1st Award—$4,000—Student Class
Niels Jorgen Gimsing, Hattensens Alle 11, Copenhagen, Denmark Technical University of Copenhagen (Graduate) and
Hans Nyvold, Ulrikkenborg, Alle 62, Lyngby, Denmark Technical University of Denmark (Graduate)

These students won $9,000 for bridge designs

American Bridge Division of United States Steel recently awarded $44,000 in world-wide competition for the best designs of small steel bridges. Professional engineers and college engineering students participated. Designs came in from 50 states and 40 foreign countries. From these entries, 15 winners were chosen, eight professional awards and seven student awards. They were selected under the supervision of the American Institute of Steel Construction. The judges were prominent consulting engineers and architects. They judged the designs on the basis of originality, economy, appearance and the utilization of steel. The bridges had to carry two-lane traffic over a four-lane interstate highway in accordance with AASHO standards. In addition to the winners, many of the designs entered were so outstanding that they will be published later.

Bridge design is a good example of what can be done with steel and imagination. But, it’s only one example. There are thousands of other uses for steel... and it takes thousands of men to make and sell steel. If you want to know about engineering opportunities at U.S. Steel, write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

United States Steel

1st Honorable Mention—$2,000 Student Class
James C. Costello
21 Leeson Park, Dublin, Ireland University College, Dublin, of the National University of Ireland

2nd Honorable Mention—$1,000—Student Class
James A. Wood  Jack A. Berridge  William O. Evers
Graduates of California State Polytechnic College, San Luis Obispo, Calif.

3rd Honorable Mention—$500 Student Class
Troy R. Roberts
Route 5, Neosho, Missouri University of Missouri School of Mines and Metallurgy (Graduate)

3rd Honorable Mention—$500 Student Class
Harland C. Zenk
Truman, Minnesota South Dakota State College (Graduate)

3rd Honorable Mention—$500 Student Class
Albert C. Knoell & Rodger K. Gieseke

3rd Honorable Mention—$500 Student Class
Joseph A. Yura
629 North 23rd St., Allentown, Penna. Duke University (Graduate)—Durham, N.C.
Energy conversion is our business

A method of doing work?
A change of state?
Regimentation of random motion?
Organized degradation of matter?
Is it reversible?

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To aid us in our efforts, we call on a myriad of talents and capabilities: General Motors Corporation, its Divisions, other individuals and organizations. By applying this systems engineering concept to new projects, we increase the effectiveness with which we accomplish our mission—exploring the needs of advanced propulsion and weapons systems.

Want to know about YOUR opportunities on the Allison Engineering Team? Write: Mr. R. C. Smith, College Relations, Personnel Dept.
At the General Motors Research Laboratories, physicists employ radioactive isotopes and other ultra-modern techniques and tools in their search for new scientific knowledge and an understanding of the many laws of nature that continue to perplex mankind.

Although a lot depends on a man's ability, enthusiasm and growth potential, there's every chance for advancement in many fields for General Motors scientists and engineers. There's virtually no limit to opportunity at GM. Fields of work are as varied as radioactive isotope research, astronautics, automobiles, aircraft engines and inertial guidance systems—to mention but a few.

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JOB OPPORTUNITIES! A General Motors representative will be on campus January 7, 8. Contact your college placement office to arrange an interview.
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Cover Note

“The engineer’s Christmas tree is portrayed for the holiday Technic issue by Frances Hirt, jr. mathematics major.”

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Entered in the Post-office at Terre Haute as second-class matter, as a monthly during the school year, under the act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized December 13, 1918. This magazine does not necessarily agree with the opinions expressed by its contributors.
Sylvania Encourages Scientific Heretics


To the young engineer and scientist who questions present hypotheses and who can combine unorthodox perception with imagination, Sylvania extends a climate of achievement. From these men, Sylvania foresees a number of tomorrow's breakthroughs. If your ambition is to attain your fullest professional potential, these facts about Sylvania—one of the world's fastest growing industrial organizations—merit your close attention.

Started as a basement industry manufacturing incandescent lamps only 59 years ago, Sylvania today has 23 laboratories and 46 plants located in 14 states across the nation. These 69 modern facilities afford employment to over 30,000 people. In the last 25 years sales have climbed from $6,000,000 to over $1/3 of a billion dollars. Strong as this industrial base is for the engineer and scientist, it was substantially reinforced in February 1959 when Sylvania merged with General Telephone Corporation. The merger of these two growth companies will:

• Increase ability to finance future growth and development
• Add further diversification to already broad commercial and defense product lines
• Measurably increase research and development facilities
• Give Sylvania the benefit of General Telephone's wide experience and background in foreign manufacturing and sales.

Sylvania Prizes Individuality

Sylvania's success and reputation have long been based on the belief that the success of the organization depends upon the personal success of the individual. The engineer/scientist-oriented management has given much thought and study to provide an environment that kindles self-expression and creativity. Here you are assigned to a position where you can direct your training toward its greatest potential. Promotion from within the company gives impetus to your professional progress; assignments are frequently reviewed.

There is no predetermined pattern of orientation, for the speed with which this is accomplished is up to the graduate; you are given a number of assignments with increasing responsibilities. Working directly with a project leader or senior engineer, you quickly confirm your special abilities and aptitudes.

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With Small-Company Flexibility

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Whether your interests center on engineer management or scientific specialization, you will enjoy parallel paths for development at Sylvania—double opportunity to move forward with equal reward and status. Sylvania encourages the publication of research articles, active participation in professional groups, attendance at meetings of engineering and professional societies. It has long been Sylvania's philosophy that these "extracurricular" activities are of immeasurable importance to both the company and the individual, for communication increases comprehension and scientific curiosity—which are the forces that spark experimentation and discovery.

Continual Advances
In State-Of-The-Art

The success of Sylvania in the advanced areas of electronics has been maintained over the years by scientific and engineering excellence. Sylvania's encouragement of uninhibited technological thinking has led to a number of important breakthroughs across many technologies, such as: Data Processing Systems; Computers; Semiconductors; Electronic Flash Approach System; Space Technology; Ceramic Stacked Tube; Electroluminescence; Bonded Shield Television Picture Tubes; Sarong Cathode Coating; First 110° Television Set.

Generous Benefits

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To explore fully the career advantages you can find with Sylvania, see your College Placement Officer; or write us for a copy of "Today and Tomorrow with Sylvania."

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730 Third Avenue, New York 17, New York

The Rose Technic
When a jet lands, wheel bearings undergo temperature changes from —40° up to 450°. Above, Dr. Richard H. Leet, who helped design a grease that could withstand such punishment, is shown working in the Standard Oil research laboratory.

Rockets and missiles have moving parts that must be lubricated at temperatures from —65° to 450°. Another special Standard Oil grease can do this job without breaking down.

At one time, grease used in wheel bearings of supersonic jet planes would melt during landings—would even catch fire! Now this has been solved by a revolutionary new grease developed by Standard Oil research.

Meet the man who put the grease in greased lightning!

When men started probing into space and flying at speeds faster than sound, they met a new and baffling lubrication problem.

Existing greases were good either in cold or heat, but not in both. A grease was needed that would not break down under extreme changes in temperature—from bitter cold one minute to blowtorch heat the next.

Lubrication experts in the research laboratories of Standard Oil, headed by Dr. Richard H. Leet, had foreseen the need for such a grease. And when America’s future jet growth hinged on the development of a revolutionary new grease, it was ready—as the result of a five-year research project.

Because of the unique qualities and great versatility of this new grease, it is also being used in industry, serving more efficiently and more economically than previous greases under conditions of extreme heat and extreme cold.

It is another example of a major contribution to progress from Standard Oil’s research laboratories. Other examples of the same thorough and painstaking research are the gasoline lines and oils millions of motorists buy daily at Standard service stations throughout the Midwest and Rocky Mountain region.

What Makes A Company A Good Citizen?
One gauge is a company’s usefulness...its contribution to the general welfare. Through research, Standard constantly strives to develop products that will strengthen America’s defenses and help millions of people in their work, in their homes, and on the road—today and in the future.
The Metallurgy Lab helps when you need a new alloy to make your idea practical

The Metallurgy Lab helps Westinghouse engineers solve problems involving the need for special alloys and other new materials. If an engineer’s idea requires a new kind of material to withstand high temperatures or one with unusual magnetic or thermoelectric properties, the men in the Metallurgy Lab may be able to develop it for him.

This laboratory, one of the largest of its kind in the country, uses both basic and applied research to come up with a spectrum of new materials with a variety of properties. One typical activity is the development of alloys of high melting point metals like tungsten, tantalum and niobium for use in reactors. Another is a study of deformation and fracture, which will add to the store of metallurgical knowledge engineers in other departments can call on to solve their specific problems.

The young engineer at Westinghouse isn’t expected to know all of the answers. The work we do is often too advanced for that. Instead, each man’s abilities and knowledge are backed up by that of specialists like those in the Metallurgy Laboratory. Even the toughest problems are easier to solve with this kind of help.

If you have ambition and real ability, you can have a rewarding career with Westinghouse. Our broad product line, decentralized operations, and diversified technical assistance provide hundreds of challenging opportunities for talented engineers.

Want more information? Write to Mr. L. H. Noggle, Westinghouse Educational Department, Ardmore & Brinton Roads, Pittsburgh 21, Pennsylvania.

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You'll find a teamwork atmosphere at Du Pont. Others have. Maybe that's part of the reason half of Du Pont's profits today come from products unheard of twenty-five years ago.

If you join Du Pont, the men who have worked on new products and ways to make them are the men who will teach you. You will be given an actual project assignment almost at once, and you will begin to learn your job by doing it. Advancement will come as rapidly as your abilities permit and opportunities develop. For Du Pont personnel policy is based firmly on the belief in promotion from within the company strictly on a merit basis.

For more information about career opportunities at Du Pont, ask your placement officer for literature. Or write us. E. I. du Pont de Nemours & Co. (Inc.), 2420 Nemours Building, Wilmington 98, Delaware.

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DECEMBER, 1959
You are cordially invited to visit Rose Polytechnic Institute where you can earn a degree in:

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- ELECTRICAL ENGINEERING
- MECHANICAL ENGINEERING
- CIVIL ENGINEERING
- MATHEMATICS
- PHYSICS
- CHEMISTRY

ROSE POLYTECHNIC INSTITUTE
TERRE HAUTE, INDIANA

HIGH SCHOOL GRADUATES OF 1959

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

- CHEMICAL ENGINEERING
- ELECTRICAL ENGINEERING
- MECHANICAL ENGINEERING
- CIVIL ENGINEERING
- MATHEMATICS
- PHYSICS
- CHEMISTRY

Office of Admissions
ROSE POLYTECHNIC INSTITUTE
TERRE HAUTE, INDIANA
Building Program Proposal

The increase in the number of applications to colleges in the past few years has given rise to many problems which must be solved by our institutions of higher learning. Engineering schools are being called upon to meet this situation with an increase in housing, classroom, and laboratory facilities.

For many years, the enrollment at Rose has remained fixed in order to maintain our high standards without becoming overcrowded. Even with a fixed enrollment, scheduling of classes has become a problem with the addition of the new curricula in mathematics, chemistry, and physics. The housing problem at Rose is of no consequence since the addition of Baur-Sames-Bogart hall in 1956. With the two dormitories on campus and the fraternity homes in town, housing can be provided for some three hundred twenty-five men. Our laboratory facilities, while presently providing the student with a variety of basic applications of engineering principles, leave something to be desired in the matter of space. With new areas of engineering design and research being explored by industry, Rose plans to initiate a graduate study program and some research facilities. Plans for a computer center at Rose with a digital computer to arrive in the spring bring some questions to my mind. Where are we going to put research facilities when we do get them? Where do we have class rooms for graduate students? How will the proposed freshman class enrollment increase affect our present scheduling problem?

Without a doubt, a building program is necessary. Rose has managed to graduate qualified engineers from the same building for thirty-seven years. However, the present demand for well-trained engineers dictates a need for more classroom and laboratory facilities for Rose.

Dr. Morgen, having given some thought to the matter, has devised a solution which could be quite feasible. He envisions a separate building devoted entirely to classrooms. As we already have utility services such as gas, electricity, and water in this building, it would be considerably cheaper to construct a classroom building rather than a laboratory building. All classrooms and offices would be in this new building, with the present classrooms and auditorium converted to labs. A new auditorium would be included in the classroom building. The relocation of classes would provide about twenty rooms now used as classrooms as well as the area now occupied by the auditorium for laboratory space — quite adequate for any proposals for laboratory expansion. The classroom building would have to be large enough to cope with the problems mentioned earlier and have provisions for faculty offices.

As might be imagined, a building program such as this would be expensive. Alumni contributions, tuition raise, personal and industrial donations, and foundation grants are some solutions to the financial problem. As the tuition is now fairly high relative to colleges in Indiana and surrounding states, the other sources will have to bear the financial burden.

With the initiation of a graduate study program and a computer center in the coming year, more ideas will be presented about the expansion of Rose. The TECHNIC and the administration would like to hear some opinions and ideas from alumni, faculty, and students.

R.L.S.
MEN ...who are Engineers, look twice
at the many advantages
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If personal interview is not possible send resume and grade transcript
to B. L. Dixon, Engineering Personnel Administrator, Dept. CM515
Pomona, California.

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GENERAL DYNAMICS CORPORATION
POMONA, CALIFORNIA
I am writing this article in the air en route to visit one of the Rose Tech Alumni Clubs. I am riding in a four-engine propeller driven Constellation which to all intents and purposes is obsolete. It will be replaced with faster and more comfortable equipment as rapidly as it can be produced and financed. When I got my ticket for this flight the attendant at the counter pressed a button and determined electronically how many seats were open on each flight on the whole line. The fuel which is supplying the power for this plane is a high-test, high anti-knock gasoline but when the line converts to jet propulsion an entirely different type of fuel will be required. The effects on the oil refining industry will be significant. As we are about to land in Cleveland, we find that this city of over one million people cannot have jet service until the runways and landing facilities are improved.

Thus, this airplane ride indicates that the duties and jobs which the engineers, be they chemical, civil, electrical or mechanical, will encounter in the next few years will be quite different than those which the same engineers were called upon to perform in the last few years. The engineer who does not progress with the times becomes technologically obsolescent. One of the real tragedies of our time is the number of technically trained persons who lose out, because of their inability to progress, long before their time to retire.

What has all of this to do with engineering education? The answer is to be found in the revolution that is occurring in engineering education. The curricula have evolved into a study of the fundamentals emphasizing "why" type of courses rather than the outmoded "how" technique. If today we were to teach the technique of internal combustion engines instead of the fundamentals of energy conversion be it atomic or sub-atomic; if we were to teach the techniques of present day computers instead of the principles underlying the translation of information mechanically and electrically; if we were to teach the refining of gasoline instead of the theory and practice of building new molecules for greater energy conversion possibilities; or if we were to teach how to make concrete instead of the fundamental properties of all types of solid materials we would be educating engineers whose information would be obsolete before they started on their first job. We would not have engineers educated to make the kind of conversions mentioned in my thoughts in the opening paragraph.

Therefore, engineering education must look towards the future and teach the students the broad basic principles. These principles have a good probability of use not only today but twenty years from now when this year's graduate will be at the peak of his productivity. The industry which employs the young graduate must train him on the job in the specific techniques of that industry. The function of industry is to impart to the young engineer the "how to do it." He can learn "how to do it" very rapidly and efficiently if the institutions of higher learning have given him a good grounding in the fundamentals of "why things operate as they do."

Unfortunately, a four-year undergraduate education is not sufficient for the engineer who wishes to pursue his career in research, teaching or certain other high level creative functions. It is anticipated that for each one hundred bachelor's degrees in engineering there are needed approximately twenty engineers with the master's degree and five engineers with the doctor's degree. It is anticipated that Rose will bear its share of the load by attempting to identify as early as the beginning of the junior year those students who should go on to graduate work. These students will be encouraged through additional courses in the sciences and an introduction to the techniques of research to prepare themselves for graduate work either at Rose or elsewhere.

With this kind of a plan Rose can face the future with confidence that it will maintain a reputation second to none.
Today we are reaping tremendous benefits from compact, miracle devices that are making conventional vacuum tubes obsolete—

Transistors—every one has heard of them, but how many know just how these things work? How are transistors being used today? Will they completely modernize the electronics industry?

It has been ten years since Bell Laboratory scientists Bardeen, Brattain, and Shockley developed the solid-state amplification principle, but almost immediately the tremendous capabilities of this phenomena were realized, until today this device has reached a position of importance equalling and in many ways surpassing the vacuum tube.

What are the advantages of the transistor? Well, first of all, semiconductor devices can do anything that vacuum tubes can do—rectify, oscillate, amplify, limit, count, etc. —and do them much more efficiently. Vacuum tubes require a hot cathode to emit electrons, semiconductors do not. By doing away with the heating electrode we not only save space but save a major portion of the ventilation problem. This gives us a power saving of from 1/4 to 5 watts over vacuum tubes. Add this to the power savings due to the lower required anode potential—1/10 to 1/100 of typical tubes—the lower voltage and consequently lower currents allowing us to use extremely small transformers and capacitor components, and we can see why the transistor is so vital in our space equipment. In many cases volume reductions of 50 to 1 have been achieved in units by use of the transistor.

Furthermore we find that these small jewels of the electronics world are compact and rugged. In their protective armor of plastic they are able to withstand shocks that would crack a tube's glass envelope.

Finally, the service life of the transistor is tremendous. Although theoretically the life of a transistor is infinite, techniques of manufacturing have reduced the socket-hours per failure figure to a mere 1,000,000 hours, as compared to the average life of a vacuum tube in a TV circuit of 2000 hours.

Before you wonder why we use vacuum tubes anymore, let us examine some of the problems encountered by use of transistors. We find that they are limited in frequency response—they refuse to function above a relatively low cutoff frequency, an upper limit having been reached that will allow us to operate them in the radio-frequency spectrum. These devices are also presently limited in noise level, because of an inherent noise-generating characteristic. This can be overcome by better design configurations, purer materials, and new circuitry. For sometime it was thought that transistors would never be applicable in the power field because of ambient operating temperature limitations, but new devices have recently been perfected that appear to be stable to 150 degrees C or can handle 50 watts. Possibly the major problem is the variation of characteristics in mass-produced semiconductors. Tubes can replace any other of the same type, but transistors must either be selected by trial and error or by adjusting the circuit values.

Transistors are made in junction and point-contact forms, the junction type being superior in most applications. Below is a pictorial representation of a basic transistor amplifier circuit. (Fig. 1) The type NPN transistor consists mainly of a thin slice of P type semiconductor sandwiched between two pieces of N type conductor. The transistor's behavior will depend mainly on current flow across the two PN junctions. As you can see the junction transistor is a three terminal device,

![Figure 1](image-url)
each lead being connected to a thin germanium wafer (or other type semiconductor). Semiconductors, whose principal current carriers are electrons are known as negative or N type conductors. This is usually made by alloying germanium with five valence electron type elements such as arsenic or antimony. Those semiconductors in which the principal means of conduction is by electron deficiency (known as "holes"), are known as positive or P type conductors. To explain the term "hole", we say that if an electron were missing from one of its usual positions in the crystal lattice, a "hole" exists. Under certain conditions an electron from an adjacent bond may fall into this "hole". Then, of course, a "hole" appears in the space vacated by the electron. If the material was originally electrically neutral, when the electron is removed shows a net positive charge, an unusual method of conduction to say the least. Transistors can be arranged either PNP or NPN, the only difference being that the applied voltage polarities are just opposite in the two types. The NPN type was chosen for discussion in that it's applied voltage polarity follows that of a vacuum tube much more closely. It should be understood that both types have identical behavior as far as signal components of voltage and current are concerned.

In normal amplifier operation, as shown, the emitter, or lower N type material is biased in the forward direction so that electrons will flow toward the base, or P type materials. Also in normal amplifier operation the collector, or upper N type material is biased in the negative direction so that most electrons in the base near the upper junction are swept into the collector, causing a reverse current across this junction. In fact, because of the small width of the base the collector current, ic, approximately equals the current across the emitter; and the base current, ib, approximately equals the "hole" current across the emitter junction. The ratio of electron current to "hole" current (across emitter junction) remains nearly constant over wide ranges of current, therefore small ib input current can control large ic output current and current amplification of between 20 and 100 times is produced. The transistor also provides voltage and therefore power amplification. While you may hear of a large number of types of transistors (grown-junction, surface barrier, four-terminal, etc.) their basic principles are all the same. The input characteristics (for a fixed positive collector voltage) is primarily the same as the volt-ampere characteristics of a semiconductor diode. At the left are some typical transistor characteristics. (Fig. 2)

Transistors are now being used in a great number of electrical units, much of it mobile. Transistors have greatly aided designers of hearing aids, automatic pilots, navigational units, and radio communication for small boats and aircraft. With compactness, ruggedness, long life, and good operating characteristics, they have been dreamed about for years. Designers of large equipment, such as electric computers, are now not faced with the tremendous problems.
During the last two years the missile and space program of the United States has seemingly lagged further and further behind that of the Soviet Union. To bridge this gap and to restore some of America’s lost prestige, the Tau Beta Pi fall pledge class of 1959 has devised a plan to achieve this fame for the United States. The following must be done to regain prestige:

1. The United States must have a “show of force” type space program. This will definitely show the world who has scientific supremacy.

2. A new and more modern approach to the problem must be devised. Recent developments at Cape Canaveral have shown that our approach to space has many faults; e.g., the many failures of our moon-shot attempts. We must not keep showing the world our shortcomings.

3. The plan to regain our “lost ground” should be unique and readily visible to all.

If we consider these factors, we find that a project of this type could involve the moon, our nearest neighbor, (because the result of the plan must be visible to all).

It is also apparent to many of our scientists that the Armed Forces are “botching up” our space program and that they have almost completely ruined our chances of putting a rocket on the moon. Although we realize that this is true, we also know that they have done at least a worthy job of placing satellites into orbit. We feel that, with this knowledge, it is not worthwhile to consider placing a rocket upon the moon, but we also feel that there is no limitation on the “earth-locked” type satellites which could be used.

To accomplish the three purposes set forth previously a unique plan was devised by the fall 1959 pledge class of Tau Beta Pi. The flag of Rose Polytechnic Institute will be permanently engraved on the surface of the moon. To do this, the surface of the moon will be fused into a glass-like material in the form of Rose’s flag.

The conception of the plan is as follows:

A generator of energy on the surface of the earth will transmit energy into space in parallel rays. This energy will naturally be in the form of gamma rays because these rays have the highest energy content of any known electromagnetic radiation.

An electronic lens will be orbited around the earth at a height of 3600 kilometers and positioned directly over the transmitting sight. (It may now be known that a body orbiting the earth at a height of 3600 kilometers will circle the earth once every 24 hours and consequently will appear to remain stationary with respect to the earth.) This lens, a new device designed by the pledge class, is a black box for concentrating the gamma rays transmitted from earth into a beam which is only a mile wide when it intersects the moon.

The flag will be 100 miles by 600 miles and will be formed by 600 successive sweeps across the 100 mile length of the flag. It can be seen that the moon will be lined up with the transmitting station and lens only once a day so therefore only one sweep can be made per day. Furthermore it can be seen that for the line of aim of the rays to be lowered a mile after every sweep is completed, it will be necessary for the lens to move slightly in a plane perpendicular to the plane of its orbit around the earth. This movement of the lens will be accomplished by a Sterling engine run from solar energy.

The electronic lens is a control unit in this array, shutting the radiation off and on to inscribe the emblem of the flag. This is accomplished with a polarization idea. The lens is polarized in the same direction as the rays when they are to be passed and in the opposite direction when they are not to be passed.

The next section of this study will deal quantitatively with the energies involved and also the means for generating these energies.

Two members of the Tau Beta Pi fall pledge class of 1959 recently spent a 72 hour weekend pass searching the archives of the Pentagon. In the last filing cabinet and the last dusty folder in the last row in the last room of the last basement they found the following secret classified information:

1) Density of the material compris-
THE MOON

By Tau Beta Pi Pledge Class

ing the moon’s surface is

\[ \text{Gamma} = 10.4 \times 10^{15} \text{ grams/cubic mile} \]

\[ \text{Alpha} = 0.237 \text{ Calorie/gram-degree centigrade.} \]

With these facts they developed the following equation (the missing link for the pledge group project):

\[ P_{\text{dif}} = G_m \cdot A_m \cdot S_{\text{dif}} \cdot V_{\text{dif}} \cdot T_s \]

where

1. \( \Delta T \) to produce fusion = 1500 °C = \( S_{\text{dif}} \)

2. \( V_{\text{dif}} \) moon fuse volume per sweep max = 0.00379 cubic mile

3. \( T_s \) = sweep time = \( \frac{1}{2} \) hour

Using the developed plug and a “number one” Supn Mehhi log log duplex, desitrig (what’s the use) slide rule, the power needed for fusing the Rose flag into the moon is 32.5 x 10^12 watts. Look at that figure again, yes, it is 32.5 x 10^12 watts. Oh well, we know what we are doing.

To generate the needed energy we are going to use the common everyday proton-proton chain reaction. The equations for this are:

The net effect of this chain is the combination of four hydrogen nuclei into a helium nucleus and gamma radiation.

The net amount of energy released is:

Rest mass of 4 hydrogen atoms = 4.03258 amu

Rest mass of 1 helium atom = 4.00387 amu

Difference in mass = 0.02871 amu = 26.7 x 10^6 e.V.

Using a special material which has 2 x 10^23 protons per gram (called ‘Concentrated Sun Lotion’, a material developed by the Rose Chemical Department and which should not be confused with Bronzetan), it is quite easy to see that we need only 1.66 x 10^2 grams to produce the needed fusion energy.

To bring about the needed temperatures and pressures to produce the proton-proton chain the 1.66 x 10^2 grams of Concentrated Sun Lotion are suspended in a specially designed glass tube. The tube is 98.6732 cm. in length and 9.333 cm. in diameter.

Surrounding the tube is a copper coil to provide magnetic “mirrors” which confine the X-1 gas within the tube. The gas is pumped into the tube at low pressures and an electric discharge is sent through the gas to ionize it so that it will be affected by the magnetic field.

A huge bank of condensers discharges at the rate of 90,000,000 KW through the copper coil. The electricity passing through the coil sends a magnetic shock wave through the tube that forces the X-1 gas away from the tube. Within one microsecond the gas temperature is raised to 3,000,000 degrees centigrade.

The gas is further heated and constricted toward the center of the tube and the suspended material. The gas temperature reaches or exceeds 20,000,000 degrees centigrade and the proton-proton chain takes place.

A thermonuclear capacitive pick-off gathers the gamma rays and sends them screaming down a wave guide to be radiated to the orbited lens.

It should be noted that an atomic power place to generate the electrical energy to charge the capacitor banks has been previously constructed. This is an ordinary installation and any details about power plants can be found in any engineering computations texts.

The enormous cost of this project is found to exceed the national debt by a factor of two. The cost is figured as any essential that is needed to supply 32 x 10^8 KW for the burning of the Rose flag on the moon. Number one is the construction of an atomic power plant as an auxiliary component. This is figured at a figure of $10 per KW. Number two is the construction of a mass spectograph to obtain deuterium for generating purposes. Number three is the cost of setting a rocket into orbit with an electronic lens as a focusing device. Number four is the selecting and testing of 10 brilliant monkeys as operators for the intricate and complicated procedures to be carried out in the two year endeavor. Number five is the consultant fees for 6 pledges, likewise brilliant, who goofed off in the Student Center. Items included like tea, coffee, and occasional trips down the road.

Itemized cost

1. 320 billion dollars
2. 320 billion dollars
3. .001 billion dollars

(Continued on page 34)
FRESHMAN FRATERNITY PARTIES
After giving get-acquainted parties the first week of school to give the new freshmen a good look at fraternity life at Rose, the four fraternities invited the freshmen for a return visit Friday, November 13. These parties were extended to one hour visits at each house thus allowing each fraternity to take these men on tours of their house, provide them with refreshments, and perform some kind of skit for entertainment. There was ample time for casual mingling and the making of many new acquaintances. Consequently, at these parties there was close scrutiny of each group by these new men.

FRESHMEN-SOPHOMORES GAMES
The traditional freshmen-sophomore games were held on the cold, rainy day of Tuesday, November 16. The spirits were high as the games began; the freshmen inspired by their bonfire victory (taking off of garters) and their overall unity. The sophomores were confident because of their successful harassment. The two groups first clashed on the football field; the freshmen finally won the game by a small margin (8-7). The sophomores blamed their defeat on the weather; upperclassmen seem to hint that the game was won by superior ball playing. The freshmen again showed their superiority by easily defeating the sophomores in the basketball game. The sophomores finally made 27 points which wasn't a match for the freshmen's 39 points. (What was wrong sophomores—the court was dry!)

After defeat in the first two meets, the sophomores forfeited the tug-of-war in view of their very possible complete failure at all three planned matches. The freshmen thus joyfully tossed their beanies into the air and gave the sophomores a cheer for at least trying.

EXTRA STUDY
The faculty has been particularly concerned over the number of students who had D's and F's in courses for the first six weeks period. As a direct result of a recent faculty meeting, a decree was issued which states that a student, on the advice of his advisor, can be required to spend two hours in the library for each credit hour of “D” or “F”.

It was agreed also among the faculty that “selected” upper-classmen could be asked to aid in instructing these extra sections. The main objective is to help these unfortunate students on confusing principles of different subjects and teach them how to “read” the text material effectively.

MR. FRANS REYNERS
On November 12, the administration scheduled a convocation pre-

Larry Berger Entertains on Engineers’ Day
senting a well know mime star, Mr. Frans Reynders. A former student of top mime actors, Mr. Reynders is on a tour to promote interest in his cultured art. The mime actor portrays various individuals in different situations by his ludicrous actions and gestures, for example—a blind man, a marionette, a surgeon, etc. Mr. Reynders was warmly received by the audience not only because his act was different and interesting but also for his expert performance.

HOMECOMING 1959

Homecoming 1959 proved to be an enjoyable experience in spite of the atrocious weather. As one student in particular has commented, no one’s spirits were dampened by the rain—just diluted.

The freshmen were accepted by the alumni and upper-classmen after their expert work on the bonfire in the face of such opposition. They acted pretty jovial about their success in getting the outhouse to fall in, didn’t they? Several freshmen were disappointed, however, that they didn’t get to take Rosie downtown.

To incite the spirit for the football game Saturday, some game-loving freshmen made a trek to the Franklin campus carrying a large Rose flag. However, it seems that the fellows couldn’t find the flagpole, so they had to hang their banner from a tree branch. You sure got them riled, boys.

The Friday evening fraternity parties were destined to be successful with so many old grads drinking cheers to classmates and near-forgotten incidents. I wonder why several of the alumni complained of sore elbows Saturday?

Practically all of the students and their dates attended the Homecoming Dance held in the Mayflower Room. This festivity, coupled with some post-dance parties, wrapped up the biggest weekend of the year at Rose.

PHILHARMONIC ORCHESTRA

On November 5, the administration acted as host to the student body and the townspeople after scheduling a convocation to present the Indiana University Philharmonic Orchestra. The musical group, under the able conductorship of Mr. Tibor Kozma, presented selections from several great pieces of musical art: “Pastorial” and “The Damnation of Faust.” By comments from some of the townspeople and several students, it is felt that our efforts to schedule Rose as part of their tour was very worthwhile.

ENGINEERS DAY — 1959

On November 7, Rose’s Student Council sponsored the annual Engineer’s Day program. Bart Gronberg, general chairman, and Charley Smith, Student Council representative, deserve our most hearty congratulations on their expert job of coordinating this program.

Saturday morning a group of about 500 students, teachers, and parents from high schools and cities in the near vicinity converged on the campus to view the various educational aspects of engineering on exhibition.

The visitors were conducted through the school in small groups by Blue Key and Tau Beta Pi members.

The Math Department highlighted their exhibition by operating the Donner Analog Computer to show the analysis of a simple engineering problem. The Chemical Department conducted an ultra-violet light demonstration. The Physics Department’s pulse tube was closely examined by all. In the Electrical Department, displays ranged from a demonstration of an aeroplane gyroscope to typical lab experiments involving standard waves. Keynoting the Civil Department’s display was the hydraulic jump apparatus. The military once again showed the visitors its arms display. The Mechanical Engineering Department stole the show, however, with its “magic” dehumidifier that took five gallons of water per hour out of the air.

Other parts of the program included a short meeting in the auditorium at which time Dr. Morgen spoke on how engineering influences our economy and on engineering as a career.
On October 17, the Fighting Engineers downed the Cougars of Concordia with a well-rounded attack. Rose scored only twice, but lost the ball three or four times within striking distance of the goal line. Scoring for Rose were Tom Hormuth on a 23-yard pass from Bob Michael and Gary Anderson on a 25-yard “never-say-die” run. The final score read Rose 14, Concordia 0, with Rose upsetting Concordia’s homecoming festivities.

The following week was the big Homecoming game against Franklin College. At the beginning of the game, Rose looked as if they would push Franklin all over the field. However, midway through the first quarter the spark died and the Engineers seemed to come apart at the seams. Franklin moved the ball consistently throughout the game. The final whistle ending the game showed a score of 32-0 in favor of Franklin’s Grizzlies. Rose fought hard throughout the entire second half, but couldn’t seem to get a sustained drive going.

October 31 found the Engineers again on the road. The destination this time was Jacksonville, Illinois, where the Engineers met the Illinois College. After spotting the Blue Boys two touchdowns in the first five minutes, the Engineers came fighting back to trail at half-time, 13-8, on a safety and a 56 yard run by Bob Michael after taking a screen pass from Bill Yochum. Right after the start of the second half, Yochum again passed for six points, this time hitting Bob Checkley in the end zone with a 36-yard pass. Illinois got another 7 points on a 65-yard march and the conversion. Rose then put together a fine drive of their own and reversed the score, 21-20. The score remained this way until the final four minutes of the game when I. C. scored on a 60-yard run. Attempting to gain the equalizer, Rose took to the air, but a wayward pass was intercepted by I. C. and returned 75 yards for a score on the last play of the game. Illinois College went home with a victory, 33-21.

The last game of the season was against Principia College at Elsah, Illinois. In the first half, Principia scored at will against the Engineers who left at half-time on the bottom end of a 26-0 score. In the second half, Rose found themselves, but could not overhaul the lead which they had spotted Principia. Scoring in the second half for Rose were Bob Checkley, who played a fine game for the Engineers and Gary Anderson, always a standout. The final score read, Principia 39, Rose 12.

Basketball is gaining momentum here at Rose with the squad getting in shape for their first game against Eureka College here on December 2. This year’s team should be greatly improved over last year’s squad which had a record of 2-17. Return-

(Continued on page 34)
There is a direct correlation between a nation's installed kilowatts per capita and its standard of living. The Industrialized Revolution, which began in the eighteenth century, created a need for producing electrical energy and thus stimulated the development of power plants. By far the greater part of this electrical energy has been furnished by the steam power plant.

The primary objective of a power plant is to furnish electrical energy at the lowest ultimate cost. To do this, it requires the steam, used to produce the electricity, to be produced in an efficient manner. A steam generator which is typical of the type used in many steam power plants is drawn below in the diagram with the essential elements shown.

In a condensing steam power plant, the steam which is exhausted at the low pressure end of the turbine is condensed to water in the condenser. This condenser serves two general purposes. First of all, it serves to reduce the back pressure on the turbine and second, it recovers the steam and converts it back to water to be used in the system again. The cooling water used in the condenser is pumped through it from a water reservoir. For this reason, steam power plants are usually located near a river, lake, or ocean.

After the steam is condensed, the water is pumped to a series of heaters called water preheaters. The diagram shows five preheaters, including the de-aerator, but more or less preheaters could be used. The heat utilized by these heaters is acquired from steam which is bled at various stages in the turbine. All of the exhaust steam could be condensed in the condenser but by bleeding the steam to preheat the water, the efficiency is greatly increased.

The water which is heated in the low pressure and low intermediate pressure heaters is pumped to the de-aerator heater where the dissolved gases in the feedwater are removed to prevent internal corrosion in the system. This is just one step of the water treatment process which is necessary to prevent corrosion in the system.

Next, the water is forced through the high intermediate pressure and high pressure heaters where the preheating is completed and the water enters the boiler.

If the fuel used in a steam generating plant is coal, the efficiency of the plant is increased by pulverizing the coal and using it in the powder form. Pulverizing the coal allows almost complete combustion with a minimum of excess air. Also, the fuel and air supply may be readily controlled to meet the fluctuations in load, and this pulverized coal, fed to the furnace by an exhauster,

(Continued on page 34)
Men of mathematics have long sought to square the circle, that is, to construct a square with the same area as a given circle. In performing this construction by classical methods, one is limited to the use of the compass and unmarked straightedge. No measuring device of any kind may be used. All methods have been tried all have led to failure. Such construction is now known to be impossible. Yet man will continue to study the problem of squaring the circle.

The key to the solution or impossibility of this construction lies with the value of \( \pi \), or the ratio of the circumference of a circle to its diameter. This relationship may be symbolized as \( \frac{C}{D} \). If \( \pi \) could be expressed as a definite value, we would have surmounted the major obstacle. However, in 1882, F. Lindemann developed a complicated proof that \( \pi \) could not be formulated as a finite value. This implies that the circumference of a circle can never be constructed on a line by using the diameter as a unit of measurement.

Since the value of \( \pi \) is a vital factor in this problem, let’s attempt to determine this value. Pi has been assigned various values ever since the beginning of mathematical study. The Bible originally designated the figure “3” as \( \pi \). The Egyptians used \( (\frac{16}{9})^2 \), or 3.16, as \( \pi \). Archimedes employed \( \frac{22}{7} \) as the approximate value of \( \pi \); today we still use \( \frac{22}{7} \) for \( \pi \) as a shortcut method. At the same time, Archimedes restricted the value of \( \pi \) between 3.1415904 . . . and 3.1416016.

. . . This was a marvelous feat for his day. The Romans used 3 1/8 or 3.125 as \( \pi \). The Hindus suggested the division 355/113, or 3.1415929 . . ., as the value of \( \pi \).

By 1873 a man named Shanks had found \( \pi \) to 707 decimal places. We don’t know why he devoted so many years to this task because \( \pi \) had been known to be irrational. Certainly he had no hope of finding a long repeating decimal. Shanks probably became so engrossed in his calculation that he just couldn’t stop. In 1946 this value was extended to 808 decimal places by Ferguson at Manchester University. Ferguson revealed a mistake in Shanks’ calculations at the 528th decimal. Modern computers have determined \( \pi \) to a staggering 2000 decimals. Thus we can obtain \( \pi \) to any decimal place we desire, but what purpose does it serve? There is no end in sight. When one reaches such extremes, it is only for curiosity’s sake. If anyone is curious, the value of \( \pi \) to thirty-five decimal places is 3.14159265358979323846264338327950288 . . .

Mathematicians continue to devise methods for the calculation of \( \pi \). One formula is the following: 

\[
\pi = 4 \left( 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + \ldots \right).
\]

This sequence oscillates about a limit, \( \pi \). As the equation progresses and the fractional values approach 0 as a limit, the oscillations get smaller and smaller. The value thus approaches \( \pi \) as a limit. An Englishman, Wallis, came up with the following infinite product for \( \pi \):

\[
\pi = \frac{(2^4 \times 3^4 \times 5^4 \times 7^4 \ldots)}{(2^4 \times 4^4 \times 6^4 \times 8^4 \ldots)}
\]

Pi can also be obtained from the continued fraction:

\[
\pi = \frac{22}{7} = 3.1428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571428571
These three methods have one thing in common. Each one is an infinite, never-ending determination of pi. If we wish to approximate pi, we can terminate any one of these equations at a certain point. The rational value thus obtained would be accurate enough for all practical applications. A very rough approximation to pi can be obtained by adding the \( \sqrt{3} \) to the \( \sqrt{2} \), giving the value 3.14626 . . . Other pairs of square roots that give an approximation to pi are \( \sqrt{79} - \sqrt{33} = \sqrt{196} - \sqrt{118} \). The quadratic equation \( 64x^2 - 160x + 0 \) has a root that deviates from pi by only one ten-millionth. Therefore, pi can be quickly approximated or obtained fairly accurately by one of the above methods.

Knowing pi and its approximations, we can proceed with squaring the circle. Many have come up with solutions to the problem. Unfortunately, they are always amateurs with limited mathematical backgrounds. They always claim that they have proved amazing results, based on a new value for pi, the only correct value, in their estimation. No two circle-squarers ever arrive at the same value for pi, strangely enough. These so-called "pi-makers" do absolutely nothing for mathematics. They use the most illogical reasoning; they may even claim that the Pythagorean Theorem is false, or something similar to that. In other words, they just aren't qualified to prove a mathematical concept.

By using false assumptions as the "pi-makers" did, we can't rightfully square the circle. Nor can we do it by classical construction. However, we can construct a square that, for all intents and purposes, will be very nearly equivalent to the circle. We do this by using the close approximations for pi. One method uses the approximation \( \sqrt{3} + \sqrt{2} = \pi \). The construction is as follows: (1) Draw a circle O with diameters AB and CD perpendicular to each other (see accompanying figure). (2) From point D, strike off DE on the circle, so that DE = radius DO. (3) Join A and C, the end-points of diameters AB and CD. Also join C and E.

Since triangle ACO is an isosceles right triangle, its sides are in the ratio of 1:1:V2. Therefore side AC = \( \sqrt{2} \) R, where R is the radius. By the same token, triangle CDE is a 30:60:90 right triangle; its sides are in the ratio of 1:2\( \sqrt{3} \). Therefore, side CE = \( \sqrt{3} \) R. The sum of the

(Continued on page 38)
Automatic systems developed by instrumentation engineers allow rapid simultaneous recording of data from many information points.

Frequent informal discussions among analytical engineers assure continuous exchange of ideas on related research projects.

Under the close supervision of an engineer, final adjustments are made on a rig for testing an advanced liquid metal system.

The field has never been broader
The challenge has never been greater

Engineers at Pratt & Whitney Aircraft today are concerned with the development of all forms of flight propulsion systems—air breathing, rocket, nuclear and other advanced types for propulsion in space. Many of these systems are so entirely new in concept that their design and development and allied research programs, require technical personnel not previously associated with the development of aircraft engines. Where the company was once primarily interested in graduates with degrees in mechanical and aeronautical engineering, it now also requires men with degrees in electrical, chemical, and nuclear engineering, and in physics, chemistry, and metallurgy.

Included in a wide range of engineering activities open to technically trained graduates at all levels are these four basic fields:

ANALYTICAL ENGINEERING Men engaged in this activity are concerned with fundamental investigations in the fields of science or engineering related to the conception of new products. They carry out detailed analyses of advanced flight and space systems and interpret results in terms of practical design applications. They provide basic information which is essential in determining the types of systems that have development potential.

DESIGN ENGINEERING The prime requisite here is an active interest in the application of aerodynamics, thermodynamics, stress analysis, and principles of machine design to the creation of new flight propulsion systems. Men engaged in this activity at P&WA establish the specific performance and structural requirements of the new product and design it as a complete working mechanism.

EXPERIMENTAL ENGINEERING Here men supervise and coordinate fabrication, assembly and laboratory testing of experimental apparatus, system components, and development engines. They devise test rigs and laboratory setups, specify instrumentation and direct execution of the actual test programs. Responsibility in this phase of the development program also includes analysis of test data, reporting of results and recommendations for future effort.

MATERIALS ENGINEERING Men active in this field at P&WA investigate metals, alloys and other materials under various environmental conditions to determine their usefulness as applied to advanced flight propulsion systems. They devise material testing methods and design special test equipment. They are also responsible for the determination of new fabrication techniques and causes of failures or manufacturing difficulties.
Exhaustive testing of full-scale rocket engine thrust chambers is carried on at the Florida Research and Development Center.

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.

PRATT & WHITNEY AIRCRAFT
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DECEMBER, 1959
On November 6 of this year Rose Polytechnic lost a great leader. Doctor John White was associated continuously with Rose for the past 56 years. He was a faculty member and member of the board of managers. His service at the school included head of the chemistry and chemical engineering department and vice-president, from which he retired in 1936, and acting president. He was acting president from 1919 to 1921 and again from September 1929 to January, 1931. He was vice-president most of the time, with the two interims out to be acting president, from 1911 until his retirement.

Upon his retirement from the faculty, he was named to the board of managers and served in that capacity until his death. He was on the faculty and discipline and the honorary degrees committees of the board. He was also on the board of directors of Union Hospital, being named to it April 20, 1911.

A native of Poolesville, Maryland, Doctor White studied at Johns Hopkins University on undergraduate and graduate scholarships and a fellowship. It granted him the bachelor's degree and doctorate in 1891.

His study also included 15 months during 1901 and 1902 spent at Ostwald's Physico-Chemical Laboratory at Leipsig, Germany, and the Federal Polytechnic in Zurich, Switzerland. He was the author and joint author of numerous scientific papers and in 1901 published a laboratory manual on qualitative chemistry.

He began his teaching career in 1891 at Cornell University as an instructor in chemistry, remaining there two years. For the next 10 years Doctor White was associated with the University of Nebraska as an instructor and adjunct professor of general and analytical chemistry. He came to Rose in 1903 from Nebraska.

He has been honored at Rose since 1952 by the John White tuition grant established that year. The 1957-58 school year was named the John White Year by the Alumni Fund committee. On the occasion of his ninetieth birthday in 1956, he was recipient of a birthday card shower instigated by Robert Shattuck (October TECHNIC), and the response was overwhelming.

Doctor White's memberships included the American Chemical Society, a German chemical society, the American Association of University Professors, the Society for Promotion of Engineering Education, and the Indiana Association for the Advancement of Science.

He also was a member of Sigma Xi, honorary science fraternity, Alpha Chi Sigma, honorary chemical fraternity, and Beta Theta Pi, social fraternity.

Because of men like Doctor White, Rose Poly has maintained the high standards which are tradition of the school. We can not hope to replace him, only build more men of his caliber.

Mrs. John White has requested that instead of sending flowers, a fund be started in honor of her husband. This fund is to be used strictly for the benefit of the Institute. The editors realize that this is a great tribute to a great man and leader.

* * *

Mr. Paul Gottfried, Rose class of 1949, has expanded his consulting activities in the field of Reliability to a full-time effort as a partner in the firm of Reliability Engineering Associates in Skokie, Illinois. The group specializes in problems connected with the development and production of missile and intelligence systems. This is just another of the many advancements that Rose men are making in their fields.

The editors are aware that there are many deserving Alumni worthy of special recognition. They hope that other Alumni will let it be known, so that the students may become familiar with the careers of Rose graduates. It is a great inspiration to read about men who went through the same training as the students are now undertaking.
Interested in computers, computer technology and applications? Then you should investigate Western Electric as a place to build your career. Telephony today is built around computers. The telephone cross-bar switch is basically a computer. Electronic switching gear uses computer principles.

At its new engineering research center and at most of its 25 manufacturing locations, Western is relying more and more on computers in doing its main job as manufacturing and supply unit for the Bell Telephone System. In its other major field—Defense Communications and Missile systems—the use of computers and computer technology is widespread.

You'll discover quickly that opportunities with Western Electric are promising indeed. Here company growth stands on a solid base, and your own growth, too. We estimate that engineers will find 8,000 supervisory jobs open to them in the next ten years. There will be corresponding opportunities for career building within research and engineering. Progress is as rapid as your own individual skills permit. And Western Electric maintains both full-time all-expenses-paid graduate engineering training and tuition refund plans to help you move ahead in your chosen field.

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SIGMA NU

As the school year has moved along, things have been quite a bit busier at Beta Upsilon. Everyone in the chapter is justifiably proud of the Sigma Nu football squad. Our last two games gave us victories over A.T.O. and Theta Xi, to end the season with a 6-0 record. Dick Landenberger’s passing led us through the first five games, but Dick was sidelined with an ankle injury for the sixth. With all but two men returning, we’re hoping to give stiff competition next fall.

While on the topic of athletics, we’d like to commend the ten Sigma Nus on the varsity team. Congratulations on a hard-fought season. The chapter would like to extend its sincerest wishes for a fast recovery to Brother Don Scott. Scotty is at Union Hospital awaiting a knee operation for an injury received in the Principia football game.

Brothers Maffucci and Raquet recently attended the Sigma Nu State Day Conference at Greencastle. The tentative date for our State Day Dance was set for March 12; the dance is to be held at the Westchester Country Club at Indianapolis.

It seems a bit late, but we have finally slipped into the social season. Along about the last of October (dates are tough, you know) a date party was held at the house, in commemoration of the Great Pumpkin.

LAMBDA CHI ALPHA

Well, the Freshmen won the games, Thanksgiving is over, and that good old two week Christmas vacation is here again. The men at Theta Kappa are looking forward to it with great anticipation.

One of the brothers will have an especially fine vacation (even though it will probably be his last one!). Our illustrious president, Gary Phipps, will be married to Miss Liz Ramsey on December 20. Congratulations, Gary and Liz. It looks like Gary will have to get used to the idea of not being the boss anymore!

The Freshmen Parties, held November 13, were very enjoyable. We hope that the Freshmen enjoyed the entertainment as much as we did the entertaining. We are looking forward to the rush parties with great anticipation.

Congratulations go to new brother Jerry Badger, who went active Sunday, December 15, and to our four new pledges, John Haley, Tom Bedwell, Bill Brown, and John Tindall. Don’t you pledges give Brother Huff too much static!

A mixer was held with the nurses from Union Hospital on Friday, December 11 to wrap presents for the Christmas Party. Due to the presence of the females, the brothers didn’t get much wrapping done. (Except for wrapping up a few dates for the future!)

The Christmas Party followed on Sunday, December 13. This party is held every year for the underprivileged children in town. The kids loved it and so did we.
Before closing, it is only proper that the brothers’ love affairs be mentioned. Bob Amos is almost pinned. (Believe it or not!) Flushed—but still hooked—is Gale Hurst. (Give up, Spike!) And finally, strange as it may sound. Don Bonness is getting restless. He’s seen how these college women are and—well, he’s interested! (Look out, girls!) That’s all!

Tom Feutz

ALPHA TAU OMEGA

Paramount on the Alpha Tau Omega home front is the change in decor for the mantle over our fireplace. The Interfraternity Homecoming Trophy now holds this place, and we are all proud to have it there. The credit for its presence there goes to the entire chapter and especially to Brothers Jay Hirt and Dave Foss who were the display co-chairmen.

Homecoming week was, as usual, a hectic one. With men working inside getting ready for the party Friday evening and men working outside on the display, the house was humming with activity. However, despite rain, winds, and a few brief flurries of test we managed to get everything finished with a few moments to spare. The rain and cold weather may have dampened other persons’ spirits, but we Taus certainly had our share of fun. The party Friday evening was a big success, and many old and not so old faces were seen around the chapter house. Saturday evening gave us another excuse to be happy when the Homecoming Dance was capped off by Brother Schukai, president of Blue Key, awarding the trophy.

On November 7, Alpha Tau Omega and Sigma Nu held the annual V.M.I. Dance at the Student Union Building of Indiana State Teachers College. We danced to the music of Phil Haines and his Quartet. Everyone had a fine time and it helped to draw the two fraternities, founded within one year of each other at the Virginia Military Institute, even closer together.

Friday the thirteenth could hardly be considered unlucky, because that was the day of the second Get Acquainted Parties, and we were fortunate enough to have a fine turn-out of freshmen interested in fraternity life. The hour allowed for each party seemed to fly past and was over before it really got a chance to start. Thanks to Brother Stark’s willingness to relate his life story the entertainment was a “howling” success. Our Mother’s Club certainly deserves a hand too for the delicious pies which were served.

The Annual Children’s Christmas Party for the orphans of the Glenn Home was a very rewarding success. Santa Claus found all the youngsters and was loaded with toys and gifts for each. To watch the kids enjoying themselves and having such a good time really set the holidays off in a true spirit of giving.

Indiana is again under the spell of that spheroid called a basketball, and Rose is no exception. Brothers T. C. Copeland and Woody Stroupe, team captain, are playing ball this year for Rose. Brother Scott Herrin is the team manager. Our interfraternity basketball team is ready to take the floor soon too, and we are looking forward to a good season under the leadership of Brother Jerry Waltz, our athletic director.

Our traditional method of recognizing brothers who are pinned by a sudden immersion in a cold shower has been invoked twice in the past month as two more Taus have given up their maltese crosses. Brother Jay Hirt is now pinned to Miss Joyce Tolley and Brother Bob Stark gave his pin to Miss Priscilla Marie Chickadaunce. Congratulations to Jay and Joyce, and Bob and Priscilla.

Finals week lies just ahead now, and everyone here is getting set for the big final stretch run. The first semester is nearly over now and it has been a good one for Alpha Tau Omega Fraternity. We just hope that the second semester will prove to be as rewarding.

—Bill Carter

THETA XI

Brother Bob Honegger utilized his Thanksgiving vacation to walk the reknown “last mile.” The new Mrs. Honegger is the former Miss Dorothy Fry. The wedding took place on Friday, November 27.

Cadet Larry Pitt recently gave his pin to Miss Jan Newland of St. Mary-of-the-Woods. Theta Xi’s seem to be falling hard and fast.

The TX Tigers are busy practicing for the coming IF basketball season. A championship this year will

(Continued on page 42)
HY-COM SYSTEM

An experimental highway-to-car communications system has been devised by the Research Laboratories of General Motors. The system, called Hy-Com, has been devised for transmitting between roadside transmitters and moving vehicles in order that a new and more efficient highway safety and traffic control program may be devised. Although the highway-to-car communications idea is not new, the idea of a controlled transmission to vehicles moving in a given direction and a given section is new. Transistors have been utilized throughout the components of the system to insure reliable and longer service.

Basically, the Hy-Com system consists of two parts, a low frequency transmitter and a transistorized receiver in the car. The transmitter is placed along the roadside and is used with either an aerial antenna or loops along the highway. The system is designed to operate in the 10-20 kilocycle range in order that it will give no interference to standard broadcasts, and so that broadcast zones won't overlap, giving interference to signals of nearby transmitters.

The receivers used may be either of the portable type that may be attached to the window of the car for use on tollroads or may be permanently installed, using the basic components of the car radio for operation. The voice of the car radio will be muted, or if the radio isn't on, the output stage of the radio is instantly turned on while in the areas in which Hy-Com signals are being transmitted and received.

The transmitting equipment includes an information transmitter, a trigger transmitter, a magnetic tape voice repeater, a 60-cycle transistor inverter and a 12-volt battery and charger, all of which are housed in a weatherproof enclosure. The trigger transmitter sends out signals in a direction towards oncoming traffic which sensitizes the receivers in the car. As soon as the car leaves the trigger zone it enters the voice zone, set up by signals from the information transmitter, where it can receive a message. After leaving the voice zone the Hy-Com receiver is automatically shut off and the car radio resumes operation as it had before the interruption.

Among the many uses of a system of this type are integration with police radio communications, helicopter traffic control, re-routing traffic flow, providing instantaneous trouble ahead warnings, and a supplement to roadside traffic signs through the use of telephone lines to a central broadcast station.

NEW TURBO-RAMJET ENGINE

The solution to a problem studied the world over, the development of the Turbo-Ramjet Engine, may have been found by a graduate of the City College School of Technology, Ed Latin. The engine utilizes a combination of the basic principles of the turbojet engine and the ramjet engine in an effort to produce a jet engine capable of accomplishing higher speeds and more efficient operation.

THE ROSE TECHNIC
The device is built essentially on the principle of the turbojet with the utilization of a high-efficiency centrifugal compressor. The compressor employed is in a disk shape with many supersonic ramjets mounted on the disk (fig 2) so as to rotate it at near sonic velocity. The engine is devised so that it may be operated at near stoichiometric temperatures by using pressure and forcing high-velocity air into the path of the ramjet. This new configuration presents an engine which is less expensive, more durable, more efficient, has a higher thrust ratio, and with far greater power than its predecessors.

One concept of utilizing this engine is to mount it behind the cockpit of plane (fig. 1) so that the rotating member of the engine is perpendicular to the airplane's path of flight. In this manner the engine could be rotated so as to produce a thrust forward, a thrust upward, a combination of horizontal and vertical thrust, or in the manner of a brake. The brake application is a development which if treated correctly could prove invaluable to the aircraft industry.

**AUTOMATIC TRANSISTOR PRODUCTION**

Scientists at the Westinghouse research laboratories have taken a major step toward the fast, continuous, completely automatic manufacture of transistors and related semiconductor devices.

Westinghouse scientists have constructed long ribbons of semiconductor devices by forming them along the surface of long thin crystals of germanium about an eighth inch wide and a few thousandths of an inch thick. Such construction appears to be feasible for the automatic production of transistors and other solid state devices directly by machine.

These devices demonstrate the ultimate usefulness of a revolutionary new method for growing germanium which was recently discovered in our laboratories. This new technique grows the germanium as thin, flat, continuous strips, or dendrites—the exact form which can be used directly in finished semiconductor devices. The unique continuous form of these dendrites, their remarkable uniformity, and their freedom from complicated processing make them unusually attractive, not only for automatic processing into useful devices, but also for the building of advanced kinds of electronic systems.

Conventionally, germanium is grown as a thick, round ingot that requires costly, time-consuming processing to produce useful devices from it. In contrast, such devices can be construed directly on the smooth, mirror-like surfaces of germanium dendrites exactly as the material is grown.

Carried through to the development of over-all systems, the molecular electronics concept could drastically reduce the size, weight and power consumption of space-age electronic systems. This concept involves a new understanding of the basic nature and capabilities of materials and a new approach—on a molecular and atomic scale—to the conception, design and development of materials that exhibit these capabilities.

In molecular electronics one seeks to combine several separate electronic functions into a single operating unit that duplicates their overall electrical behavior. For example, one can conceive of a single tiny slab of solid material that performs the function of a combination of transistors, resistors, capacitors, plus...

(Continued on page 33)
IBM Engineer Richard R. Booth explores electronic frontiers to develop new, faster and larger storage devices for tomorrow's computers.

"My job is to design and develop new, high-speed storage devices for a powerful new computer that will perform, in one day, operations requiring six months on present equipment," said Dick Booth as he began a typical day recently. A product development engineer at the IBM Laboratories in Poughkeepsie, N.Y., he started his morning with a conference on a product of great interest to him: a magnetic core storage device with a nondestructive read-out feature. For an hour, he discussed with circuit design engineers the logical devices needed for the register—such as magnetic core drivers and sense amplifiers. Should such devices not be available, the group would work on designs for new ones.

Dick Booth next met with members of the Magnetic Materials Group to establish specifications for the magnetic core memory elements to be used in the register. He also discussed with the group the development of equipment to test the memory elements. "This magnetic core register is based on an original idea of mine," he explained. "When you have a worthwhile idea, you will be given a free hand in proving it out, backed by IBM's resources—plus the assistance of skilled specialists."

At 10:30, Dick Booth reviewed the status of the entire project with the two engineers, two technicians, and one logic designer who make up his team. "My present position is staff engineer," he explained. "It's the second promotion I've had since I joined IBM three years ago with a B.S.E.E. degree from the University of Illinois. I know that there are plenty of other opportunities to move ahead. Furthermore, parallel advancement opportunities exist for engineers in either engineering development or engineering management."
Preparing for the future

In the afternoon, Dick Booth went to the 704 Computing Center to supervise some complex precision computations. "You see how quickly the 704 arrives at the answers," he said. "The computer being developed is expected to multiply more than 500,000 fourteen-digit numbers a second and add them at the rate of one million a second. The computer may be used for design computations for reactors, as well as calculations of satellite behavior. Of course it should have hundreds of other applications."

At 3:30 P.M., Dick Booth attended a weekly class on Theoretical Physics that lasted until 5:00. Afterward, he commented, "You know, IBM offers excellent educational opportunities both in general education and for advanced degrees. One of the engineers in my group has just received his Master's degree from Syracuse University, after completing a postgraduate program given right here at the IBM Laboratory."

A chance to contribute

As he was leaving for the evening, he said, "Yes, I'd recommend an IBM career to any college graduate who wants to exercise his creative ability. IBM will appreciate his talent and he'll have the opportunity to work with specialists who are tops in their fields. I doubt that he'd be able to find a more sympathetic and stimulating atmosphere. Furthermore, he'll have the added incentive of contributing to vitally important projects . . . projects that will take him to the frontiers of knowledge in computer electronics."

* * *

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Other recently designed and developed products are:

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RESEARCH & DEVELOPMENT
(Continued from page 28)

other circuit components, and yet contains none of these components as actual entities. To perform such an operation, a solid state device must reach an entirely new order of perfection. Conventional ingots of semiconductor materials, which must go through tedious and complicated manufacturing procedures, are not likely to yield the near-perfect devices required for the job.

Crystalline dendrites can make such units possible. Their quality is more uniform because of the unique way in which they grow; furthermore, their desirable properties are not jeopardized by long and complex processing into a usable form. These characteristics, and the fact that they grow as high-quality continuous ribbons, make dendrites also appear to be the only form of material that now looks feasible for the fully automatic production of semiconductor devices.

Germanium dendrites have only one preferred direction of growth, which causes them to form rapidly into strips about an eighth inch wide and a few thousandths of an inch thick. There is no limit to their length.

Useful semiconductor devices are made from a dendrite simply by constructing them directly on its surface. Any desired number of devices can be built on a single dendrite to form a long, continuous strip of devices. Or, if desired, the individual devices can be separated from the group simply by cutting the dendrite into small pieces.

LAIIKA

On Nov. 3, 1957, Sputnik II was launched. In it was Laika, a humble little dog weighing less than 600 grams. In a Russian Technical Report, some of the various developments, research and experimentation carried out were reported. One of the many problems in the experiment was the cabin, equipment and auxiliary apparatus. An airtight cabin was developed that would provide the best conditions. Included in the cabin was equipment such as an automat for measuring the animal's blood pressure, an indicator for air pressure in the cabin, a cabin air temperature indicator, and so forth. During the flight of the satellite, temperature and pressure readings were checked and these parameters were regulated by rheostats on relays. The temperature was maintained at about 15 degrees Centigrade. A three liter container was devised to hold the dog's food supply. A receptacle was also provided to receive the animal's excretions; this was an air-tight receiver fitted to the pelvic region. Much of the research work done was in the way of determining the proper and normal electrical impulses that should be transmitted by the action of the animal wired with various indicators and electrodes. The radio-telemetric system set up in a separate chamber of the satellite received all operational impulses from the airtight cabin.

A great deal of preparation and training was required in order to obtain an animal that would react normally under extremely unusual circumstances, such as a lack of freedom of movement. One problem solved by extensive experimentation was that of the composition of the food to be used. The resulting product consisted of 40% bread crumbs, 40% powdered meat and 20% beef fat, to the total extent of 100 gms. per day. Approximately 120 - 200 milliliters of water was dispensed daily.

The results obtained from the flight backed up promising hopes of space travel. In high altitude flight there is ordinarily a period of partial or complete weightlessness. When the sensation of weightlessness was realized the thorax was released from the compression that keeps respiration continuing. After a brief time heartbeat returns to the normal rate, but it took about three times longer in actual flight than the animal had been trained for. Signals received from the satellite indicated that the conditions inside the cabin were satisfactory for survival of living creatures. Effects of radiation could not be satisfactorily evaluated because observation of the living animal is the only way complete conclusions could be drawn.

With the accumulation of more experimental data the basic concepts and procedure of cosmic flight will be more applicable to the use of the human race.
fuel is by far the greatest single expense in the production of steam power. A hydro-electric power plant requires no fuel in the accepted sense of the term, so one might think that the advantages of a hydro-electric plant would far out-number the steam generating power plant with its extravagant use of fuel. However, fuel is only one of the many items of expense entering into the cost of producing electricity. With few exceptions, our sources of water power are remote from industrial centers, the first cost of the hydro-electric plant is usually far above that of a steam generating plant, and hydro-electric plants are dependent on water supply. In contrast, the steam generating plant is low in first cost and it may be located near the point of power utilization. Consequently, the low heat requires no fuel in the accepted sense of the term, so one might think that the advantages of a hydro-electric plant would by far out-number the steam generating power plant with its extravagant use of fuel. However, fuel is only one of the many items of expense entering into the cost of producing electricity. With few exceptions, our sources of water power are remote from industrial centers, the first cost of the hydro-electric plant is usually far above that of a steam generating plant, and hydro-electric plants are dependent on water supply. In contrast, the steam generating plant is low in first cost and it may be located near the point of power utilization. Consequently, the low heat (Continued on page 42)

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LOCKER RUMORS
(Continued from page 18)

ing lettermen include Captain Woody Stroupe; guards Mike Smith, Ron Jennings, and Dan Pool; forwards Don Dekker and Joe Gladden; centers John Ray and John Tindall. Other returnees from last year's squad and some promising freshmen should push these lettermen for starting positions. With better than average height and bench strength, Rose should be a strong contender for the Prairie College Conference title. Let's all get out and cheer the "roundballers" to a successful season.

November brought a close to the fall intramural program. Intramural football this year turned out to be very lively, with the championship battle going down to the wire. The juniors were victorious in the final playoff. They were then matched against the league All-Stars and emerged victorious, 6-0, in a well-played game played under cover of darkness.

Sigma Nu took the interfraternity football championship this year by going through the entire season undefeated. Following Sigma Nu in the standings were Lambda Chi Alpha at 3-2-1, Theta Xi at 2-3-1, and Alpha Tau Omega at 0-6. With the ending of I.F. football, all four fraternities are looking forward to basketball. This year the I.F. teams look as if they will be well balanced. This means that fraternity night in the fieldhouse probably will produce some great games.

On November 17, the annual freshman-sophomore games were held to determine whether or not the freshmen liked to wear beanies. Evidently, we have some varied tastes in headwear as some beanies were seen with a frilly design while others were hardly seen at all. The first event was the football game. After a hard-fought contest, the frosh emerged victorious in the wild affair. Action then shifted to the fieldhouse for the basketball game. The now-inspired freshmen showed the sophomores no mercy and left the basketball game "beanieless", after an easy victory.

This total comes to $640,001,066,-000,001 plus a questionable amount.

The consequences of a project of such magnitude must be predicted with great accuracy to prevent any unforeseen problems which could cause complete failure. Since the technical problems have already been solved, the sociological effects must be considered. When astronomers first see the changes taking place on the face of the moon, they will spread the news throughout the world. Almost immediately, more and more people will begin watching the moon. One of the first results will be the great demand for telescopes. If the contractors for this project will go into the optic's business, as a sideline, part of the expense can be defrayed. As the project progresses, to a stage where the changes can be seen with the naked eye, there will be a great problem caused by people continually looking up. To prevent a mass case of stiff necks, the optics company can then start selling small mirrors which can be attached to eyeglass frames and can be focused on the moon. This product will likewise help to defray the expenses of the project.

It is likely that the number of marriages will drop sharply due to this project. Those couples who had been going to lovers lane under the pretense of watching the moon will actually be doing this. Although this sounds like a sad situation, it will be beneficial since it will serve as a solution to the over-population problem.

When the banner of Rose is finally completed on the moon, the whole world will clamor to know what this word means. Undoubtedly, the President of the United States will call a news conference and announce with pride that Rose stands for Rose Polytechnic Institute whose 1959 Tau Beta Pi pledge class created the project.

The Rose Technic
To our missile experts, "is it ready" is almost as important as "how far can it go." For retaliatory power, missile crews must be able to launch a maximum number of missiles in rapid fire order.

America's intercontinental ballistic missile, the Atlas, had already proved itself for distance on a 5500-nautical-mile range. But checkout and launching took several hours. So the next step in turning the missile into an operational weapon was to make it ready for quick action. RCA was selected to build an electronic system that would radically reduce the countdown time at the Atlas Operational Bases now under construction.

Now, in a matter of minutes, this elaborate electronic system can determine if any part needs attention—or signals that the missile will be ready to go.

This automatic checkout equipment and launch control system for the Atlas is one more of the many ways in which RCA Electronics works to strengthen our national defense.
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HOLIDAY READING
May we suggest the following titles for your holiday reading pleasure. They represent a selection from the newest books in the Library.

The Angers of Spring, by Joseph Whitehill

Joseph Whitehill’s first novel is warm, vital, charged with humor and with swift, accurate human observation. Furthermore, it presents an exciting picture of an American profession hitherto unexplored in fiction: electronics engineering.

Mr. Whitehill writes of machines with a passionate intensity that makes them sing. His picture of an electronics plant at work is, to put it simply, hypnotic. But Joseph Whitehill is an author whose talent lies, firsthand, foremost and headlong, with people—“the real live population of this U.S.A.”

Command the Morning, by Pearl S. Buck

In Command the Morning, Pearl S. Buck has turned to the greatest topics of our times—man’s conquest of the atom—and, seeing it as both novelist and woman, woven this suspenseful story of the thoroughly human beings who brought it to pass. She takes us back to those fateful years early in the second world war when great physicists had become convinced that a weapon of unutterable destructive power was within their grasp. We live with the scientists from then on, as they become ever more awestruck at what they are unleashing. We listen in their laboratories as they work out the mechanics of their monster—the details that may mean the difference between a dud, a usable bomb, and a holocaust that will set the hydrogen in the oceans ablaze and consume the world. We sit in their homes as they struggle with their disrupted private lives—and we stand beside them in their sleepless nights as they grapple with that nightmare question which each of them must ultimately confront squarely: Shall this weapon be used?

All About Men, by Joseph H. Peck

In this refreshing, entertaining book, blessed with rare common sense, an old-time family doctor tells what his thirty years of medical practice have taught him about the ailments, appetites and aberrations of his fellow men—and women.

Teenagers, bridegrooms, husbands and fathers will relish Dr. Peck’s sallies . . . and they will welcome his excellent advice on how to be healthy and happy, and live at peace with wife, children, boss, neighbors—and themselves.

Across the Sea of Stars, by Arthur C. Clarke

The eighteen short stories and two full-length novels presented here show the tremendous scope and power of Clarke’s imagination and writing talent. They clearly reflect his reputation as a brilliant scientist. Those who already know Clarke will not want to miss this collection. Those who have not yet read Clarke have this exciting discovery ahead—a discovery that includes the fastest space ship in existence chasing a lone man around a Martian satellite; a phony death ray that turns out to be the real thing; an invasion, not from outer space, but from within the earth; and a war that was lost because the enemy’s science was inferior.
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- Engines
- Diesel
- Gas

**Fields**
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- Stress Analysis
- Process Engineering
- Mechanical Design
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- Nucleonics
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line segments $2AC$ and $2CE$, or $2R (\sqrt{2} + \sqrt{3})$ is then a reasonable approximation to the circumference. From this point, the construction of the equivalent rectangle is relatively simple. Merely lay off the circumference as the length of the rectangle and one-half the radius as the width and we have squared the circle. Since $C = 2\pi r$, then $C.R/2 = 2\pi r/2 = \pi r^2$, the area of a circle.

A second, more precise method uses $355/113$ as the approximation to pi. This value deviates but three ten-millionths from pi. This is so accurate that no instrument could possibly detect the difference between this value ($3.14159292 \ldots$) and $\pi$ ($3.14159265 \ldots$). To obtain this quotient, graphical division may be used. By construction methods divide a line 355 units long by 113. The resulting segment, pi, can be laid off as one side of a right triangle whose other side is $R^2$ units, where $R$ is the radius of the given circle. The area of the square will then be $\pi R^2$, almost exactly equal to the area of the circle. The error is only 1 in 9,000,000.

From a practical standpoint we have squared the circle. No man or machine could ever detect this slight error. Such trivial error would mean nothing to a surveyor or engineer. However, in the eyes of the mathematician, we have not squared the circle and we never will. Mathematics is exact and it will not accept something “almost true.” The mathematician regards our crude solutions just as wrong as $2 + 2 = 5$.

The quadrature of the circle is impossible by pure construction methods. Yet some will say that solving the impossible merely takes a little longer. We can construct a square that approaches the area of a circle. Man is satisfied with nothing but perfection. He will continue to study the squaring of the circle.
• Flight data systems are essential equipment for all modern, high speed aircraft. In the AiResearch centralized system, environmental facts are fed to a central analog computer (above), which in turn indicates to the pilot where the aircraft is, how it is performing, and makes automatic control adjustments. Pioneer in this and other flight and electronic systems, AiResearch is also working with highly sensitive temperature controls for jet aircraft, autopilot systems, submarine instrumentation, transistorized amplifiers and servo controls for missile application, and ion and radiation measuring devices.

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- AiResearch is also working with hydraulic and hot gas control systems for missiles.
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- **Gas Turbine Engines**—world’s largest producer of small gas turbine engines, with more than 8,500 delivered ranging from 30 to 850 horsepower.

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FOLLOW THE LEADER is no game with Delco. Long a leader in automotive radio engineering and production, Delco Radio Division of General Motors has charted a similar path in the missile and allied electronic fields. Especially, we are conducting aggressive programs in semiconductor material research, and device development to further expand facilities and leadership in these areas. Frankly, the applications we see for semiconductors are staggering, as are those for other Space Age Devices: Computers . . . Static Inverters . . . Thermoelectric Generators . . . Power Supplies.

However, leadership is not self-sustaining. It requires periodic infusions of new ideas and new talent—aggressive new talent. We invite you to follow the leader—DELCO—to an exciting, profitable future.

If you’re interested in becoming a part of this challenging DELCO, GM team, write to Mr. Carl Longshore, Supervisor—Salaried Employment, for additional information—or talk to our representative when he visits your campus.

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C. **Case carburization** makes the steel of Timken bearing races and rollers hard on the outside to resist wear, tough on the inside to resist shock. This prolongs the life of Timken bearings. And the steel we start with is the best. It's nickel-rich for toughness.

**What is Better-ness?** It's our word for the result of the ceaseless American urge to make machines that do more, do better, do faster. Our engineers help make Better-ness possible. They've pioneered every major tapered roller bearing advance. And they work right at the drawing board with engineers of every major industry. It's exciting, rewarding work with a future.

If you would like to help create Better-ness on our engineering team, write Manager, College Relations, The Timken Roller Bearing Company, Canton 6, Ohio.
STEAM POWER PLANTS
(Continued from page 34)

efficiency factor of the steam generating plant may be more than offset by these advantages.

The low heat efficiency factor is due in part to the heat that is lost to the cooling water in the condenser, and the heat that is lost through the smoke stacks. The heat loss in the escaping gases through the smoke stacks is reduced to a minimum by using the heat to preheat the incoming air which is necessary for combustion. Some plants utilize even more of this heat that would otherwise be lost by placing a feed-water heater, called an economizer, within the flue.

In general, when you consider that the cost of fuel, labor, and equipment has been rising, you may wonder why the cost of electricity has increased little in the past twenty years. The reason is that engineering achievements in power plants have allowed a higher efficiency of generating and distributing electricity.

FRATERNITY NOTES
(Continued from page 28)

permanently retire the traveling trophy, and Coach Vern Gross’s squad will be loaded for bear. Returning veterans are Bros. Lanning, Cunningham, Wardle, McCardle, and Schreiner. Newcomers Blase, Andis, McGivern, and Gilpatrick should bolster the team quite a bit.

Several of the do-it-yourself fans, led by Brother Clayton, have just finished a remodeling job in the basement. Brother Fiddler intends to fulfill a lifetime ambition by building a bar.

“Thanks” to Dr. and Mrs. Robert Brown, who generously donated a 24" RCA Victor console television set to the chapter. Chapter scholarship is expected to drop in the near future.

Congratulations to Sigma Nu for winning the Interfraternity football championship. Battered and bruised, we can only shout, “Wait ’till next year.

—Bob McCardle

SEMICONDUCORS
(Continued from page 13)

that they originally encountered when trying to use vacuum tubes for the thousands of amplifiers the computers used. The military uses of transistors are of such importance that today various space and defense projects still demand high priority use of manufactured transistors.

It is estimated that about 30 U.S. manufacturers now produce over 500 official types of transistors causing the estimated number of units sold in 1959 to be around 120 million units. It is further predicted that by 1964 transistor sales will surpass tubes sales and that in 1966 the transistor sales will reach the tremendous sum of one-half billion dollars.

We can certainly see how important these miracle devices are. Anyone the least bit interested in electrical engineering, or in any other field, should spend more time studying these gadgets. They are causing enormous changes in every part of the world and in every phase of life today.

Starting Salaries

The Engineers and Scientists of America has conducted a further study of the trends of starting salaries for newly graduated engineers. From the data available we have prepared recommended minimum starting salaries for various levels of experience and class standing.

Copies of this recommended minimum standard have been sent to your Dean of Engineering, Engineering Library, Placement Director, and Chairmen of the Student Chapters of the various Technical Societies.

We would be happy to send you a complimentary copy upon request.

Engineers and Scientists of America
Munsey Building
Washington 4, D. C.

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December, 1959
The Salesman whose pants wear out before his shoes is making too many contacts in the same place.

They tell us that in certain parts of town you can still buy a drink of liquor for a dime—or so a recent autopsy discloses.

Two men were knocking another: "To me," said one, "he's a pain in the neck."

"Funny," said the other, "I had a much lower opinion of him."

"Use a bottle opener, Granny. You'll ruin your gums."

"Drink?"
"No."
"Neck?"
"No."
"Well, do you eat hay?"
"Of course not!"
"Gad, you're not fit company for man or beast."

Some girls are not afraid of mice, others have pretty legs.

Chemical Engineer (moaning at the bar): "It's terrible, the cost of living has gone up to $4.18 a quart."

Coed: "Did I ever show you the place where I hurt my hip?"
Date: "No."
Coed: "All right, we'll drive by there."

Little Audrey, mad as hell, Pushed her sister in the well. Said her mother, drawing water, "Gee, it's hard to raise a daughter."

Little Mary was left to fix lunch and when her mother returned with a friend, she noticed Mary had the tea strained.

"Did you find the lost strainer?" mother asked.

"No, mother, I couldn't, so I used the fly swatter," Mary replied.

Mother nearly swooned, so Mary hastily added, "Don't get excited, I used the old one."

Johnny hopes to make the news. He wants to fill his father's shoes.

Mary hopes to do much better—She wants to fill her mother's sweater.

"She isn't my best girl—just necks best."

Women's faults are many, Men have only two; Everything they say, And every thing they do.

Daffynition: Alimony — The high cost of leaving.

Girls who do everything under the sun ought to have their hides tanned.

Mother: "Well son, what have you been doing all day?"

Son: "Shooting craps."

Mother: "Well, that must stop, son. Those little things have as much right to live as you do."

"Do you have a faculty for making love?"

"No, we rely on the student body."

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

Prof.: (In the middle of a joke) "Have I told this joke in class before?"

Class: (In a chorus) "YES!"

Prof: "Good, you'll know when to laugh this time."

Engineering Comp. problem: If it takes 10 hours for a woodpecker with a rubber bill to chop $65 worth of shingles from an oak tree, how long does it takes a grasshopper with a wooden leg to kick the juice out of a dill pickle?

Blessed are the pure for they shall unhibit the earth.

"Just because my eyes are red is no sign I'm drunk. For all you know, I might be a white rabbit."

Mary had a little skirt, And it was very tight, Who gives a damn for Mary's lamb, With Mary's calves in sight.

He: "Whisper those three little words that will make me walk on air."

She: "Go hang yourself."

A drunk fell out from a third floor window. A crowd immediately gathered.

"What's going on," yelled a cop as he pushed his way through to the drunk.

"Ish dunno," hiccupped the drunk, "Ish just got here."

Page 44
Photography works for the Engineer

There's hardly a spot in business and industry today where photography does not play a part at simplifying or easing work and routine. It works in research, on the production line, in the engineering and sales departments, in the office. And everywhere it saves time and costs. You will find it valuable in whatever you do. So be sure to look into all the ways it can help.

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Interview with General Electric's
Charles F. Savage
Consultant—Engineering Professional Relations

How Professional Societies Help Develop Young Engineers

Q. Mr. Savage, should young engineers join professional engineering societies?
A. By all means. Once engineers have graduated from college they are immediately "on the outside looking in," so to speak, of a new social circle to which they must earn their right to belong. Joining a professional or technical society represents a good entree.

Q. How do these societies help young engineers?
A. The members of these societies—mature, knowledgeable men—have an obligation to instruct those who follow after them. Engineers and scientists—as professional people—are custodians of a specialized body or fund of knowledge to which they have three definite responsibilities. The first is to generate new knowledge and add to this total fund. The second is to utilize this fund of knowledge in service to society. The third is to teach this knowledge to others, including young engineers.

Q. Specifically, what benefits accrue from belonging to these groups?
A. There are many. For the young engineer, affiliation serves the practical purpose of exposing his work to appraisals by other scientists and engineers. Most important, however, technical societies enable young engineers to learn of work crucial to their own. These organizations are a prime source of ideas—meeting colleagues and talking with them, reading reports, attending meetings and lectures. And, for the young engineer, recognition of his accomplishments by associates and organizations generally heads the list of his aspirations. He derives satisfaction from knowing that he has been identified in his field.

Q. What contribution is the young engineer expected to make as an active member of technical and professional societies?
A. First of all, he should become active in helping promote the objectives of a society by preparing and presenting timely, well-conceived technical papers. He should also become active in organizational administration. This is self-development at work, for such efforts can enhance the personal stature and reputation of the individual. And, I might add that professional development is a continuous process, starting prior to entering college and progressing beyond retirement. Professional aspirations may change but learning covers a person's entire life span. And, of course, there are dues to be paid. The amount is graduated in terms of professional stature gained and should always be considered as a personal investment in his future.

Q. How do you go about joining professional groups?
A. While still in school, join student chapters of societies right on campus. Once an engineer is out working in industry, he should contact local chapters of technical and professional societies, or find out about them from fellow engineers.

Q. Does General Electric encourage participation in technical and professional societies?
A. As a matter of fact, General Electric does encourage participation. In indication of the importance of this view, the Company usually defrays a portion of the expense accrued by the men involved in supporting the activities of these various organizations. Remember, our goal is to see every man advance to the full limit of his capabilities. Encouraging him to join Professional Societies is one way to help him do so.

Mr. Savage has copies of the booklet "Your First 5 Years" published by the Engineers' Council for Professional Development which you may have for the asking. Simply write to Mr. C. F. Savage, Section 959-12, General Electric Co., Schenectady 5, N. Y.

*LOOK FOR other interviews discussing: Salary • Why Companies have Training Programs • How to Get the Job You Want.