the "duffers." Various forms of recreational facilities were put at our disposal, all resulting in an immediate air of Canadian vacationland encompassing our group for the seven days of our stay.

Keflavik, the Air Force base in Iceland, is absolutely the balmiest, cloudiest section of the world I've ever visited. It did not rain so much but we were constantly dodging puddles of water as we jogged down the half-paved sidewalks. If the sun shown while we were there, I missed it. But actually this gave a lot of color to an otherwise drab contour. There are no trees in Iceland and no grass to speak of. Lava-flows covered most of the land in the southwestern section; therefore, the greenery that we appreciate so much in America is no part of the Icelandic landscape. The pale blue cast of the rolling clouds on the distant mountains and the rocky terrain do much to satisfy this dearth. In the few cities of Iceland, the buildings displaying bright pastels on the rooftops and colorful stucco walls contrast marvellously with these foul-weather clouds.

Iceland showed a culture that had signs of being not as primitive as their roads or various other public facilities. The women were general-
A Precise Language?

THEORY OF WRITTEN ENGLISH

By Prof. A. R. Schmidt
Department of Mathematics

One characteristic of our modern society (not just in education circles) is the underlying principle that, being a democratic society\(^{(1)}\), all things are properly decided by a majority — or at least by the more vocal segment of society who make so much noise they sound like a majority. That is, there are no absolutes except for the measure “everybody’s doing it.”

Thus with things moving so rapidly as they are, it just isn’t possible to keep abreast of the latest without some sort of guide-book to help make progress more nearly within the grasp of everyone\(^{(2)}\). So it is in recognition of a need for a guide to written English that the following easy-to-learn-in-your-spare-time rules are offered. Before commencing, we must give credit where credit is due—all that is contained in this guide has been learned by over ten years of reading test papers and of talking with students, so none of this is original.

One axiom must be accepted at the outset, for without this there would be only hopeless confusion since English is impossible anyway. So—

AXIOM 1. There are no rules for written English.\(^{(3)}\)

As in all good postulational developments, an axiom must be followed by other axioms, definitions, and/or conclusions. So:

DEFINITION 1. A good piece of writing is one which nobody is sure of your meaning. (This is a reasonable definition on the basis of the ten-year survey.)

AXIOM 2. All words are interchangeable, without regard to meaning.

DEFINITION 2. A dead language is one which nobody\(^{(4)}\) understands the meaning of.

CONCLUSION 1. English is a dead language.

Verification of conclusion 1 can be accomplished by asking the following questions:

i) How do the words each, every, any, some, and all differ in meaning?

ii) What is a thesaurus — Roget’s, for example?

iii) What is meant by that classic “unfinished” sentence in the Bible, namely “God is.”?

One of the more popular rationalizations given for tolerating or even accepting slovenly language habits is that “the purpose of language is the conveyance of thought.” One may well ask “From whom to whom?”\(^{(5)}\). Unfortunately, proponents of this convenient line of reasoning overlook the vast wealth of necessary and useful information already written by deceased thinkers. So if language is to be governed only by the majority opinion at any one time, how can the work and writings of our predecessors be meaningful to us?

(Pardon the preceding departure from axiom 1—it was just a bit of sentimentality for a dead past that comes from the old age of this author, So, ON WITH PROGRESS!)\(^{(5)}\)

AXIOM 3. Always make certain no single meaning (if any) can be derived from a written statement.\(^{(5)}\)

AXIOM 4. Symbols of punctuation occur every so often.

No discussion of axiom 4 is necessary since test papers reek with sufficient empirical evidence to convince any Thomas.

AXIOM 5. Axiom 1 notwithstanding, words r spelled the wa u think th sound.

There are many more axioms and definitions in the making again this year. The embryonic-stage is sometimes referred to as “high-school jargonese”; the pupal-stage is found in college freshmen who are not yet certain; and the polished form is

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\(^{(1)}\)because for many years, Republicans have had smaller families.

\(^{(2)}\)who has his feet propped on an ottoman in front of the TV or who holds a bridge-hand for hours on end.

\(^{(3)}\)As a remarkable example of what happens when rules are imposed and followed, look at Latin—precision in the grammar lead only to its bean a dead language. The old form of written and spoken English adhered to rules and it did to after the second war.

\(^{(4)}\)The use of the generalization “nobody” here parallels such modern innovations as the comparative forms “unique; uniquer,” “precise; more precise” as well as the versatile words such as “tough,” “cool,” etc.

\(^{(5)}\)This is of special importance to students when writing tests, for then when the teacher explains what the answer should of been, its always possible to cry out with anguish “but that’s what I said.” (Real cool, huh?)

(Continued on Page 32)
RESEARCH & DEVELOPMENT  
(Continued from Page 23)

A microwave would spread its radius waves over a field 10,000 miles in diameter. The “laser” is destined to become of considerable importance in communications by expanding the present radio spectrum of 50,000 million cycles to channels upwards of 500,000 billion cycles.

Solar Telescope

Construction of the world’s largest telescope has begun at the Kitt Peak National Observatory, Tucson, Arizona. A characteristic feature of the telescope is a hole that is bored into the peak at a thirty-two degree angle and is 380 feet deep and fifteen feet in diameter. After the completion of the project, a motor-driven mirror will reflect the sun’s image a distance of 500 feet to the bottom of the tunnel. Then, it will be reflected back 280 feet to a third mirror, which will project it at right angles into an underground observing room. Here, the image is thirty-four inches in diameter, ready to be photographed or conducted to a spectroscope for study.

Emergency Exit Device

For the first time, Underwriters’ Laboratories has tested and endorsed an emergency exit system, which has been contrived by Sargent and Company. Featuring independent locking parts, the new exit hardware will open at the slightest touch and yet remain closed to contain fire and protect property. Even when subjected to 1900° F. and to the blast of a fire hose, the Sargent hardware held the doors shut.

Ultra-Low Pressures

The photomultiplier ion gauge for measuring pressures less than $10^{-12}$ atmospheric pressure has been conceived by Westinghouse engineers. To be exact, the gauge is linear over the range from $10^{-3}$ to $10^{-16}$ millimeters of mercury, pressures which would be encountered 50 to 650 miles above the earth. Doing away with the hot filament ordinarily used in such instruments, the new apparatus produces the required ionization of the gas to be measured by means of ultraviolet light. This ultraviolet beam stimulates a series of metal plates, called the photomultiplier, to emit electrons for collecting and counting. Finally, the pressure is determined by the rate at which the ions form.

Low Temperature Bonding

No longer will heat sensitive electronic components be ruined by hot soldering. The National Bureau of Standards has been studying the use of gallium-based alloys as low temperature bonding materials in a project sponsored by the Air Force. Gallium, like mercury, will combine at room temperature with copper, gold, nickel, or silver to form a soft mixture that hardens within two to twenty-four hours. Originally intended to be used in dentistry, these soft alloys were found to become tarnished by food particles. Instead, the substances have proved highly successful as bonding materials in cold soldering and in making wire connections.

LIBRARY NOTES  
(Continued from Page 24)

The book culminates with the appearance of Grant, the general whom Lincoln trusted above all the rest, and the one in whom he confided. Other titles we suggest are:

- The Hidden Civil War by Wood Gray
- The Civil War and Reconstruction by J. G. Randall
- The Life of Billy Yank by Bell Irvin Wiley
- This Hallowed Ground by Bruce Catton
- Recollections and Letters of General Robert E. Lee by his son Captain Robert E. Lee
- The American Heritage Picture of the Civil War
- The Lincoln Nobody Knows by Richard Nelson Current
- The Photographic History of the Civil War, in 5 volumes

Edited by Francil Trevelyan Miller.
Of specific interest to the engineering student is the effort devoted to the procurement of qualified professional technical personnel. By the time this article appears in the Technic, the seniors will have already felt its impact. Frequently, special staffs are organized for college recruiting activities. The same staff or an entirely different staff may devote its efforts toward securing experienced professionals from the open market.

The total number of people involved in personnel relations work is generally very small compared to those in other functional areas such as engineering or manufacturing. Numbers alone, therefore, limit the opportunities. Further, it is obvious that the engineer prefers to work in an area that will take the most advantage of his training. Some proof of this is the fact that only six persons who graduated from Rose after the Class of 1939 are employed in the personnel relations field.

Relations personnel seldom have direct contact with the great masses of people that they serve. A reasonably wide variety of personalities can, therefore, be used. For the most part, however, those employed in the personnel field lean toward being extroverted. Sincerity, pleasantness, integrity, and an acceptable appearance round out the prototype.

In the past, formal programs for the development of relations personnel were few in number. Today, many industries provide for this training. Many of the individuals accepted for work in the relations field have majored in personnel administration in college.

The future, undoubtedly, will provide many changes in the field of relations work. In the past, the greatest effort has been expended where direct labor manufacturing personnel were concerned. In the last ten years, however, the ratio of all other personnel to direct labor personnel has been increasing so that new and different relations emphasis can be expected in the future.

yielding only one-half kilowatt per cubic foot. Contrast this with the Hydrox cell's 6 kilowatt output.

Still a third type fuel cell is the Carbox cell, deriving energy from the combination of carboacious fuels (kerosene, alcohol, gasoline vapor, etc.) with oxygen in the air. One such cell ran continuously for 500 hours without maintenance in an endurance test.

Just within the past few months, a unique fuel cell that generates electric current from an amalgam of sodium in mercury and oxygen has been developed. Each cell develops twice the voltage of the Hydrox cell and produces 75 kilowatts. The sodium-mercury cell appears to have great potentialities as it weighs only one-thirtieth as much as a lead storage battery of equal output.

Granted that there are many types of fuel cells, of what significance are they? For the most part, the fuel cell is still in the research stage, since none have been marketed as yet. Nevertheless, the fuel cell has been applied to various instruments with measurable success. A twenty horsepower electric tractor powered by 1008 fuel cells recently demonstrated that it could pull its own weight of 5000 pounds plus a single-bottom plow. Operating below 100° F. and at atmospheric pressure, the unit was reportedly powered by a propane gas mixture and oxygen. The cells were arranged in 112 units of nine cells each, all units organized into four banks. Speed is governed by operating the controller, which places the four banks of cells in series or parallel in order to vary the supply of current.

In conclusion, while the fuel cell remains an experimental device, it holds great promise for use in satellites, public transportation, and electric power generation. The fuel cell is advantageous over alternating current and direct current batteries because of its ease of mobility and maintenance and its high power-to-weight ratio.
THEORY OF WRITTEN ENGLISH

(Continued from Page 29)

in its full-blown adult stage in the writing of upper-classmen who will wail "but that's the way we learned it in high-school." After this final metamorphosis, there is little left but the actual expiration of last year's majority vote.

To use the rather common brand of logic one may argue that: i) this continual change in language habits is evolutionary; ii) progress is evolutionary; and therefore the new language is progressive.

Lest we gather that this confusion is only of late years, it may bring solace to suppose that Omar (the tentmaker, not the breadman) felt somewhat the same discouragement many years ago when he wrote:

"Myself when young did eagerly frequent
Doctor and Saint, and heard great Argument
About it and about; but evermore
Came out by the same Door as in I went."

ASTRONOMY

(Continued from Page 17)

Figure 4. Neptune and its inner satellite. is so remote from the sun and earth, Neptune appears with the telescope as a star of the 8th magnitude. No markings have been discerned on its small greenish disk.

Neptune has two known satellites. The first, Triton, is somewhat larger than the moon and is slightly nearer the planet than the moon's distance from the earth. Its mass, as determined by Alden, is 0.022 times the earth's mass, or nearly twice the mass of the moon, and it may have an atmosphere. Triton revolves from east to west around the planet, contrary to the direction of the planet's rotation.

The second satellite, Nereid, discovered by Kuiper in 1949, is much the smaller, fainter, and more distant from the planet; the distance ranges from about 1 to 6 million miles. The satellite revolves from west to east once in nearly a year in an orbit having an eccentricity of 0.75, the greatest of any known satellite. Neptune and its inner satellite are shown in Figure 4.

PLUTO

Pluto is visible with the telescope as a star now of visual magnitude of 14.9, and 0.8 magnitude fainter in blue light. Its diameter is 3600 miles, as measured by Kuiper with a disk meter on the 200-inch telescope. Unless its density is greater than would be expected, its mass does not exceed a tenth of the earth's mass. Pluto may have a gritty snow-covered surface and perhaps an atmosphere that is considerably rarer than ours. Its period of rotation is 6,390 days.
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(There are some jobs, too, for freshmen and sophomores, as lab assistants and vacation relief operators. They should apply direct to the Du Pont laboratory or plant of their choice.)

BETTER THINGS FOR BETTER LIVING... THROUGH CHEMISTRY

WORK WITH DU PONT THIS SUMMER
U.S.O. ON THE GO
(Continued from Page 28)

ly the most beautiful that I have ever seen. Window shopping revealed that styles are very much up-to-date and retail promotion is much the same as in America.

After two performances of “I Remember Mama” and a single television appearance, we were boarding our flight to return to Newfoundland.

Argentia, Newfoundland, the only Naval base we played during the tour, was our final stop before “going stateside.” Argentia is located in the southeastern sector of Newfoundland known as Placentia. This region has the typical hilly, pine-covered terrain overlooking placid, blue waters of the innumerable lakes.

We gave two performances in Argentia and stayed there but three days. Our time was mostly our own, so many of us toured the scenic countryside. Then a farewell party

on the last night of our stay completed the tour except for re-entering the country.

Since leaving the U.S. on June 27, 1960, we had traveled approximately ten thousand miles and had given sixteen performances of “I Remember Mama,” two television shows, and a radio appearance. Exactly one month later, July 27, we arrived on home soil and made departing farewells to the people with whom we had lived for more than a month.

The USO, I hope you can now realize, performs a very worthy function not only for servicemen but the college drama groups and entertainers as well. I am grateful for the opportunity to share in the broadening experience of travel; I am humbled by the experience of associating with the St. Mary’s Drama Department which displayed a tremendous spirit of cooperation; I am proud to have been a part in serving my country through the USO program in such a worthwhile endeavor.
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Designers and producers of industrial systems; and manufacturers of compressors, crushers, earth movers, engines, kilns, motors and controls, nuclear reactors, pumps, steam and hydraulic turbines, switchgear, tractors, transformers, valves.
He'd shown her his etchings, and just about everything else in his apartment and, as Jack poured the last of the martinis into their glasses, he realized the moment of truth with Louise had arrived. He decided on the direct verbal attack. 

"Tell me," he said smoothly, fingering a lock of her hair, "do you object to making love?"

She turned her lovely eyes up to his. "That's something I've never done," she said.

"Never made love?" cried Jack, appalled at the waste of magnificent raw material.

'No, silly," she answered in soft rebuke. "Never objected."

"Answer the door.

"Hello, door."

A young engineer got a job in a remote mining camp. On his first day, off, he approached his boss and asked, "Say, boss, what do you folks do around here for amusement?"

The boss replied, "Well, all of us usually watch Sam, the cook, drink a gallon of whisky, gasoline, and red pepper juice. It's the funniest thing you ever saw. Why don't you come along?"

The young engineer was obviously shocked. "No thanks," he said, "I don't go for that kind amusement."

"Well," answered the boss, "I sure wish you'd come. We really need six men for this thing."

"Why is that?" asked the new man.

"Some of the boys have to hold Sam. He don't go for that kind of amusement either."

"Well, Sally, what did you learn at Sunday School today?"

"Oh, about a cross-eyed bear!"

"Now, Sally, are you sure that's what the lesson was about?"

"Yes, and his name was Gladly. We even sang a song about him: 'Gladly, the Cross I'd Bear.'"

And then there was the rather forlorn engineer who, on seeing a pigeon flying overhead, exclaimed: "Go ahead, Everyone else does."

Math Prof.: "Will the gentlemen in the back of the room stop passing notes."

Student: "We're not passing notes, sir, we're playing bridge."

Prof.: "Oh, I beg your pardon."

Many an argument is sound — just sound.

Bank President: "I like the way you handle money—where did you learn?"

Teller: "In Yale."

B P: "And what is your name, son?"

"Yohnson."

Two's company, three's the result.

A fraternity man promised his girl he would cut down on his drinking. About to call for his femme on a date he found himself a bit looped.

"I'll sit down in the living room and read," he thought. "Whoever heard of a drunk reading a book?"

His date came down the stairs and heard a noise from the living room. "What in the world are you trying to do?", she asked.

"Just reading, sweetie," he replied happily.

"You drunken bum!" she yelled, as she looked into the room. "Close that suitcase and get out of here!"

Jimmy was assigned by his teacher to write a composition about his origin. He questioned his mother.

"Mom, where did Grandma come from?"

"The stork brought her."

"Well, where did you come from?"

"The stork brought me and you too."

So the small modern wrote as the introduction: "There have been no natural births in our family for three generations."
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Qualities I Look For When Recruiting Engineers

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

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

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

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

Q. With only academic training as a background, how long will it be before I'll be handling responsible work?
A. Not long at all. If a man joins a training program, or is placed directly on an operating job, he gets assignments which let him work up to more responsible jobs. We are hiring people with definite consideration for their potential in either technical work or the management field, but their initial jobs will be important and responsible.

Q. How will the fact that I've had to work hard in my engineering studies, with no time for a lot of outside activities, affect my employment possibilities?
A. You're concerned, I'd guess, with all the talk of the quest for "well-rounded men." We do look for this characteristic, but being president of the student council isn't the only indication of this trait. Through talking with your professors, for example, we can determine who takes the active role in group projects and gets along well with other students in the class. This can be equally important in our judgment.

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

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

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

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

If you are interested in further information, you may wish to write to Engineering Personnel, Bldg. 36, 5th Floor, General Electric Company, Schenectady 5, N. Y. 959-8

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