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February, 1960

In This Issue

FLY ASH: PART I
HUMAN ENGINEERING
BEHAVIOR ANALYSIS
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February, 1960
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Division of General Motors, Indianapolis, Indiana
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Cover Note

Allied Structural Steel Companies, fabricated and erected 3,150 tons of structural steel for this 800-bed U. S. Naval Hospital of Great Lakes, Illinois.

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February, 1960
To the Editors of the Rose Technic:

I would like to stand corrected on my recent editorial of January, 1960. The corrections are as follows:

1. There will be a Master of Science in Engineering offered and not a Master of Engineering Sciences degree.
2. All sports would not be eliminated. Intramurals would be continued but varsity sports will be eliminated if they are not properly supported.

I would also like to clarify the reason for the printing of the letter to the editor in the previous issue. This agrees with a stated policy in a previous issue. The policy was that any letter written on a legitimate topic would be printed, signed or unsigned. This policy was recently changed, but after the letter had been printed. It should also be noted that, on the contents page, it is stated that this magazine does not necessarily agree with the opinions expressed by its contributors.

Personally, I feel a lesson can be learned from the action caused by the letter mentioned above. It should point out some of the deficiencies of our engineering training at Rose. As potential engineers, we should be able to sit back and plot a course of action against just such unpleasantries. We should not go off "half-cocked", but use the bad things of life to help and better ourselves.

I hope this has cleared up some of the questionable points of the January issue of the Technic. Now I should like to extend my congratulations and those of my co-editor, Ron Staggs, to the new editors of the Technic. I hope that the new editors will exercise their freedom of the press and not become outmoded because the magazine can only say yes. They will surely do a fine job, and Ron and I wish them the best of luck.

Robert Larry Berger

To the Editors:

Are fraternity politics necessary at Rose? By fraternity politics, we mean not only politics carried on by the four social fraternities, but by any group which exerts an organized influence on any school election. We believe that such fraternity politics not only unnecessary but detrimental to the functioning of the affected organization or class and to the spirit and enthusiasm of its individual members. In addition, the honor associated with the election to any office has been almost completely destroyed.

The success of any organization and the benefit derived by its members depends upon the most capable leadership. The most capable men will be those who are elected through an honest consideration of their capabilities by each voter and not through fraternity ties. It is then the responsibility of the persons elected to perform their duties with integrity and impartiality and not to use their office to deliberately further the prestige of their fraternity or group.

We think that most of the men at Rose are familiar with fraternity politics but in this knowledge are unwilling to believe that the situation can be changed. However, we believe that if the underclassmen can be made to realize the significance of the situation, they may accept the responsibility of working together as a student body and not as small self-prospering groups. If the spirit given to the individual fraternities and groups would be partly directed to the school in general, the organizations and classes would function more efficiently, and, as a result, the entire student body would benefit; thus, the reputation and standing of Rose will be maintained.

Yours truly,

Jim Godwin
Rich Carter
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...in hydraulics

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February, 1960
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Summer jobs often lead to rewarding careers at Du Pont

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Pictured are a few of the many Du Pont plants and laboratories across the country where selected technical students roll up their sleeves during summer vacation and put their college training to practical use.

Most of the assignments are similar to work the employees are likely to do after graduation. Next summer, for example, a chemical engineering student may go to work on a catalyst recovery project. A mechanical engineering trainee may become engrossed in a challenging hydraulic study. A promising young chemist may tackle a problem in organic chemistry.

In short, each man is given a regular plant or laboratory assignment commensurate with his education to date. And, as with permanent employees, the student’s training is personalized and tailored to fit his background and interests... even to the location he prefers, as far as practical.

This program has proved of benefit both to students and to Du Pont. It gives students an opportunity to increase technical knowledge and to learn how to put college training to use in industry. It gives Du Pont a chance to observe men who will soon be graduating in science and engineering. Many of these summer associations are stepping stones to rewarding careers with this company.

Juniors, seniors and graduate students will be given technical assignments. Opportunities are in chemical, mechanical, electrical and metallurgical engineering; also in physics and mathematics. Candidates should write at once to E. I. du Pont de Nemours & Co. (Inc.), 2420 Nemours Building, Wilmington 98, Delaware. Openings are, of course, limited.

There are opportunities also for men who have completed their freshman and sophomore years, as laboratory assistants or vacation relief operators. They should apply direct to the Du Pont plant or laboratory location of their choice.

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- Chemical Engineering
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Honor System?

“Firm in the belief that there can be no real research without honesty and no genuine engineering without integrity, and, knowing that without an atmosphere of mutual trust, the capacity to be honorable can never be fully utilized or developed, we, the students of Rose Polytechnic Institute, do solemnly resolve that we accept the responsibilities which are given us by the Student Honor System.”

This was the preamble of the honor system constitution which was proposed two years ago. This proposal never passed the 90 per cent approval of the student body. Many students and faculty at the time believed this proposed constitution did not pass for two reasons:

1.) The mechanics of the constitution were not acceptable to many students.

2.) Many students did not vote because they were just not interested in whether it did or did not pass.

Why is an honor system desirable? Obviously this type of system cannot function properly unless the students are all honest in the first place, so why have it at all? I believe the Honor System is a tool upon which this “atmosphere of mutual trust” is built between students and faculty. You may think we have this trust now, but do we really? A professor still stays in the room where his students are taking a test, professors keep certain laboratory reports and do not return them for fear they will be used again in the future. A take home test, which in certain aspects is a definite advantage, is rarely given by the faculty.

Recently, a very interesting article appeared in the Saturday Evening Post which described the embarrassing situation of mass cheating existing in certain institutions of higher learning. We of Rose have always been proud of our reputation and good name, however I believe that our prestige could be strengthened by establishing a self-disciplining Honor System.

In addition to increasing our school’s prestige, the Honor System can emphasize our self-respect enough to carry on into our lives after graduation.

D.A. J.
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SPACE
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TO GRADUATING SCIENTISTS AND ENGINEERS

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NASA Research Centers and their locations are:

- Langley Research Center, Hampton, Va.
- Ames Research Center, Mountain View, Calif.
- Lewis Research Center, Cleveland 35, Ohio
- Flight Research Center, Edwards, Calif.
- Goddard Space Flight Center, Washington 25, D.C.

NASA National Aeronautics and Space Administration
In order that the students and the alumni may understand better some of the changes that are occurring at Rose, I would like to clarify some of the points about which there appears to be confusion. In my opinion one of the healthiest signs on the campus is a new spirit of inquiry, questioning and ferment among the students and the staff. Without this favorable situation, we cannot expect progress. The only thing about which we are sure is that there will be continual changes. Some of the changes will be good and they will be continued. Some of the changes will prove to be not so desirable and they will be modified.

This applies to the various curricula, to the extra-curricular activities and to all other phases of life at Rose. Each curriculum will continue to change from year to year with the hope that those who graduate from Rose will have been given an opportunity to understand what is currently meant by the profession of engineering.

Study of the catalog indicates that each of the various curricula can be completed in the regulation four years, or eight semesters, by the average well prepared student. The student who is less well prepared, or who can absorb information less rapidly than the average, will be given a special program. His academic load will be lightened. As a result, the student who takes a lighter load in any one particular semester will require more time in which to complete the requirements for the Bachelor’s Degree. This is the program which the students have been calling the “5 Year Program.” In essence, there is no 5 year program but merely a specially tailored program for those students who cannot progress, for various reasons, at the same rate as the average well prepared student. Each student will have a time schedule tailored to his particular needs so that he may graduate from Rose with the knowledge that he understands the meaning of the word professional engineer and is ready to enter into a career of professional engineering.

On the other end of the spectrum is that group of students who for various reasons can progress more rapidly than the average student. These students may come with advanced standing in certain courses, they may be able to pass a particular course by taking an examination without having taken the course, or they may demonstrate by their grades that they can do additional specialized work. All this will be possible by designing a specific program for those students with special interests. Many of these students will be interested in learning the techniques of research and working on a research problem while still undergraduates. This explains why it is so important that certain members of the staff engage in research and make available to the students the opportunity to assist them. This can be accomplished through the medium of courses labeled “Special Problems,” or an honor program. The name of the course is not important, the chance to get the information is.

There will be an active program at the Master’s level. The degree which the students will earn will be Master of Science in Engineering. While most of the courses that they will take in this Master of Science program will be in the field of engineering sciences, each student will be allowed to specialize by engaging in a thesis in his particular area of interest.

Even in a school as small as Rose, the biggest problem is one of communication. As a matter of fact, the student body in general shies away from courses in communication such as reading, writing and speaking. Among the better ways to improve both campus communication and the ability of students is the publication of newspapers and magazines, and the sponsorship of meetings and seminars by the students. There are now three media of written expression on the campus at Rose; the two old standbys are the Modulus, which is the year book, and the Technic, a monthly technical magazine. This year, an innovation, a bi-weekly newspaper, the Explorer, has been started. It is my hope that all three will prosper and provide opportunities for three different staffs composed of three different groups of students to learn the art of communication through the written word. It is my hope that, as an extra curricular activity, all students will get experience in writing or speaking without making it necessary to increase the number of class hours in the communication arts.
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ON FORMING GOOD JUDGMENTS

Human Engineering

By Steve Like, frosh.

For a generation there has been developing in Europe and America a literature the main purpose of which has been to improve industry through improving the human factor. Only recently have engineering schools become directly interested in what is sometimes referred to as the social engineer. This attitude seems to be the result of many engineers whose experience has convinced them of the need for human engineering in industry.

The social sciences have contributed much to the advancement of industry. Economics, psychology, and medicine have made striking progress in this direction. Industry thus receives a big boost in the sociological frame of mind.

Since many believe it to be the most important, I shall discuss the economic value of an open mind. All activity is preceded by an idea or a series of related ideas. First we think about doing something and finally decide when and how to do it; or we may decide not to do it. What we take into account before making a decision is an indication of the open or closed state of our minds.

To decide upon a reaction we must take, we must exercise good judgment. A man using good judgment in a given situation benefits from his decision more than the man who goes out to solve a problem possessing only vast quarries of information.

The open mind is a creative one. If we let the creative mind study about his work, not only have we made him happy and furthered his knowledge on the subject, but we have solved the problem of monotony. As we can see, creative thinking is productive. To be creative, we must develop the habit of using mental tools available. In other words, do research. It is compulsory that we inculcate the habit of research if we are to continue progressing in industry.

Making use of a single talent that we may possess is the achievement of research. To illustrate this, let us look into the life of Dr. Alexander Ehrlich. Ehrlich was an excellent stainer of microscopic slides, but he never passed his examinations in medicine. By developing his existing talent, Ehrlich made some startling discoveries, one of which is arsphenamine 606, now used for destroying the parasites that cause one kind of yellow fever. The number 606 means that 605 failures preceded this success. Surely this is an open mind. Patience is another evidence of an open mind — the willingness to try and try again.

An open mind is an active mind. Such a mind is also unprejudiced. An indication of a wise person is his willingness to think about all phases of an idea. A wise man listens to ideas very attentively and reasons carefully, being certain not rule out any possibilities. By now it is apparent that progress is the result of open-mindedness.

Also very important in human engineering is organization. Man is an organization; an organization of brain, arms, legs, feet, hands, head, and heart directed to carry out the activities of living. The machine is likewise an organization; an assembly of certain parts uniquely for a certain purpose. As a family is an organization of human beings, industry is an organization of different machines. There is something about working with others toward a common goal that is inspiring. It gives one a feeling of well-being and accomplishment. Any organization of human beings is significant because of its social importance and achievement and for an organization to be purposeful at all requires co-ordination of human engineering.

One of the first essentials in the introduction of new ideas into industry is appreciation of the effect of these new ideas upon the great (Continued on page 40)
By Bill Perkins, sr., c.e.

For centuries, concrete has been a most important and versatile building material. Here is how fly ash is used to make a more economical pozzolanic cement. The sequel to this article will appear in next month’s issue.
Concrete is one of man’s most important and most versatile building materials. Its use dates back before the beginning of recorded history. Many different types of concrete have been used through the ages; one of the oldest and most important types is made with pozzolanic cement. Probably the most widely used pozzolanic cement today is made with fly ash, the ash collected by precipitators in coal-burning power plants. This article, the first of a series of two to be presented on fly ash, will first discuss the history, the characteristics, and the chemistry of pozzolanic cement; this will serve as excellent background material for the primary discussion of this series on the use of fly ash.

POZZOLANIC CEMENT

Pozzolanic cement gets its name from the group of mineral substances called pozzolans, which make up part of the cement. A pozzolan is defined in the American Society of Testing Materials Designation C129 as "a siliceous or siliceous and aluminous material, which in itself possesses little or no cementitious value, but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties." Pozzolans include naturally occurring minerals, natural materials treated by heat or chemicals and artificial materials such as ground brick, fly ash, and various slags.

HISTORY OF POZZOLANIC CEMENT

Pozzolanic cement, like concrete, was used long before recorded history began. Undoubtedly by accident the ancient people discovered that a combination of certain volcanic materials with calcined limestone greatly improved the quality of mortars. This combination-type mortar also hardened under water as well as in air. The earliest known pozzolans to be used in this manner included Santorin earth, a rhyolite tuff from the island of Santorin, and phonolitic tuffs from Vesuvius in Italy. Deposits of these phonolitic tuffs near the town of Pozzuoli provided the source of the presently used name, pozzolans.

Of the many structures the Romans erected using pozzolanic cement, the most famous is the Pantheon, a magnificent building, with 20 feet thick walls, that is still in excellent condition.

After natural cements were developed during the latter part of the 18th century and portland cement in the early 19th century, the use of pozzolanic cements declined. Although it has been known for nearly 75 years that combinations of portland cements and pozzolans give desirable qualities to mortars and concretes, engineers have been very cautious about using such pozzolanic cements. Only since around 1950 have portland pozzolan combinations come into general recognition as effective cementing materials.

CHARACTERISTICS OF POZZOLANIC CEMENT

One big reason probably contributed to retarding the use of portland - pozzolan combinations; several unsatisfactory experiences were encountered because inferior pozzolans or excessive proportions were used. The resulting adverse effects included reduced rate of hardening and development of strength and elasticity, increased drying shrinkage, increased water requirement, and low resistance to freezing and thawing.

Lengthy testing and experimentation has now shown that combining the best pozzolans in optimum proportions with portland cement will improve many qualities of concrete:

1. Improved workability.
2. Lower heat of hydration and thermal shrinkage.
3. Increased watertightness.
4. Improved resistance to attack by sulphate soils and waters and sea water.
5. Improved extensibility or resistance to cracking.
6. Improved plastic or stress adjusting characteristics.
7. Reduced alkali-aggregate reaction.
8. Lower susceptibility to dissolution and leaching.
9. Lower costs.

These definite advantages may be augmented by the facts that the better pozzolans will not increase water requirement, will produce concrete with satisfactory resistance to freeze-
ing or thawing (particularly with air entrainment), and will not greatly increase (and may even decrease) drying shrinkage.

CHEMISTRY OF POZZOLANIC CEMENT

R. H. Bogue, in his book, The Chemistry of Portland Cement, expertly summarizes the present state of knowledge about pozzolans:

"The chemistry of pozzolans is still not solved . . . and only when the chemical action is completely understood will it be possible to design a "pozzolan" of ideal composition for any particular purpose."

The generally accepted theory is that the siliceous compounds in a finely ground pozzolan react with hydrated lime (calcium hydroxide) formed during the hydration of portland cement to form highly stable cementing substances of uncertain composition involving water, calcium, and silica. The hydrated lime has no cementing value by itself; it is soluble in water and therefore may be leached from permeable concrete by percolating water. The factors that effect the manner and rate of the silica-hydrated lime combination are unknown. Obviously with the limited knowledge of pozzolanic chemical activity, the chemical composition of pozzolans is of little value in judging their quality. Consequently engineers have sought additional methods for studying pozzolans. Now spectrographic methods, microscopic and petrographic examination, X-ray diffraction methods, and thermal differential analysis, combined with chemical analysis, are being utilized to investigate pozzolans. Eventually these methods will probably lead to an understanding of pozzolanic activity, but yet today the only sure way of judging the quality of pozzolans is by actual performance tests.

FLY ASH IN CONCRETE

Fly ash, although formed artificially, is nevertheless probably the most important pozzolan in use today. Unlike pozzolans in general, the use of fly ash is relatively new, dating back only to the 1940's. As far as scientists know, fly ash acts chemically like the other pozzolans; it also possesses most of the same characteristics as other pozzolans. The unique quality that makes fly ash so important is that it is a waste product, otherwise worthless except in concrete. Fly ash offers the advantages of the other pozzolans plus the fact that it is plentiful and very cheap.

COLLECTION AND COMPOSITION OF FLY ASH

When pulverized coal is burnt in boilers, the ash is carried upward in the gases as fused particles which solidify into a roughly spherical shape. This ash can be collected in mechanical or electrical precipitators. The electrical precipitator, the more efficient of the two, charges the suspended particles in the corona discharge and subjects these charged particles to an electric field. This causes the particles to migrate to collecting electrodes from which masses of the particles are moved to receiving hoppers. This process collects much finer material than could be recovered with mechanical collectors.

The fly ash is very finely divided and has a specific surface which varies from about 2000 to 5000 square centimeters per gram and is generally greater than that of cement. In composition the major constituent is glass with quartz and mullite as the most important crystalline components. Combustible material is always present, but in well burnt samples it is below 10%. The value of fly ash from different power stations varies widely, but most have useful pozzolanic properties.

SAVINGS THROUGH USE OF FLY ASH

To emphasize that the basic advantage of fly ash is the economy, two examples for which figures are available are cited in Table 1. The savings in these projects were realized even though the fly ash was shipped well over 1000 miles to the sites of the projects.

TESTING OF FLY ASH

Before building material of any kind can be used with confidence a great deal of testing is necessary. Extensive tests were run by universities, highway departments, power companies, the United States Bureau of Public Roads, the United States Bureau of Reclamation, and the Corps of Engineers, United States Army. The results of many of these tests are summarized in this article and its sequel.

Pozzolanic cements, including fly ash cement, consistently develop higher tensile strengths than portland cements alone, as shown in Table 2.

Fly ash is one of the most efficient strength-developing pozzolans. Table 3 lists the average results of strength tests of 3/4-inch maximum and 1 1/2-inch maximum concretes in 6-inch by 12-inch cylinders for straight portland cement and 70-30% blends of portland cement-fly ash with 5 different water to cement ratios.

Another set of data using fly ash of low carbon content indicates that their substitution for 30% by weight of portland cement reduces the strength of wet-cured concrete at 70°F. by about 35-40% at 28 days, 20% at 90 days, 10% at 180 days, and very little at one year. For a 40% substitution, the reductions were 60% at 28 days, 30% at 90 days, 15% at 180 days, and very little at 1 year. A 20% substitution gives a strength reduction of 10-20% at 7 days and 5-15% at 28 days. The fineness of the ash appears to have more influence on the strength developed than does the combustible content provided this is below about 10%.

Fly ash causes drying shrinkage to be reduced, as shown in Table 4. The values listed represent the average of results from five series of tests with two different sources of fly ash.

The results of tests run by the Bureau of Public Roads and the Corps of Engineers add greatly to our knowledge about this newly-introduced, money-saving building material, fly ash. These results will be summarized in the sequel to this article in the March issue of the ROSE TECHNIC.

(Continued on page 36)
CONFORMITY VS. INDIVIDUALITY

BEHAVIOR ANALYSIS

By Ken Miller, frosh.

Could there be certain basic assumptions that guide the actions of people? Are there basic, underlying reasons why John Doe votes Democratic every election? Why do some students work until the job is done, while others give up in disgust? I believe that every human action bears an explanation. Of course, to analyze every little twitch of a finger would be a tedious task. Nevertheless, I can note general behavior patterns and determine upon what assumptions they are based. I have tried to derive the public’s primary suppositions on the subjects of education, conformity, and American government. Although these assumptions may not reflect the attitudes of everyone, I believe that the majority of people I have encountered adhere to them.

The common belief today is that one cannot attain true success without a college education. People naturally take this for granted because so many industries will hire only college men. Experienced employees, trying to work their way into key, administrative posts, resent that young college graduates step into the higher positions. Those lacking a college education will often cite this as the reason why someone else gets the promotion. Does the employee have a good record? Does he have the mental and physical qualifications for the job? When the employer has considered all possible points of view, then, and only then, he chooses someone for the post. The fact remains, however, that education is the most important consideration in placing applicants for positions of responsibility. Therefore, people will continue to assume that one cannot become a success in life without higher education.

Americans are so filled with the beatnik craze that it is a fundamental assumption that one should conform to the present modes of thinking and acting. Anyone who does something unique is considered a beatnik, a “square”, or some other freakish name. They conclude, then, that nonconformity is wrong, and any intelligent, law-abiding citizen should stick to conformity as the best policy. For example, a boy who does not date girls until his very late teens is looked down upon a social outcast in high school. Automatically something is wrong with him because he has no interest in girls. People snicker at someone who walks around in his bare feet. “He should wear shoes like the rest of us,” they argue. What is wrong with going barefooted? It is healthful for the feet and often serves to relax a person, to ease tensions. People just do not like to see an individual be different, to “make a fool of himself,” they say.

Americans tend to believe that one should conform to the rules of society by not offending the other person. We apply this philosophy to almost anything. Parents coddle their teen-age sons and daughters. Junior gets the family automobile any night he requests it. He buys his own car if he wishes. The daughter dates as often as she pleases and with whom she pleases. Father and Mother will not refuse the child because they absolutely do not dare ruin his social life or injure his feelings in any way. Taking another example, an actual case, a smartly-dressed young gentleman, I shall call him Mr. Smith, sat beside another gentleman, Mr. Jones, in a restaurant. Mr. Jones had ordered a hamburger with onions. Suddenly Mr. Smith interrupted Mr. Jones and pleaded with him to refrain from eating the onion with the hamburger. Smith contended that he could not bear watching someone eat onions. Then Mr. Jones, only after being convinced that Smith was sincere, obligingly placed the onion to a side and ate his hamburger. Imagine Mr. Jones’ shock when Mr. Smith ordered onion soup! People will go to great lengths to avoid trouble.

It seems to be a common, deep-
WORLDS LONGEST CONVEYOR BELT

The Link-Belt Company constructed the largest conveyor belt system in the world for the Ideal Cement Company. The new conveyor which is five and a half miles long is to be used to transport limestone and shale at the rate of 1,000 tons per hour from Lawrence to Ado, Oklahoma. This gigantic new system is one of the first to utilize the support of prestressed concrete structures. The conveyor system consists of seven separate belt conveyors, changes direction four times, and assumes the shape of an “S.” In the five and a half mile span of the conveyor, it crosses two highways and two railroads, and has also made provision for several cattle crossings since the path is across farm land most of the way. The conveyor system also contains the longest single flight, almost two and a quarter miles long, which travels 500 feet a minute. The shortest flight is 500 feet long. The entire system is operated from a single push button at the end closest to the mill. When the system is turned on the closest flight goes into operation, when it has reached 50% of its normal operating speed the next flight is automatically started. The complete starting cycle requires a total of five minutes.

The conveyor is utilized in carrying limestone four, eight hour days a week, and shale one day. Due to the vital importance of the new gigantic conveyor to the functioning of the Ideal Cement Company Mill, many carefully planned safety precautions have been designed. The conveyor is on a right-of-way strip which averages 100 feet in width, with drainage structures, power transmission lines, and a 16 foot road for inspection and easy access to the conveyor.

NEW INCANDESCENT LAMP

A significant step toward miniaturization has been achieved through Sylvania’s new mass production of a new incandescent lamp, which was developed by Deamond Ordinance Fuse Laboratories. The new lamp, called the Mit-T-Lite, may possibly find uses in airborne electronics systems, compact matrix displays, tape readout devices, and other systems where compactness is required or desired.

The Mit-T-Lite, when illuminated, can be seen in a room under normal lighting. The lamp has a maximum length of 0.125 inches and a maximum length of 0.005 inches. The filament of the lamp is approximately 30 turns of 0.00025 inch tungsten wire. This new light may be operated directly from the power of a transistor because of the low operating range voltage of 1.0 - 1.5 volts required. The Mit-T-Lite has a maximum current of 35 ma. at 1.5 volts and a maximum pulsed frequency of 100 pps.

The new lamp possesses a minimum resistance of 6.5 ohms when cold and 38 ohms when hot. At 1.5 VDC the Mit-T-Lite has a light output of 100 millilumens and a minimum light efficiency of 1.5 lumens per watt. With all of these outstanding features the Mit-T-Lite may lead the way in a new realm of lighting.

HEAT TO ELECTRICITY CONVERTER

The conversion of heat to electricity is a problem which has been studied for many years. Dr. Volney C. Wilson of General Electric is one of those persons interested and is working on a solution to the problem. Dr. Wilson has discovered a “thermionic converter”, that, while still in the research stage, accomplishes the purpose of converting heat directly to electricity. The principle that electrons can be “boiled out” of metals is utilized in the thermionic converter. The fact that high temperatures are required for the operation of the converter may make it applicable for use in putting otherwise wasted heat from jet turbines, nuclear reactors, and “tail-

(Continued on page 46)
The world's longest permanent cross-country transport belt conveyor system, 5½ miles in length, was fabricated and erected by Link-Belt Company.

An incandescent lamp, so small it can be passed through the eye of a darning needle, is expected to open new frontiers in many phases of microminiature transistor circuitry.
ARE ALL ROCKETS MISSILES?

MISSILE CLASSIFICATIONS

By Fred Wright, soph., m.e.

It has been said that our future in America depends on the development of guided missiles. For this reason it is important that we, as Americans, acquaint ourselves with these objects that are so vital to our security.

Missiles and rockets are not, as many think, synonymous terms. A missile is an unmanned vehicle capable of flying through air or space in a flight path which can be altered by a mechanism located within the missile or controlled from a remote point. As compared to a rocket, usually thought of as a research tool, the connotation of missile is that it is a weapon. All rockets and missiles do, however, have in common an airframe, a power plant, a guidance system, and a payload capacity.

Forces that power missiles are in the main a form of jet embodying the principle of Sir Issac Newton's Third Law: To every action there is an equal and opposite reaction. For example, missiles may be powered by a jet engine, rocket engine, atomic energy, or some other source.

Missiles are classified into four major categories defined by the intended mission of the missile. The first type is the air-to-air missile (AAM). These are the smallest and are carried and launched by an aircraft usually to destroy enemy aircraft. When launched from a fast-moving plane to a target the chances of hitting the target are greatly reduced. For this reason more than one AAM is carried. This is fine except that there may not be time to launch more than one because the enemy aircraft will be traveling at a tremendous rate of speed also may reach its target before there is time to launch another AAM if the first misses. This tendency to miss the target is almost completely corrected by the guidance system in the missile. In the air-to-air missiles the guidance system, called homing guidance, may be compared with iron filings in a magnetic field. (The filings are attracted to the magnet). In homing guidance, the missile reacts directly to the emittances of light, heat, sound, or radar from the attacking aircraft. Probably the highest rated AAM in use today is the Falcon GAR-2A which reacts on heat emitted by enemy.

The second major category of missiles is the air-to-surface missile (ASM). These are simply bombs which after being dropped from an aircraft can stretch their glide path or change their course to drop upon the target. This type of missile is important because they are far more accurate than free-fall bombs and aircraft which launch them do not have to be near the target and hence exposed to enemy anti-aircraft fire. The U.S. Navy has recently announced an ASM called Fairchild Petrel. The Petrel is capable of guided air-to-surface attack and, also, air-to-underwater attack against submarines.

The third type is the surface-to-air missile (SAM) used to intercept and destroy enemy aircraft or long range missiles. The guidance system in the SAM is called the command guidance. This type of guidance system requires directions from an outside source. To give directions, tracking devices must furnish the source with running information relative to the position of the missile and its target. The source, in turn, must communicate this data to the missile. A specific example of command guidance, radar command, is illustrated below in the diagram. A radar command system consists of three separate radar units, one for finding the target, one for tracking the target, and another for tracking the missile itself. This information is fed into a control center, electronically computed, and continuously relayed to the missile until it hits the target. The Nike-Ajax missile uses radar command guidance.

Finally, the fourth type is the surface-to-surface missile (SSM). Surface-to-surface missiles are further divided into intermediate range ballistic missiles (IRBM) and intercontinental ballistic missiles (ICBM). IRBM are effective in ranges up to about 1500 miles and ICBM about 5500 miles. This 5500 mile range of the ICBM was not chosen arbitrarily; Moscow is about 5500 miles from Washington. With the ICBM, any city in the Soviet Union can be destroyed by an ICBM carrying a hy-

(Continued on page 38)
CONVAIR-POMONA...in Southern California

offers NEW PROGRAMS with excellent opportunities today for Engineers. Convair-Pomona, created the Army's newest weapon, REDEYE, Shoulder Fired MISSILE and developed the Navy's ADVANCED TERRIER and TARTAR MISSILES and many other, still highly classified programs.

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If personal interview is not possible send resume and grade transcript to B. L. Dixon, Engineering Personnel Administrator, Dept. CM-515, Pomona, California.

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Pomona, California

FEBRUARY, 1960
Again this month the spotlight falls on outstanding alumni of Rose Poly. Rose Poly has produced many engineers, who by using the training that they received from the institute, have advanced to positions of great importance in all fields. This month there are five alumni who have used their training to advance to good jobs.

Mr. Granville P. Brosman, class of 1929, is a graduate of Rose Poly in electrical engineering. Mr. Brosman began his telephone career as an engineer in State Area Traffic engineering in 1929 for the Illinois Bell Telephone Company. He served in various Traffic and Engineering capacities before entering service at the Naval Ordnance Laboratories in Washington, D.C., in 1942. In 1944 he returned to State Engineering and was named State Area plant extension engineer in 1948. He became general traffic engineer, State Area in 1950, staff research engineer in the Business Research Department in 1952 and division traffic superintendent, Chicago Toll, in 1953. He became general traffic supervisor, Chicago Area, in 1956 and West Division engineering manager in 1957. He was named to his present job in June of 1959.

Mr. Brosman was a classmate of Dean Herman A. Moench. During his undergraduate days at Rose Poly Mr. Brosman was a charter member of Tau Beta Pi. He was a very excellent student.

A native of Marshall, Illinois, Mr. Brosman has served as fifth district representative for Rose Poly. He also served as his class's agent. He is also very active in the Chicago Rose Tech Club. Mr. Brosman has returned to Terre Haute many times for Homecoming. He is very active in many other activities in and around West Springs, Illinois. He lives there with his wife, Jennie. Mr. Brosman works mostly in administrative end of the telephone business, where he uses many of the basic fundamental concepts he learned at Rose Poly.

Mr. George R. Stockelman graduated from Rose Poly in 1958. After graduating, he was employed by the Joseph S. Finch Company of Schenley, Pennsylvania. Later he was inducted into the Armed Forces and completed basic training at Fort Jackson in South Carolina. He is presently serving in the Engineering Command of the Chemical Corps at the Army Chemical Center, Maryland.

Mr. Stockelman graduated with a B.A. from Saint Joseph's College in 1957 before coming to Rose Poly. While at Rose he was very active. Mr. Stockelman was a member of the American Institute of Chemical Engineers, the Rose Campus Club, and the Rifle Team. A native of Cincinnati, Ohio, Mr. Stockelman is definitely a young Rose graduate on the way up.

ASCE MEETING

On December 3, 1959, a meeting of the student chapter of the American Society of Civil Engineers was held at the school. A panel discussion was held for the benefit of the students. Three alumni of Rose served on this panel; Mr. Harmon Rose, class of '43, Mr. Jack Taylor, class of '56, and Mr. Gurdon Huntington, class of '53.

Mr. Harmon Rose is president of Construction-Engineering Service, Inc. He lives in St. Mary-of-the-Woods, Indiana. He has done a lot of engineering work overseas, which has given him very valuable experience to go with his education. He has combined these two tools to form his own company. Mr. Rose pointed out at the meeting, how valuable English is to the engineer. He pointed out that as an engineer we must be able to commutate both with other engineers and many people who are not as familiar with engineering terms as we are.

Mr. Jack Taylor has recently gone to work for Stran-Steel in Terre Haute. He has worked for Alden E. Stilson Associates in Columbus, Ohio. Mr. Taylor emphasized the fact that the engineer must enjoy his work. He said that it is not unusual for the young engineer to change jobs two or three times during the first few years after graduation. He also pointed out how he felt he had benefited from his education at Rose Poly.

After working for Westinghouse, Mr. Gurdon Huntington went to work for J. B. Wilson and Associates, a consulting firm in Indianapolis, Indiana. He is now a partner and chief engineer for the company. Mr. Huntington also emphasized the need for a good command of the English language. He said that in much of his work he must actually sell his ideas, so you can see the importance of being able to express yourself.
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: Computors . . . 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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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&W 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&W 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.

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FLORIDA RESEARCH AND DEVELOPMENT CENTER — Palm Beach County, Florida

February, 1960
ALPHA TAU OMEGA

Whew!!!! That's another set of finals done and gone! The first semester seemed to race past, and now another is upon us.

Heart Saturday was a grand success again as in years past. With alumnus Brother Ron Reeves leading the campaign the active chapter turned out in full force to occupy the street corners of the city carrying the plastic hearts and asking for contributions. Aiding us in the cause were members of the Gamma Phi Beta Sorority of Indiana State Teacher’s College. Thanks for the help, girls.

Gamma Gamma finished the first semester in a social flurry with two of the best mixers we have ever had. At the Sadie Hawkins Mixer the Gamma Phi's were our guests, and Daisy Mae never looked so pretty. Brother Larry “Marryin' Sam” Berger won the best costume award.

We literally didn’t know whether we were coming or going when the Chi Omega Sorority of Indiana State came to our backwards mixer January 15. The problem centered around the fact that everyone wore everything backwards. To cap off the evening Brother Scott Herrin psychoanalyzed himself (unknowingly, of course). Entertainment consisted of a satirical skit by the girls. In a more serious vein the Alpha Tau Omega Players presented “Ode to a Coke”. Participating in the performance were Brothers Scott Herrin, Dick Cordill, Jack Thompson, Dave Trueb, and Bob Stark. Star attraction of the show proved to be Brother Hal Booher with his booming... ah... er. The Fire House Five minus one also put in an appearance with Brother Joe Snyder on the accordion, Brother Fred Wright on the electric guitar, and Brothers Jay Hirt and Dave Burns singing.

The Taus finally got on the winning road in sports with a victory over Lambda Chi. Sparked by Brother Bob Stark’s fifteen points and Brother Jerry Heiniger’s six point effort we pulled off a 35-28 victory. This gives us a 1 and 2 record for the season, but we have excellent prospects of making that mark a lot better by the time the final whistle blows on the courts.

We are happy to say that three out of the seven candidates for Honorary Cadet Colonel were escorted to the Military Ball by Taus. Miss Judy Stelle, pinmate of Brother Fred Wright, Miss Judy Ivancevich, escorted by Brother Dick Cordill, and Miss Nancy Turner, pinmate of Brother Bob Schukai, were the candidates.

More on the boy-girl situation as reports roll in concerning the events of Christmas vacation. It seems that this was a relatively easy vacation for the men of Alpha Tau Omega. The only activity seems to be the engagement of Brother Ed Ayers to Miss Lynne Allison. It seems Brother Ayer’s favorite song is getting to be “Splish Splash.”

Announcement of the new leaders of the Technic showed that Brother Dave Trueb is one of the new co-editors. Brother Jon Stiles is the new business manager, and Brother Dean Powell is the new circulation manager. Acting as student advisors will be Brothers Marshall Garino, Larry Berger, and Ron Staggs. Under such fine leadership the Technic is sure to continue its rule of keeping the school and alumni well informed through unbiased reporting.

Rush weekend should be very interesting and exciting this year as it has in years past. The house is in tip top shape due to the efforts of Brother Jerry Heiniger, our house manager, and the other brothers. With another man, Brother Allen Jannasch, moving into the house we now have twenty-seven men living here, well below the thirty-three man limit. This leaves only two Taus living on campus.

We are looking forward to a good rush and a productive second semester. With so many activities, projects, and responsibilities coming up, everyone will have to keep in there working, and the men of Gamma Gamma of Alpha Tau Omega will be doing their share and more.

LAMBDA CHI ALPHA

First, I would like to congratulate all of the freshmen pledging fraternities. You men will find that a fraternity will affect your lives in many ways; scholastically, socially, and morally. In later years, the fraternity will bring back fond memories of good times and close friendships. Some of these friendships that will be made in the fraternity will last
your lifetime. Again I say, pledges, Congratulations.

Along this line, congratulations and welcome to Ron Johnson, sophomore from Hobart, Indiana, who pledged ∆XA, January 19, 1960.

Initiated February 10 were John Haley, Terre Haute, and Tom Bedwell, Lyons, Indiana. Welcome, Brothers.

Serving in new posts on the Technic and Explorer are Jim Funk, Jim Gates, and Don Dekker. Funk and Gates are Co-editor and Feature Editor, respectively of the Technic and Dekker has been elevated to Co-editor of the Explorer.

Number 2 and 3 men, respectively, in the intramural bowling league are Tom Feutz and Bill Fenoglio. They carry averages of 170 and 166. Dick Pike's bowling team took the lead in the bowling league January 19 with a record of 7 wins and 1 loss.

It seems as though we haven't solved the defensive rebounding problem yet, for we dropped our third straight IF Basketball game to ATO. This leaves us with a record of 0-3. Come on, gang!

Along the line of basketball, Reserve Steve Ban proudly reports that he has finally broken into the scoring column for the Rose varsity squad. Supporting regulars John Ray and Don Dekker in Rose's losing cause against Greenville was Ban's fabulous jump shot from 15 feet! Steve now has a shooting percentage of 1.000 (1 for 1) for the year. The Boston Celtics have announced that he is No. 1 on their draft list for 1962.

Congratulations go to Bill Schaper who recently became engaged to Miss Sally Scarlett of Orleans, Indiana. Nice going, Shape, you finally got your pin back. Congratulations also to Jim Montgomery. Jim lost his pin to Miss Millie Norwood of Boston, Massachusetts.

January 5 and 6 brought the visit of national secretary, Neil Scott. Neil conversed with the officers during his short stay and offered them many helpful ideas and hints to assist them in doing a good job. At the regular chapter meeting on January 6, Neil congratulated all of the brothers on their fine showing for the past year and wished them success and good luck in the ensuing year. He also let slip that our chapter ranks No. 1 scholastically among the ∆XA chapters nationally. We are looking forward to Neil's next visit with anticipation.

SIGMA NU

Finals are over! Now we can relax? Counting noses I see that most of the Knights of Sigma Nu made it back. However, Brother Mike Smith and Pledge Harvey Burkett have decided on a stretch in Navy before finishing school. Good luck, fellows, we're going to miss you.

Many new things have happened here at Beta Upsilon of Sigma Nu. Installed is a brand-new stainless-steel sink, fitted into a wood cabinet with a formica top. Also, a six-foot bar was set in the kitchen for Mom's convenience (and that of the snackers and coffee drinkers. Three wooden stools accompany the bar. While the actives painted the kitchen yellow, our three fall pledges, Don Hurst, Wilbur Decker, and Dick Bennett painted the backstairs hall a pretty beige, during their "Help Weekend."

Our Mother's Club generously donated a vacuum cleaner to the house, to supplement the enormous work done by our other "battered-up" one. (Warning! Don't let Rod Herrick use the new one on the front stairs.)

Eminent Commander Hal Miller has the distinction of having the newest car at the house, a 1960 Ford Fairlane 500. Looks nice Hal, but when will it be able to outdrag Dean Moench's Continental?

We are doing fairly well in I-F basketball under the direction of Coach Fred Morgan, with 2 wins and 1 loss. Regular starters are Pledge Don Hurst, and Brothers Tom "Happy" Hormuth, Bill Yochum, Dick Landenberger, and Allen Raquet. Our hopes are high for the championship.

It seems that more and more of our Knights have plans that will "altar" their status. Brother Fred Morgan surprised us all by announcing that he was married to Miss Donna Roberts August 30; he hasn't even given his pin talk yet! Donna is now attending Indiana State Teachers College. Brother Allan

(Continued on page 42)
D. J. Dumin (E.E. '57) earned his degree at Johns Hopkins. An Associate Engineer at IBM, he is doing original work in the design and testing of thin film circuits. Two of his ideas in this field have been filed upon for patents.
HE'S WORKING TO GIVE OLD METALS A NEW FUTURE

The metals now being utilized in thin film development have been known and used for centuries. But dormant within these metals has been their quality of superconductivity at extremely low temperatures. Only when researchers were able, with great ingenuity, to create certain relations between metals and changes in their basic structures, could these superconducting qualities be utilized. But much remains to be done at this moment, especially in the application of thin metallic films to practical working devices.

Development Engineers at IBM are at work daily on the problem. They envision the replacement of today's electronic logic elements with modules of amazing responsiveness, durability, and simplicity. The extremely small size of these modules and their low power requirements will be important factors in shaping the electronic systems of the future.

Closely allied on this work are engineers of practically every specialty. Only by bringing the talents and abilities of people of many fields to bear on the unique problems of thin film development, will progress be consistent with objectives. Engineers at IBM expect to obtain these objectives, and once they are obtained, to set new ones.

If you think you might be interested in undertaking such truly vital and interesting work, you are invited to discuss your future with IBM.

Our representative will be visiting your campus soon. He will be glad to talk with you about the many opportunities in various engineering and scientific fields. Your Placement Director can give you the date when our representative will next visit your campus.

For further information about opportunities at IBM, write, outlining your background and interests, to: Manager of Technical Employment, Dept. 844, IBM Corporation, 590 Madison Avenue, New York 22, New York.
Computers have shown their usefulness during the last few years for analysis of very complex engineering problems. In recognition of this fact, Rose thought that it would be beneficial to the student body to have access to one of these machines. The committee for investigating the purchase of a computer consists of Professor T. P. Palmer, chairman; and professors Criss, Galginaities, and Blake. If the National Science Foundation honors their request for grant toward its purchase, Rose could have a computer by the end of this school year.

The computer being considered is RPC-4000, medium sized, fully transistorized, digital computer. The importance of the computer can easily be recognized. Dr. Criss would undertake the first major project by extending the work he did for his Doctor's degree in electrical engineering. Moreover, all the students could take a course in computer theory and programming. Those interested in numerical analysis could work on special projects. This is another action taken by Rose to keep abreast of scientific advancement.

Saturday evening January 16, the Rose Society of American Military Engineers held its annual Military Ball in the Cotillion Room of the Deming Hotel. The ball was a gala event with music being furnished by a popular Terre Haute group, the "Monitors". Ron Staggs and Larry Pitt, co-chairman for the dance, deserve congratulations for their good work of coordinating the work of the various committees, flowers, tickets, decorations, and bids.

Cadet Captain Fred Wernicke, President of S.A.M.E., acted as drill master for the traditional "O'Grady Drill" with Cadet Pat Kelly of the Rose Rifles being competitively chosen as the outstanding O'Grady Driller. The highlight of the evening was the selection of the new Honorary Cadet Colonel for 1960. The candidates for this year's Honorary Cadet Colonel were Misses Judy Ivancevich, Judy Stelle, Kathy Sharp, Judy Ash, Anita Fehrenbach, Nancy Turner, Ruth Loewenstein, and Mary Leachman. This year Major General Christian F. Schilt, a former Rose student, presented the medallion to Miss Kathy Sharp which signifies her reign as Honorary

(Continued on page 41)
Mis Kathy Sharp, escorted by Cadet Paul Blase, begins her reign as the 1960 Honorary Cadet Colonel. The presentation was made by Lt. Colonel Walker and Cadet Schukai.

Military Ball
1960

Ed Blahut relaxes during intermission.

The Faculty and wives seem to be enjoying one of Sgt. Roberts' many tales.
The Engineers, after getting off to a good start, have not fared so well lately. They have not been able to register a victory since taking their initial two games.

The opening game of the 1959-60 season was here at Rose on December 2 against Eureka College of Eureka, Illinois. The Engineers, playing a good game on the boards as well as from the field, held a 13 point lead at half time, 36-23. In the second half, Rose, led by the scoring of junior forward, John Ray, went on to protect its lead and register the victory. The final score was 68-58.

Rose's next opponent was Illinois College on December 5, 1959. The game seemed a continuance of the fine performance the Engineers had shown in their opener. Again strong on the boards, Rose held a 36-28 half time lead. After the intermission the Blue Boys just couldn't keep up. Rose slowly increased their lead to a final score of 75-61. John Ray played a fine game, taking home rebounding as well as scoring (23 points) honors.

The scene of the next game was Indianapolis, where Rose met Marian College. The first half produced quite a bit of excitement with the see-saw effect with a 23-23 tie. The second half started out the same way. However, with about 8 minutes remaining in the game, Marian caught fire and pulled away from the Engineers. The final score read 71-58. Scoring honors went to Ron Jennings, senior guard and John Ray, both scoring 14 points.

December 12, found the Engineers in Lebanon, Illinois, to take on McKendree College. Throughout the free scoring game, Rose trailed, but kept within striking distance. With 3 minutes to go, strike they did: they came from 8 points down to tie the score at 81 all with but 55 seconds remaining. In those 55 seconds not a basket was registered. However, McKendree scored 5 points from the foul line during this time to take away victory from a very deserving Rose team. Mike Smith scored 26 points to lead both teams in scoring.

On the weekend before Christmas vacation, Rose played two games—one on Friday night against Concordia College and the second one against Illinois College. The Concordia game proved to be another heartbreaker for the hapless Engineers. Scoring 8 points in the final minute and a half, Rose tied the score at the end of regulation time. In the overtime period the Engineers did not fare so well as they finally went down to defeat 79-76. Mike Smith again was the top scorer for the Rose Men.

Intramurals

Basketball: The intramural basketball league is shaping up as a real battle down to the wire. So far there is only one undefeated team—BSB II Celtics. Right on their heels with only one loss are the Junior Cats, the Junior Jems, the Senior Civils, the Sophomores, and the Deming Demons. Who will come out on top is a matter for them to work out. With the season only half over, the league is still wide open and no one can be certain who will take the (Continued on page 46)
One of the sharpest photos ever taken of sun's surface. It, and hundreds of others taken by stratoscope, may answer mystery of violent magnetic disturbances on earth.

Exact position of photograph in relation to the total sun surface is shown here. Plotting and photography of precise areas was made possible by airborne RCA television.

RCA REPORTS TO THE NATION:

REMARKABLE NEW PHOTOS UNLOCK MYSTERIES OF SUN'S SURFACE

Special RCA Television, operating from stratosphere, helps get sharpest photos of sun's surface ever taken

Scientists recently took the first, sharp, searching look into the center of our solar system. It was achieved not by a missile, but by a balloon posted in quiet reaches of the stratosphere.

The idea was conceived by astronomers at the Princeton University Observatory. They decided that a floating observatory — equipped with a telescope-camera — would offer a stable "work platform" from which sunspots could be photographed free of the distortion caused by the earth's atmosphere.

But "Project Stratoscope" encountered an unforeseen and major obstacle on its initial flight. A foolproof method was needed for aiming and focusing the telescope of the unmanned observatory. Princeton asked RCA to help.

A special RCA television system was devised which enabled observers on the ground to view exactly what the telescope was seeing aloft. This accomplished, it was a simple matter to achieve precise photography — directed from the ground by means of a separate RCA radio control system.

The resulting pictures reveal sunspot activities in unprecedented detail. They provide the world with important information regarding the magnetic disturbances which affect navigation and long-range communications.

The success of "Project Stratoscope" is another example of RCA leadership in advanced electronics. This leadership, achieved through quality and dependability in performance, has already made RCA Victor the most trusted name in television. Today, RCA Victor television sets are in far more homes than any other make.

RADIO CORPORATION OF AMERICA

THE MOST TRUSTED NAME IN ELECTRONICS
West Point Atlas of American Wars

The Library has recently added to its collection *The West Point Atlas of American Wars*, the first comprehensive map-and-text American military history ever to be published. This edition is identical with the new 1959 textbook for West Point's Course in the History of the Military Art. The maps are the consummation of years of work by some thirty former instructors. With the Atlas, you can actually participate in great decisions and evaluate leadership, battle orders, tactical ruses, and strategic decisions in the light of the main intelligence factors which were available to the commanders themselves. Map sequences and their corresponding texts have been carefully designed to give the reader a full, continuous grasp of the changing situation.

Despite its name, *The West Point Atlas of American Wars* deals with far more than just the campaigns and battles in which American troops were participants. While the main emphasis is on American actions, wars are treated as a whole. For example, most of the maps in the World War I section cover events prior to the entry of the United States into that war.

*The West Point Atlas of American Wars* is a magnificent example of map-making and of pictorial presentation of history on the spot. No work of similar scope has ever been published — either in America or anywhere else in the world. It is destined to become a classic in military and historical literature and a stimulating and rewarding companion for everyone interested in American history and in America's great tradition.

NEW PERIODICALS

The following magazines have been added to our subscription list for 1960. (For a complete listing of the magazines received in the library, see the February Library Newsletter.)

- BUSINESS HISTORY REVIEW
- FLYING
- INDIANA BUSINESS AND INDUSTRY
- MECHANICAL CONTRACTOR
- MILITARY REVIEW
- MODERN CASTINGS
- PLASTICS WORLD
- SOVIET HIGHLIGHTS
- SOVIET PHYSICS — SOLID STATE

FROM THE NEW BOOK SHELF

*Edison*, by Matthew Josephson

A new concept of Thomas Alva Edison emerges from this biography. Edison has been one of the great folk heroes of our history—popularly regarded as the facile inventor, the electrical wizard, the perfect symbol of the self-made and practical creator. And so he was. But this book sees the great inventor as one of the most paradoxical figures of our industrial past. Using a wealth of original materials, Matthew Josephson brilliantly chronicles Edison's development. From a deaf, impoverished boy with no formal education, Edison became in his adult years a fertile and versatile inventor and developer. His accomplishments made fortunes for himself and others, but Edison seemed indifferent to wealth except as a means of further invention, further knowledge, and further triumph. He was a major transitional figure—a man halfway between the craftsman-tinkerer of the early nineteenth century and the theoretical of today.

Matthew Josephson's *Edison* brings to life the many strong traits of the man: his talent, his ambitions, his originality, wit and charm. The book is rich in examples of Edison's original expression and thought.

Conceived with all the thoroughness, the sympathy for his subject, the understanding of American history that have won such a solid place for Matthew Josephson as a chronicler of the past, *Edison* is biographical writing of a very high order.

*The Chains of Love*, by Zoe Oldenburg

Set in Paris between the years 1947 and 1951, Zoe Oldenburg's newest novel of love thwarted and love fulfilled carries on the lives and fates of some of the characters of *The Awakened*, though *The Chains of Love* is constructed as an independent work. Two star-crossed lovers meet again after seven years of separation, during which Elie has been a prisoner of war, and Stephanie has raised their little daughter through a period of utter misery and want. But there are ghosts that stand between the two. Against the background of postwar Paris, its problems, its political ferment, Stephanie and Elie pursue their mortal struggle until one of them is destroyed.

(Continued on page 40)

THE ROSE TECHNIC
HE MAKES HIS ENGINE STALL

...so yours won’t!

Charles Domke has one of the world’s most unusual jobs. He tries to have engine trouble! He’s a Project Automotive Engineer at Standard Oil. In all kinds of weather—hot, cold, wet, dry, low barometer, high barometer—he goes driving. First thing you know, he’ll stop and change fuel, put in a different blend of gasoline to see what happens. If it stalls, he doesn’t call a tow truck. He just puts in another blend of gasoline.

You might say he makes his engine stall...so yours won’t!

What Mr. Domke and other automotive engineers learn from these constant experiments is used to give you gasoline that is blended especially for the region of the country in which you live and also for the season.

It may surprise you to learn that 12 or more seasonal changes are made in Standard gasoline every year! It is adjusted for temperature, humidity, altitude and other factors that affect gasoline performance in your area.

A pioneer in petroleum research, Standard Oil is famous for its “firsts” in petroleum progress. Since our first research laboratory opened 70 years ago, our scientists have been responsible for many major petroleum advances—from making a barrel of oil yield more gasoline to discovering a way to get more oil out of the earth.

Charles Domke and other scientists at Standard Oil and its affiliated companies are searching continually for ways to make oil products serve you better...to make petroleum more useful to more people than ever before!

What makes a company a good citizen?

For a company, good citizenship is more than obeying the law and paying taxes. It is looking ahead, planning for the future, making improvements. America has grown to greatness on research conducted by private business for the benefit of all.

Charles Domke (right) is one of the few men we know who takes a positive delight in having his engine stall in sub-zero weather. He and Mechanic Verland Stout change gasoline blends frequently. When the engine stalls, they try another blend. Their objective, of course, is to find the perfect gasoline under various climatic and road conditions—and the true test is on the road itself!

The gasoline that performs best in icy conditions will cause engine difficulty in hot weather. Standard gasoline formulas are changed twelve times a year to assure peak performance in every season. Mixtures also differ from one geographical location to another in order to offer customers more gasoline value for their dollar.
FLY ASH
(Continued from page 16)

<p>| TABLE 1 | COMPARATIVE COST DATA AND SAVINGS THROUGH ADDITION OF FLY ASH |
|----------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|</p>
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<th>Project</th>
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| TABLE 2 | TENSILE STRENGTHS OF PORTLAND AND PORTLAND-POZZOLAN CEMENTS |
|----------------------------------|--------------------------|--------------------------|--------------------------|
| Cement and Pozzolan Replacement by Absolute Volume | Tensile Strength, psi |
|----------------------------------|--------------------------|--------------------------|--------------------------|
| Project                          | 7 days                   | 28 days                  | 1 year                   | 5 years                 |
| 100% Type I cement               | 410                      | 480                      | 520                      | 460                     |
| 30% pozzolan                     | 320                      | 480                      | 640                      | 550                     |
| 100% Type II cement              | 380                      | 500                      | 500                      | 520                     |
| 15% pozzolan                     | 360                      | 480                      | 610                      | 540                     |
| 25% pozzolan                     | 320                      | 460                      | 580                      | 540                     |
| 30% pozzolan                     | 300                      | 490                      | 620                      | 610                     |
| 35% pozzolan                     | 310                      | 440                      | 580                      | 520                     |
| 100% Type IV cement              | 300                      | 460                      | 520                      | 460                     |
| 25% pozzolan                     | 240                      | 440                      | 680                      | 640                     |

| TABLE 3 | STRENGTH DEVELOPMENT OF FLY ASH |
|----------------------------------|--------------------------|--------------------------|--------------------------|
| Cement and Fly Ash Replacement by Weight | Compressive Strength, psi |
|----------------------------------|--------------------------|--------------------------|--------------------------|
| Project                          | W C + P By Wt. | 28 days | 90 days | 180 days | 1 year |
| 100% Type II cement              | 0.43                    | 6860     | 7890     | 8160     | 8530     |
| 30% fly ash                      | 0.47                    | 4710     | 6670     | 6350     | 8070     |
| 100% Type II cement              | 0.48                    | 5340     | 6330     | 6140     | 7090     |
| 30% fly ash                      | 0.48                    | 4040     | 6380     | 6760     | 6890     |
| 100% Type II cement              | 0.53                    | 3350     | 5340     | 5980     | 6610     |
| 30% fly ash                      | 0.58                    | 4270     | 4970     | 5480     | 5510     |
| 100% Type II cement              | 0.63                    | 2870     | 5020     | 5410     | 5980     |
| 30% fly ash                      | 0.63                    | 4240     | 5220     | 5530     | 5900     |
| 100% Type II cement              | 0.63                    | 2390     | 4430     | 4780     | 5560     |

| TABLE 4 | SHRINKAGE, PORTLAND-POZZOLAN CEMENT (Fly Ash) |
|----------------------------------|--------------------------|--------------------------|--------------------------|
| Cement and Fly Ash Replacement by Absolute Volume | Total Shrinkage, in inches, at 180 days |
|----------------------------------|--------------------------|--------------------------|--------------------------|
| 100% Type II cement              | 0.66                     | 0.087                    |
| 10% fly ash                      | 0.66                     | 0.087                    |
| 20% fly ash                      | 0.66                     | 0.083                    | 0.085                    |
| 30% fly ash                      | 0.66                     | 0.084                    |
| 40% fly ash                      | 0.66                     | 0.084                    | 0.085                    |

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but . . .
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from books
cheaper and faster

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What happens to your career... after you join Western Electric?

You'll quickly find the answer is growth. The signs of progress — and opportunity — are clear, whether your chosen field is engineering or other professional work. There is the day-to-day challenge that keeps you on your toes. There are new products, new areas for activity, continuing growth, and progressive programs of research and development.

For here telephone science is applied to two major fields — manufacture and supply for the Bell Telephone System, and the vitally important areas of defense communications and missile projects.

You'll find that Western Electric is career-minded... and you-minded! Progress is as rapid as your own individual skills permit. We estimate that 8,000 supervisory jobs will open in the next ten years — the majority to be filled by engineers. There will be corresponding opportunities for career building within research and engineering. Western Electric maintains its own full-time all-expenses-paid engineering training program. And our tuition refund plan also helps you move ahead in your chosen field.

Opportunities exist for electrical, mechanical, industrial, civil and chemical engineers, as well as in the physical sciences. For more information get your copy of Consider a Career at Western Electric from your Placement Officer. Or write College Relations, Room 200D, Western Electric Company, 195 Broadway, New York 7, N. Y. Be sure to arrange for a Western Electric interview when the Bell System team visits your campus.

Western Electric
MANUFACTURING AND SUPPLY UNIT OF THE BELL SYSTEM

FEBRUARY, 1960
drogen warhead. However, we must not forget that Russia has ICBM which could carry the same destruction to our country.

There are a number of ways of guiding ballistic missiles. The pure ballistic missiles, Honest John for instance, is completely unguided except for initial orientation at launching and follows a ballistic trajectory similar to an artillery shell.

Another method, called inertial guidance, requires no outside control or reference. The missile's path is programmed into it prior to launching. In flight, outside forces, such as weather, friction, or gravity, may cause it to deviate from its path. Inertial guidance detects changes in velocity or acceleration and corrects them. Gyros maintain a stable position in space so that the accelerometers can detect changes in velocity in three dimensions and communicate them to double integrators. These in turn compensate for changes and compute distances. Incidentally, this system guided the Nautilus directly through the north pole under the polar icecap in 1958.

Still another method of guiding ballistic missiles is celestial guidance. An instrument called a sextant is used which when modified in a missile becomes a star tracker. This star tracker is gyroscopically oriented to the horizon and feeds its findings directly to the missiles controls. Since the stars' paths are known and predictable, a course using specific reference stars can be programmed into the missile before launching. Light from these reference stars enters the system's telescope, reflecting their continuously changing angle above the horizon, as the missile progresses toward the target. This system is expensive but very accurate for long range missiles.

The ballistic missile is, in general, a very effective weapon due to its high speeds and difficulty of interception with conventional weapons. The only two major difficulties peculiar to ballistic missiles are caused by the re-entry into the earth's atmosphere. The re-entry occurs at extremely high speeds consequently friction will produce atmosphere drag and considerable heat. The missile must be so constructed as to prevent the heat from burning the missile like a meteor. These problems do not present themselves during the outbound flight as the speeds encountered are moderate.

It is obvious that a missile which develops many pounds of thrust and carries the largest nuclear warhead would be of little value without its guidance system to direct it. Development of missiles in all phases has necessitated major revisions in military logistics and in political thinking. Considering the way things stand now, our continued freedom in America may depend on the existence of a ready arsenal of superior guided missiles.

**New Kind of Missile with Higgins Ink**

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Good news for draftsmen! New Higgins American India Ink Cartridge always feeds the right amount of ink into pens and drawing instruments. No mess, no waste!

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**The Rose Technic**
Engineers who qualify to fill these chairs...

are on the road to filling responsible jobs
with a growing company in a growing industry

American Air Filter Company is one of the world’s pioneers in the field of “better air.” Starting 30 years ago as a manufacturer of air filtration equipment only, it has, through a planned program of product development, attained the unique position of being the one company in its industry that can take the complete over-all approach to the customer’s air problems. In brief, this means supplying and coordinating all the proper products to filter, cool, heat, clean (control process dust), move, exhaust, humidify and dehumidify air. “Better Air”, while a big business today, is still in its infancy. Name any industry, any building type, and you have a present or potential user of AAF equipment. Other well-known trade names in the AAF family are Herman Nelson, Kennard and Illinois Engineering. At present, AAF operates ten plants in Louisville, Moline, Ill., St. Louis, Chicago and Montreal, Canada.

THIS KIND OF ENGINEERING DEGREE . . . QUALIFIES YOU FOR THIS KIND OF JOB

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Electrical — Engineering or Sales
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FORMAL FIVE-MONTH TRAINING COURSE
Your first job at AAF will be to complete a full five-month course in its technical training school. This is a complete and carefully planned course covering every phase of this business of better air and is under the direction of Mr. James W. May, a recognized authority on air handling problems and presently a member of the board of directors of ASHRAE. Classes, held in special, air conditioned quarters, are supplemented by field trips to visit AAF plants and observe on-the-job applications of equipment.

YOUR FUTURE IS ALL-IMPORTANT TO AAF
AAF prides itself on attempting to match the man to the job. During your training period you will have contacts with key company personnel. Your personal desires as to type and location of job are given every consideration. AAF is big enough to provide opportunities galore—small enough to never lose sight of the personal touch that adds satisfaction along with success.

A representative of AAF will be on your campus soon to interview students interested in learning more about the opportunities with this company. Consult your Placement Office for exact date.
HUMAN ENGINEERING

(Continued from page 13)

group of workers, executives known as the human factor. In the old days, when nearly all work was performed by hand, it was common practice to employ many men to do the work which later was to be performed by one man with labor-saving devices. It was natural that some men that unemployment must increase in proportion to the increased use of labor-saving equipment. If the development of labor-saving equipment were dwelt upon without consideration of other factors entering into the situation, it is apparent that some workingmen might be apprehensive and start to anticipate.

The workers of thirty years ago could not foresee the enormous changes which would accompany the development of equipment and the improvement of operating methods. There were only a few at that time who predict the 8 hours work day. It was a common practice then to work daily ten and twelve hours and, in some instances, an even greater number of hours. In those days, the demand for products in a large measure was considered to be the requirements of a relatively small group of purchasers. Salesmanship, as we know it, was little understood. The average factory representative of thirty years ago was merely an order taker. Advertising was used but very little to stimulate consumption and those in charge of production did very little to promote the interest of purchasers.

Today, advertising and salesmanship have practically created markets where none existed before. Every line of business has been multiplied through the promotion of interests in marketable goods. With this result, there has been increasing opportunity for employment.

By and large, all of the wonderful changes in industry, known as the industrial revolution, have been made possible by the recognition and utilization of the human factor; by the development of one special talent as Ehrlich did; by the improvement of human engineering.

LIBRARY NOTES

(Continued from page 34)

In The Days of McKinley, by Margaret Leech

Allan Nevins says: “McKinley has waited for an able biographer, but he has in the end been remarkably fortunate. A more thorough, discerning and delightfully written book on him and his era could hardly be imagined. Miss Leech presents a great body of new facts, and what is more important, an acute, independent and courageous set of judgments on McKinley, Hanna, the currency and tariff struggles, the Spanish War, and overseas expansion. It is a full-bodied, exciting story. Out of it emerges a convincing presentation of McKinley as a finer spirit and firmer President than most men have supposed, and a fresh impression of an era of transition and adventure for the nation.”

In this immensely readable book Margaret Leech has written absorbingly of a little-known personage of our past. McKinley emerges as a man of charm and a certain wry wit—courteously reticent, and little understood even by his closest friends.

With her skill as a writer and her sharp sense of drama, Miss Leech places McKinley against the background of his period and among his contemporaries.

Devil’s Repertoire, by Victor Gollancz

Devil’s Repertoire presents the moral, or religious, case for unilateral nuclear disarmament. Victor Gollancz, a British publisher, wants his country to resign from “the nuclear club.” According to him, use of nuclear weapons in any circumstances whatever would be “sheer unqualified evil.” Half the book is about such timeless subjects as music and mysticism. Gollancz makes it his first business to discuss the premises that underlie political thought and action. The last section of the book attempts to demolish “the devil’s repertoire” of excuses for brushing aside promptings such as the author’s.
ary Cadet Colonel for 1960. Miss Sharp is a freshman at St. Mary's of the Woods College.

Everyone present thought that the dance was a smashing success for the military organization.

This month has seen action taken by the administration that might prove to be of utmost importance to students of Rose in the future. First on the agenda was the discussion of the present engineering curriculum here at Rose.

Since the fields of engineering and pure science have expanded and progressed enormously in the last decade, several educational institutions over the country have initiated a five year undergraduate program for degrees in engineering and science. Recently Dr. Morgan and Dean Moench openly discussed the possibility of such a program here. Both advocated a policy that would maintain Rose's prestige. It could be easily deduced from their comments that both men are opposed to the five year program for the entire student body.

One argument against this is the added financial burden for the student. The second is that a five year program holds back the student who can successfully accomplish the work required for a B.S. degree in four years. This extra time for some of these men could amount to a year of graduate school under the old system.

Since a five year program was viewed as unfavorable, Dr. Morgen said that the school will work on the "individual basis" for those students who plan to study here. This plan consists of a curriculum suited to the student's individual knowledge and rate of learning.

This in no way implies that Rose will lower its present standards for graduation. Instead, students who can't stay up with the rapid progress in their classes can take special remedial courses. Dr. Morgen believes that Rose's curriculum will continue to be watched and altered accordingly, to stay abreast of the rapid advancement in such fields.

On January 7, 1960, Dr. Morgen presented a report to the student body and visitors about his visit to the Soviet Union in November of 1958. He supplemented the talk by color slides that he took during the tour. Dr. Morgen was in Russia as part of an exchange delegation which inspected Soviet engineering training facilities.

Dr. Morgen stated that Russia's objectives of education are very different from ours. While the United States works for educated people first, and technical confidence second, the Soviet Union wants trained technicians in the service of the state. Russia wants trained scientists for the "material defense" of the nation. But, the aim of U.S. educators is to provide educated young people who can defend and preserve our concepts of democracy by instilling in them the idea of brotherhood, competition, and national survival.

---

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**A.W.FABER - CASTELL**

Pencil Co., Inc., Newark 3, N. J.
Raquet was married to Miss Shirley Otolski January 30. Shirley attended I.S.T.C. last year and is now working in Terre Haute. Commander Miller also announced his engagement to Miss Ann Biggs of Casey, Ill. Congratulations and best wishes to all.

This year is the sixty-fifth anniversary of our chapter's being chartered in Sigma Nu; we were founded in 1895, and are the second oldest fraternity on campus. As yet no plans have been made for a celebration, but Commander Miller reports that an alumni-student celebration will be planned. Alumni will be informed of such a celebration by a news-letter.

We would like to welcome back Brother Ned Kurtz, who, during his year's leave of absence, gained valuable experience working at American Foundry Co. in Indianapolis. Welcome back Ned.

That's about all from 831 S. Center for this time. In closing, let me say that I know that we all are going to do better this semester. —Bob Carter

THETA XI

Things have subsided to a dull roar at the TX house as the brothers prepare for finals. Everyone is hitting the books in one last desperation effort.

Kappa Chapter recently elected officers for the coming semester. They are: Vern Gross, President; Don Lanning, Vice-President; Jack Schreiner, Treasurer; Mike Gilpatrick, Senior House Manager; Mike Clayton, Junior House Manager; and Ralph Wardle, Corresponding Secretary. We are confident that they will all be capable of leading Kappa through another successful semester.

Chapter congratulations go to Miss Kathy Sharp, who was elected Honorary Cadet Colonel at the 1960 Military Ball. Miss Sharp was escorted by Brother Paul Blase.

—Bob McCardle

Most of the Brothers will be around during the semester vacation to work on the house. We are planning to remodel both of the upstairs bathrooms and do a few miscellaneous repairs.

Coach Jack Schreiner's TX Tigers have moved into undisputed first place in the IF basketball race. The Tigers, led by Larry Cunningham and his famous stumble shot, squeezed past Sigma Nu for their third consecutive victory. Coach Schreiner, known in athletic circles for his ability to suffer silently, made his first strategic move of the season by switching from a zone to a man to man defense in the first half.

On January 18 Kappa initiated two new men. We are proud to have Don Augenstein, of Louisville, Kentucky, and Bill McGivern, of East Gary, Indiana, in the Bonds of Theta Xi. —Bob McCardle

To students who want to be SUCCESSFUL highway engineers

There's a real need for qualified men in America's 100 billion dollar highway program. It's a big job. For example, for the new Interstate Highway System alone, 35,000 miles are still to be built.

Choice assignments await engineers at every level. They will go to the men who prepare for them.

As part of that preparation, you must have basic material on Asphalt Technology. For if you don't know Asphalt, you don't know your highways. Asphalt is the modern paving for today's and tomorrow's roads. Asphalt surfaces more than 4/5ths of all roads and streets in the country.

We have put together a special student portfolio to meet that need for information on Asphalt. It covers the Asphalt story, origin, uses, how it is specified for paving . . . and much more. It is a worthwhile, permanent addition to your professional library.

It's yours, free. Send for it today. Prepare now for your future success.
For the man who likes to make his own career decisions

The Allis-Chalmers Graduate Training Course is based on freedom of opportunity. You will have up to two years of practical training to find the right spot for yourself. At the same time, you enjoy a steady income. You can accept a permanent position at any time — whenever you can show you are ready.

You help plan your own program, working with experienced engineers, many of them graduates of the program. Your choice of fields is as broad as industry itself — for Allis-Chalmers supplies equipment serving numerous growth industries.

A unique aspect of the course is its flexibility. You may start out with a specific field in mind, then discover that your interests and talents lie in another direction. You have the freedom to change your plans at any time while on the course.

Types of jobs: Research • Design • Development • Manufacturing • Application • Sales • Service.

Industries: Agriculture • Cement • Chemical • Construction • Electric Power • Nuclear Power • Paper • Petroleum • Steel.

Equipment: Steam Turbines • Hydraulic Turbines • Switchgear • Transformers • Electronics • Reactors • Kilns • Crushers • Tractors • Earth Movers • Motors • Control • Pumps • Engines: Diesel, Gas.

Freedom of Opportunity opens the doors to challenging and interesting careers. Among them is our Nuclear Power Division, with an engineering staff in Washington, D. C., a new research and development center in Greendale, Wis., and an important research effort at Princeton University involving power from the hydrogen atom. For details on the opportunities available, write to Allis-Chalmers, Graduate Training Section, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

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seated belief that if something is not working in one's favor, one should abandon it. Anyone who fails to do so is a nonconformist. Most students who leave school do not fail; they quit because their grades are down. They apparently adopt the farcical philosophy: Flunk now and avoid the June rush. Unfortunately, the same principle has been applied to even more detriment. Marriage is thought of as an instrument today, something one can take or leave as he wills. As soon as the slightest disagreement arises, the married couple is talking about divorce. When such a trivial claim, a vague and meaningless claim, as mental cruelty can produce a divorce, marriage is in a sad state. As soon as the husband or wife feels he is getting nothing from the marriage, he divorces his partner. This concept is wrong; likewise, the assumption that one should always abandon something in one's disfavor is wrong.

Great artists and authors never followed the belief that if some activity gives no material gain, it is not worth the time and effort. Walt Whitman and Leonardo da Vinci did not strive for material gain in their chosen fields, or they would have deserted their respective professions before they attained greatness. They refused to surrender when times were difficult. The modern, selfish philosophy that one should seek material wealth offers a reasonable explanation why there are few, if any, great artists, authors, or sculptors today. Many young people refuse to enter such a career or abandon it when they find it does not always yield profit. There lies the defeatist attitude of the day!

According to the general public, one should be a conformist and be optimistic. One should tell himself that things will improve; they could be worse. He will be a more pleasant person as a result, one who makes friends easily. An optimistic person does better in the classroom and on tests. Optimism brings confidence; confidence brings results.

BEHAVIOR ANALYSIS

(Continued from page 17)

Americans reveal their optimism in many ways. For one thing, they assume someone else will do the job if they do not. Why do individuals refrain from volunteering for work or from asking questions in class? They simply assure themselves that someone else will do it or someone else will ask the question. They reason that if someone does not ask the question, it probably was stupid or not worthwhile in the first place. A group of students is supposed to clean up after a dance. What does ambitious Johnny High School do? He walks out on the job. There will be enough students to do the work without him, he tells himself.

Americans reveal their optimism in other ways. They feel that if war comes, America will win the war. Ours is a nation of destiny, Americans claim. We have never lost a war and never will, they contend democracy will defeat communism because God intended it to be that way. This attitude of optimism and confidence is revealed by some of the things we do. All of us do not rush out to build bomb shelters. We feel reasonably certain that we are safe from communist attack. The communists will not attack us because they know we will retaliate and destroy them. Two or three years ago we let our missile program lag because we did not recognize any great need for it. Even though Americans may express concern over our relationships with Russia, stashed neatly in the back of our minds is the optimistic assumption that America and democracy will be victorious in the end.

Although this is a democratic country, thousands of Americans assume that they have little voice in government. For example, Americans underestimate their voting power and responsibilities. Many will declare, "My one vote will not make any difference." This explains why forty per cent of the voters do not vote in a national election. We do not realize how great our voting power is. If every one of that forty per cent of the voters should hold the attitude, "There is no use in voting for candidate X; candidate Y will win it anyway," then that forty per cent could easily swing the election to candidate X if they would make the great effort to vote. Contrast this with Russia, where it makes no difference in the outcome of the election if one man votes or ninety-nine per cent of all the citizens vote. Yet, the Russian still cherishes his vote.

Many Americans assume that they have no chance of being elected to public office. They do not know that the political parties are always looking for respectable, well-liked citizens for local governmental positions. If one does not possess the qualifications for office, he may still help out as a clerical worker for some public official, or he may "get out the vote," so to speak. Certainly, there is some way one could take an active part in government if he cared to.

Americans often express opinions on national problems in discussions with friends. However, they very seldom write to their congressmen to express themselves on public issues. They assume that the senator or representative, whichever the case may be, will drop their letter in the nearest wastebasket as so much scrap paper. Quite to the contrary, all congressmen want to know what the people back home are thinking. Just a few well-chosen words may be enough to motivate him into introducing a bill that will provide for the new federal highway or that will raise the social security. In conclusion, we must eradicate our indifference about American government and democracy and take a more active interest in national affairs.

People do entertain definite assumptions; they apply these standards to many situations. Although some basic assumptions may be good and others not so good, they at least provide for some semblance of an orderly pattern in the individual's behavior.

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THE ROSE TECHNIC
Reaching into a lost world

... for a plastic you use every day

Massive creatures once sloshed through endless swamps, feeding on huge ferns, luxuriant rushes and strange pulp-like trees. After ruling for 100 million years, the giant animals and plants vanished forever beneath the surface with violent upheavals in the earth’s crust. Over a long period, they gradually turned into great deposits of oil and natural gas. And today, Union Carbide converts these vast resources into a modern miracle—the widely-used plastic called polyethylene.

Millions of feet of tough, transparent polyethylene film are used each year to protect the freshness of perishable foods such as fruits and vegetables. Scores of other useful things are made from polyethylene... unbreakable kitchenware, alive with color... bottles that dispense a fine spray with a gentle squeeze... electrical insulation for your television antenna, and even for trans-oceanic telephone cables.

Polyethylene is only one of many plastics and chemicals that Union Carbide creates from oil and natural gas. By constant research into the basic elements of nature, the people of Union Carbide bring new and better products into your everyday life.
RESEARCH & DEVELOPMENT  
(Continued from page 19)

pipes” of jet engines to a good use. It is estimated that one kilowatt may be generated by a converter with a four square inch area per side electrode. While as of now only a eight per cent efficiency has been obtained, it may pave the way towards exceeding the present 40% efficiency achieved by the commonly used turbine generator.

Dr. Wilson has compared the operation of his converter with water running down a hill using the principle that water will do work if uninterrupted. The electrodes of his converter smooth the path for electrons, thus enabling the electrons to do work. Dr. Wilson has estimated that the thermionic converter may be able to achieve two volts per cell. A greater voltage could be obtained by hooking the cells in series. The thermionic converter may prove itself invaluable in the new space age as a convenient means of obtaining energy.

LOCKER RUMORS  
(Continued from page 32)

championship.

Volleyball: In volley ball there are two undefeated teams tied for first place—the Juniors and BSB I. Both of them have well balanced scoring and necessary makings of a championship group. They are followed by Dr. Meeks’ Faculty team, the Deming team captained by John Toole, Mr. Tinker’s Faculty team, BSB II, the Deming team captained by Pat Hauert, and the Independent Freshmen.

Bowling: After the 5 weeks of play, there is only one undefeated bowling team. This is Joe Andel’s sophomore team with an 8-0 record. Following him are Sgt. Blake’s Faculty team (9-1), George McLellan’s sophomore team (7-1), and two junior teams captained by Dick Pike (5-1), and Jack Gilmour (5-1). There is a lot of interest in bowling this year and everyone in the league is enjoying it. It is good wholesome recreation and provides a well-rounded life for those students who participate.

* * *

“Who gave the bride away?”

“No one. I could have but I kept my mouth shut.”

* * *

Student: “Could you help me with this problem?”

Professor: “I could, but I don’t think it would be quite right.”

Student: “Well, take a shot at it anyway.”

* * *

Engineer in a drug store: “Is your ice cream pure?”

Clerk: “Pure as the girl of your dreams.”

Engineer: “Gimme cigarettes.”

* * *

According to a story going around in Western Europe, one Prague resident refused to join the outcry against a new Stalin statue in the city’s public square.

“Why not a statue?” he said, “It gives us shade in the summer, shelter in the winter, and an opportunity for the birds to speak for all of us.”
A missile’s main engine runs only for a few seconds. To supply electric and hydraulic power for control during the entire flight a second power plant is necessary. The AiResearch APU (accessory power unit) which answers this problem is a compact, non-air-breathing, high speed turbine engine. The unit pictured above develops 50 horsepower and weighs 30 pounds. The acknowledged leader in the field, AiResearch has designed, developed and delivered more accessory power units than any other source.

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Diversity and strength in a company offer the engineer a key opportunity, for with broad knowledge and background your chances for responsibility and advancement are greater.

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**Other major fields of interest include:**
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- **Environmental Control Systems** — pioneer, leading developer and supplier of aircraft and spacecraft air conditioning and pressurization systems.

Should you be interested in a career with The Garrett Corporation, see the magazine "The Garrett Corporation and Career Opportunities" at your College placement office. For further information write to Mr. Gerald D. Bradley...

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Systems, Packages and Components for: AIRCRAFT, MISSILE, NUCLEAR AND INDUSTRIAL APPLICATIONS

February, 1960
Everyone likes to see a broad smile — especially if she smiles at him.

* * *

“It’s quite simple,” explained one of the seniors in EE, “to hook up an electric power circuit. We merely fasten leads to the terminals and pull the switch. If the motor runs, we take our readings. If it smokes we sneak it back and get another one.”

* * *

She was a gorgeous girl,
And he was a loving male.
He praised her shape in English,
French, Italian, and Braille.

* * *

Student looking through telescope: “God.”
Another: “Aw, g’wan; it isn’t that powerful.”

* * *

Freshman: “What does ‘Fantasy’ mean?”
Senior: “A story in which the characters are ghosts, goblins, virgins, and other supernatural beings.”

* * *

A professor is a man whose job it is to tell students how to solve the problems of life which he himself has tried to avoid by becoming a professor.

* * *

Engineer: You never kissed me like that before, Mary. Is it because we’re in a dark room?
Girl: No, it’s because my name isn’t Mary.

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Here I sit in silent bliss
Listening to my sliderule hiss,
While every now and then is heard
The explosion of a profane word.
Thru murkey some is dimly seen
Del div A, Script D between
Cross-dot products, tensors too,
Cripes I’m confused, but that’s nothing new.
The Prof gave me some problems
to do at the pad,
Another nights sleep gone but
that’s just too bad.
Time wasted on study gives rise
to a flinch.
But never-the-less I invariably
“cinch”.
We study in groups
To solve problems not too clear,
But always we goof
So out for more beer.
Engineers are great with exciting
equations,
They seem to be lost at all other
occasions.
No doubt about it, Engineers are
not sane,
And if I don’t “un-cinch” I’ll be
engineer on a TRAIN!

* * *

Recent tests conducted by the Physics Department prove that the grasshopper hears with its legs. In all cases the insect hopped when a tuning fork was sounded nearby. There was no reaction to this stimulus, however, when the insects’ legs were removed.

* * *

The best way to drive a baby buggy is to tickle his little feet.

Then there was the luncheon orator who stood before his audience with manuscript in hand and said:
“Before I start my speech, I would like to say something.”

* * *

The average man has five senses: touch, taste, sight, smell and hearing. The successful man has two more — horse and common.

* * *

A wealthy Texas oilman cashed a huge personal check which came back from the bank with “Insufficient Funds” stamped across its face. Beneath the stamped word was the handwritten notation: “No you—us.”

* * *

Undoubtedly, those who are unable to pass their driving license tests become parking lot attendants.

* * *

Husband to wife: “Whew! I took an aptitude test this afternoon. Thank goodness I own the company.”

* * *

“Hey, you guys, where are you carrying that fellow? Is he drunk?”

“Nope.”

“Sick?”

“Nope.”

“Just a gag?”

“Nope.”

“Well, what’s the matter with him?”

“Dead.”ur

The professor who comes in 10 minutes late is rare; in fact he in a class by himself. 
By setting templates of standard components on photo-sensitive paper and exposing it, hours of hand drafting are saved.

With this plotter, stereo aerial photos become contour maps, show highway routes, mineral-bearing formations, volume of coal piles.

Slides give the sales staff quick understanding of the engineering superiority of their product—equip them with facts for their customers.

From drawing board to shipping platform...

Photography works for the engineer

Whatever your field, you will find photography increasing in importance. It works for the research scientist, the production engineer, the sales executive, the administrator. It speeds engineering, expedites quality control. It trains, and teaches, and sells. It will help you in whatever you do.

Careers with Kodak

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

If you are looking for such an interesting opportunity, write for information about careers with Kodak. Address: Business and Technical Personnel Department, Eastman Kodak Company, Rochester 4, N. Y.
Q. Why does your company have training programs, Mr. Abbott?

A. Tomorrow's many positions of major responsibility will necessarily be filled by young men who have developed their potentials early in their careers. General Electric training programs simply help speed up this development process.

In addition, training programs provide graduates with the blocks of broad experience on which later success in a specialization can be built.

Furthermore, career opportunities and interests are brought into sharp focus after intensive working exposures to several fields. General Electric then gains the valuable contributions of men who have made early, well-considered decisions on career goals and who are confidently working toward those objectives.

Q. What kinds of technical training programs does your company conduct?

A. General Electric conducts a number of training programs. The G-E programs which attract the great majority of engineering graduates are Engineering and Science, Manufacturing, and Technical Marketing.

Q. How long does the Engineering and Science Program last?

A. That depends on which of several avenues you decide to take. Many graduates complete the training program during their first year with General Electric. Each Program member has three or four responsible work assignments at one or more of 61 different plant locations.

Some graduates elect to take the Advanced Engineering Program, supplementing their work assignments with challenging Company-conducted study courses which cover the application of engineering, science, and mathematics to industrial problems. If the Program member has an analytical bent coupled with a deep interest in mathematics and physics, he may continue through a second and third year of the Advanced Engineering Program.

Then there is the two-year Creative Engineering Program for those graduates who have completed their first-year assignments and who are interested in learning creative techniques for solving engineering problems.

Another avenue of training for the qualified graduate is the Honors Program, which enables a man to earn his Master's degree within three or four semesters at selected colleges and universities. The Company pays for his tuition and books, and his work schedule allows him to earn 75 percent of full salary while he is going to school. This program is similar to a research assistantship at a college or university.

Q. Just how will the Manufacturing Training Program help prepare me for a career in manufacturing?

A. The three-year Manufacturing Program consists of three orientation assignments and three development assignments in the areas of manufacturing engineering, quality control, materials management, plant engineering, and manufacturing operations. These assignments provide you with broad, fundamental manufacturing knowledge and with specialized knowledge in your particular field of interest.

The practical, on-the-job experience offered by this rotational program is supplemented by participation in a manufacturing studies curriculum covering all phases of manufacturing.

Q. What kind of training would I get on your Technical Marketing Program?

A. The one-year Technical Marketing Program is conducted for those graduates who want to use their engineering knowledge in dealing with customers. After completing orientation assignments in engineering, manufacturing, and marketing, the Program member may specialize in one of the four marketing areas: application engineering, headquarters marketing, sales engineering, or installation and service engineering.

In addition to on-the-job assignments, related courses of study help the Program member prepare for early assumption of major responsibility.

Q. How can I decide which training program I would like best, Mr. Abbott?

A. Well, selecting a training program is a decision which you alone can make. You made a similar decision when you selected your college major, and now you are focusing your interests only a little more sharply. The beauty of training programs is that they enable you to keep your career selection relatively broad until you have examined at first hand a number of specializations.

Furthermore, transfers from one General Electric training program to another are possible for the Program member whose interests clearly develop in one of the other fields.

Personalized Career Planning is General Electric's term for the selection, placement, and professional development of engineers and scientists. If you would like a Personalized Career Planning folder which describes in more detail the Company's training programs for technical graduates, write to Mr. Abbott at Section 959-13, General Electric Company, Schenectady 5, N. Y.