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Rose Technic Staff
Rose-Hulman Institute of Technology

Rose Technic

March 1964

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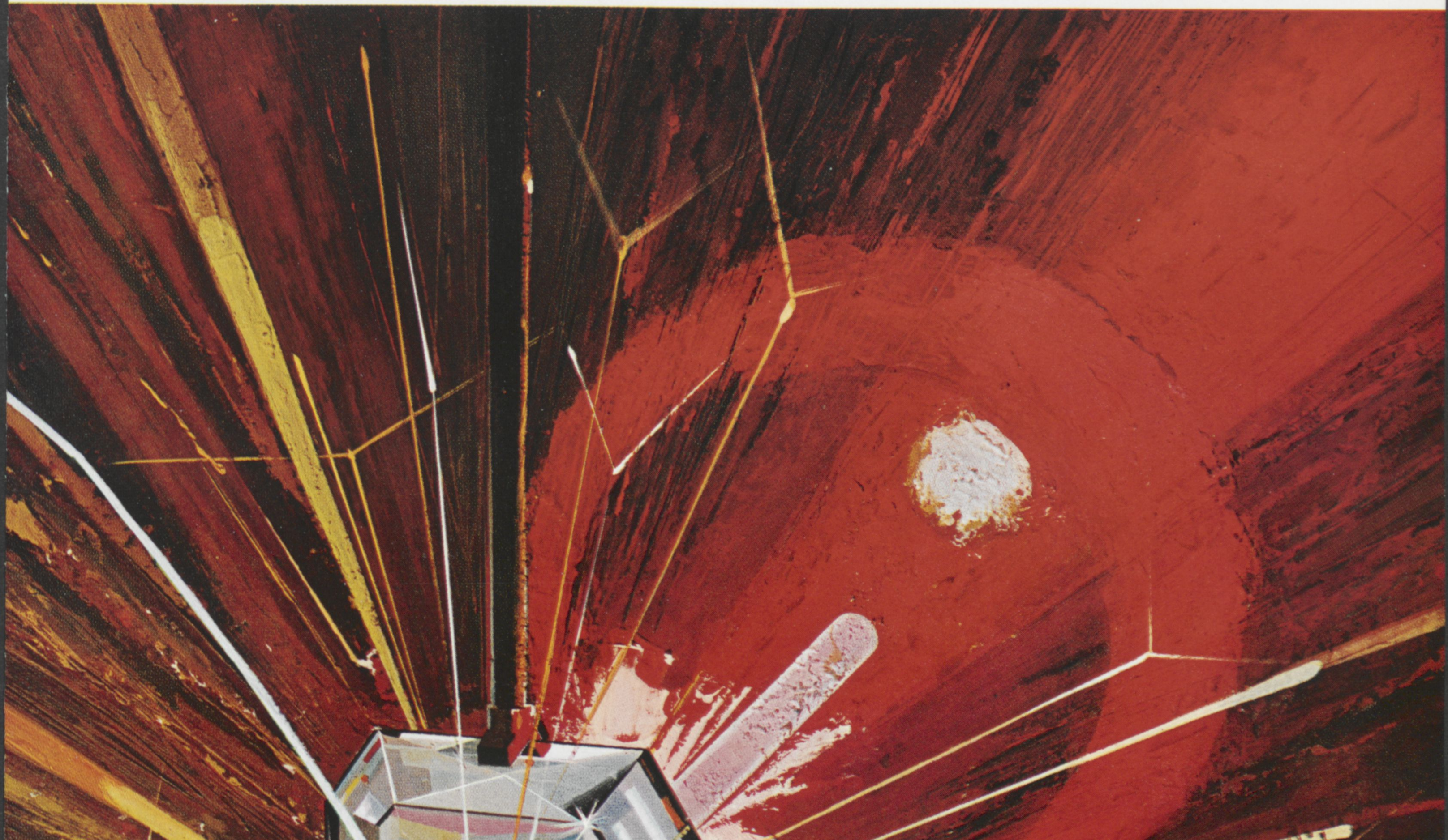
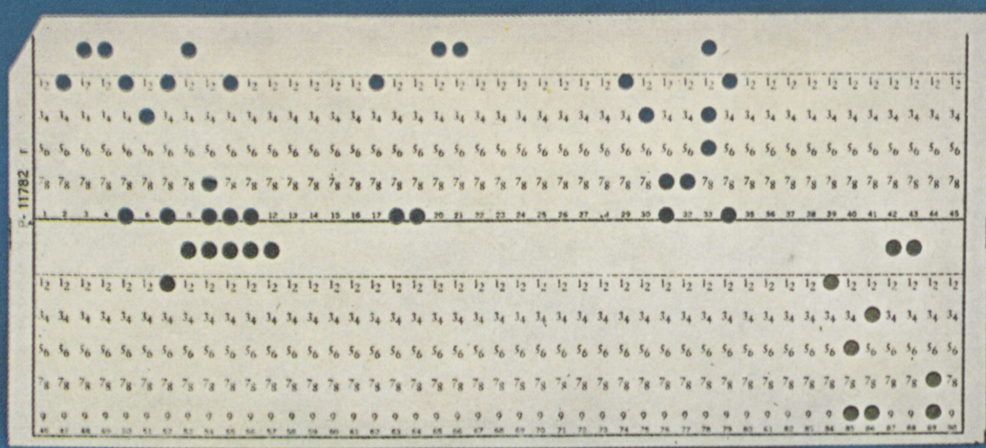


PHOTOELECTRIC CELLS
AEROSOL SPRAYS
THE DEPRESSANT DRUGS

The captain commands a Westinghouse computer



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IN THIS ISSUE

A FEW WORDS ABOUT TELESCOPES

Although it is usually difficult to get Bob Crask to say a *few* words about anything, he presents here a brief, diagrammatic explanation of optical telescopes. The various types are described and their advantages and disadvantages pointed out. Bob is a sophomore mathematics major and is president of the Astronomy Club.

PHOTOELECTRIC CELLS

Regular contributor Stan Henson describes the development and application of photoelectric cells in this article. In addition, he points out one special use which might be of vital interest to all engineers in the next few years.

AEROSOL SPRAYS

Ever wonder how those push-button sprays work? Bruce Johns gives forth with the magic on aerosol packaging — how it was developed and today's production methods. Do not puncture or incinerate this article.

Cover Note

This month's cover appears through the courtesy of Monsanto Chemical Company, St. Louis.

Rose Technic

March 1964

AMERICA'S OLDEST ENGINEERING COLLEGE MAGAZINE IN CONTINUOUS MONTHLY PUBLICATION — 1891-1964

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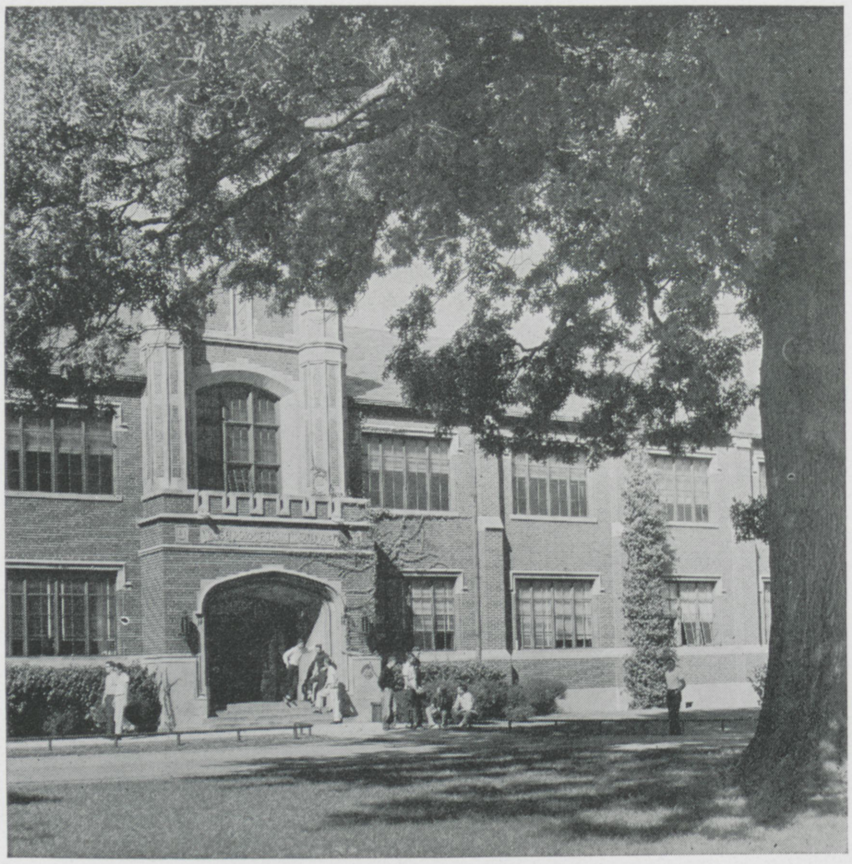

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editorial

square pegs for round holes?

For quite some time now, observations which I have been making have provoked a great deal of thought in my mind concerning what I feel to be a growing problem at this school. If it is a problem, perhaps it is so because too few people ever bother to think about it. Or maybe they are aware of the situation but do not think that it is a problem. I am referring to the apparently growing ignorance on this campus of the importance of being well-rounded. Just what is meant by the term "well-rounded?" It is not by any means exclusive of academic knowledge — the truly well-rounded person is well-schooled in a wide range of fields of education. From my point of view, however, the term applies to a greater extent to those qualities and abilities which cannot be taught from a textbook or in a classroom. In addition to knowledge, the truly well-rounded person is distinguished by his pleasing personality, his social poise, his ability to communicate and to cooperate with others, his acceptance of responsibility, and the other similar traits by which he commands the respect and admiration of every one of his associates. These qualities enable the well-rounded individual to adapt himself easily to a variety of situations.

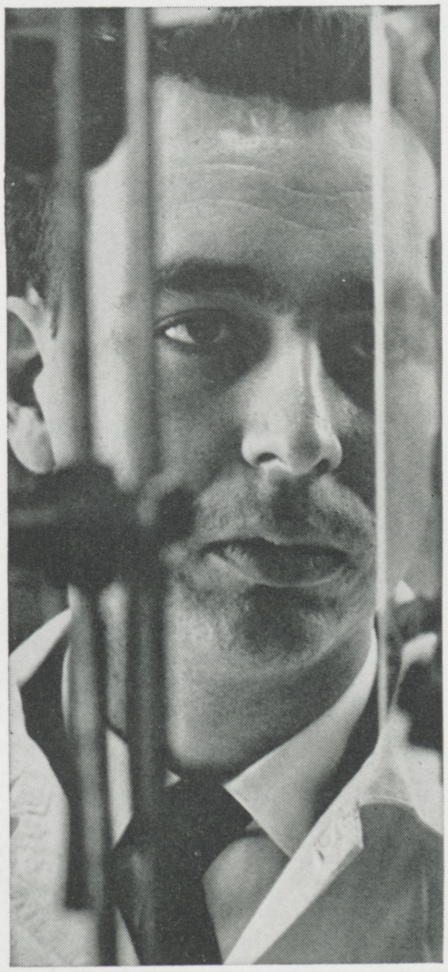
What is so important about being well-rounded? In light of the above, the answer should be obvious to any Rose student who looks ahead to his own future. Of course, if he intends to spend his professional lifetime in front of a television set, he may not be so easily convinced of the advantages of a so-called "liberal education." But how many engineers and scientists spend any substantial amount of time working entirely on their own? How many new products and scientific techniques are the result of one man's work alone? Reclusion is not a trait of the responsible engineer. A relatively large percentage of industry's top executives today started as engineers. Look at any one of them and ask yourself why he got to the top. It wasn't only because he solved problems the fastest or came up with one or two good ideas. Computers solve problems, but they don't become vice-presidents; ideas are meaningless unless their originator can convey them to other people. In order to attain to a position of authority and responsibility, an engineer must possess, in addition to knowledge, the ability to communicate with other men, to cooperate with them, and to gain their respect. The aspiring engineer cannot afford to be merely a machine.

How does the Rose student become more than a receiver and regurgitator of information? Hopefully, he was a little more than this before he came here. Rose is proud of its reputation for academic excellence; but just as with the game of golf, you can't teach social poise, cooperation, and responsibiilty from a textbook. The saying goes, "In golf, experience is the great teacher." So it is also, I believe, with the trademarks of a well-rounded individual. Only through experience with other people can a person learn social poise and cooperation; only through experience with responsibility can he learn to be responsible; only through experience with authority can he gain respect as a leader among men.

If these traits are required of the engineer and the scientist, it is the responsibility of this institution to see that each student is provided with the opportunity to acquire them. I heartily commend the administration for its attitude and success in doing this. Unfortunately, however, the fact that the school provides the opportunity does not insure that even a majority of the graduates each year will be well-rounded individuals. What good are opportunities if no one takes advantage of them? Lately I have sensed what seems to be a decline in the number of students at this institution who have the potential and the desire to become well-rounded. The four social fraternities at Rose, who generally look for well-rounded men, potentially or actually, pledged a total of only 50 men this year, as compared with an average of 80 or more in the past few years. I seriously doubt that any of the four classes in the school now will be nearly as outstanding as any of the last three graduating classes. What is the reason for this apparent decline? The opportunities now are certainly not fewer than they have been in the past.

I offer one possible explanation to ponder before I close. It is not improbable, in the light of the observations that have been presented, that the potential of the entering class has lately been decreasing with each new freshman class. Perhaps the school has allowed scholastic performance to overshadow all other considerations. If this is the situation, I hope that it is soon corrected. It is the aim of this institution to produce qualified engineers, but it is not the duty of a school as selective as Rose to accept those who do not have the potential to become *true* engineers and scientists. Most of the time you cannot fit square pegs into round holes. If we are trying to do so, let us at least make sure that the corners are rounded off a little before we start lest we waste our time.

R T K



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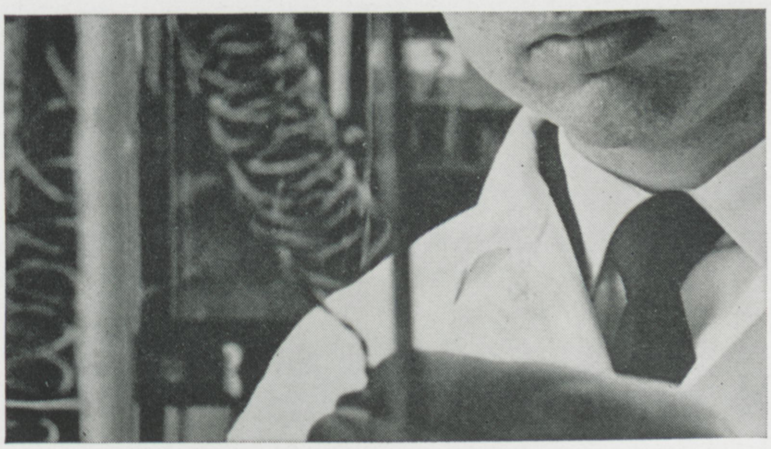

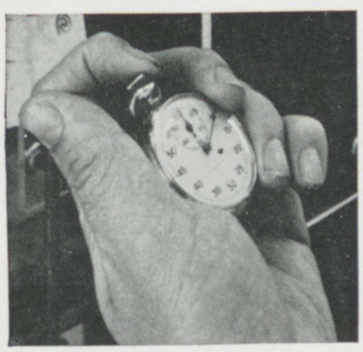

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The Dean's Corner

Creativity

Yesterday, memorization and drill claimed much time and effort at every level of education. Today, no educational program, even at elementary levels, can achieve respectability unless it stresses "creativity" on the part of the teacher as well as the student. To the extent that it fosters genuine productive competence, this trend is all to the good.

To nurture creativity in students of science and engineering is a tough job for even the dedicated teacher. Genuinely creative people are never easy to regiment, they tend to follow their own bent. In classs they frequently sidetrack the planned development of a subject and often they come up with questions that can be upsetting to the teacher. To capture the interest of these non-conformist types requires the utmost in flexibility as well as competence on the part of the instructor. But the results justify the effort.

As John W. Gardner of the Carnegie Foundation points out, creativity as a process is one of the most baffling secrets of the human mind. In technology as well as in literature and the arts we have plenty of opportunity to observe the creative process. But we do not understand it. Even creative people themselves do not understand it. When they try to explain the creative process they often succeed only in mystifying us further.

Extensive research programs supported by the Carnegie Corporation have been conducted at the University of California to study hundreds of creative individuals in three groups — creative writers, research scientists and mathematicians, and architects. The men listed had been nominated as particularly creative by eminent individuals in their own fields. It turned out that they were themselves curious to learn more about the creative process, and quite willing to subject themselves to extensive tests and interviews.

One of the most striking characteristics of creative people is *independence*. They don't worry about "What will people say?" Nor do they get themselves imprisoned by group pressures. The mere fact that everyone else believes some particular thing doesn't mean that the creative person will believe it. Especially in the area of his creative work he refuses to be subservient to another man's creed.

A second characteristic of the creative individual is *flexibility*. His mind is not cluttered up with a lot of rigid views. He doesn't dig himself into a rut. He likes to "play with" ideas, trying them on for size, looking at them from various angles, testing them in various combinations. This approach may seem disorderly rather than systematic and confused rather than organized. But out of the disorder the creative mind comes up with something that no computer could have hit upon.

Besides independence and flexibility, the creative man has a certain *openness*. He seems literally to see more, hear more, register more vivid impressions, and drink in more experience. Many of us develop a somewhat tired and jaundiced outlook on the world. We try to shut it out, as far as possible. But the creative person manages to keep a freshness of perception, an unspoiled and eager alertness. Further, he is on good terms with his own inner self. Since he knows and accepts what he finds inside himself he is able to draw on his resources for the hunches and insights that contribute so much to the creative process.

Identifying creative individuals among the men who come to Rose is no easy task. Current research has demonstrated that standard intelligence tests do not measure creativity. Even though intelligence is an important and necessary attribute of the creative person, it now seems clear that creativity is a special attribute not measured by scholastic aptitude tests.

Freedom to do the work he *must* do is the compelling need of the truly creative man. His teachers, in turn, must provide constructive guidance and necessary facilities. But their great contribution is to avoid smothering creative efforts by imposing frustrating constraints.

In our pursuit of excellence in undergraduate instruction as a part of the announced philosophy of Rose, all of us, students and faculty alike, need to devote much thought and effort to encouraging and fostering creativity wherever we find it.

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A Few Words About Telescopes

by Bob Crask, Soph. Math.

Until recently (with the advent of the radio telescope-see author's article in January '64 Technic) man's closest contact with the stars was the optical telescope. Since the introduction of the astronomical refracting telescope in 1609 by an Italian, Galilei Galileo, the optical telescope has undergone drastic changes which have aided the astronomer to delve into the innermost secrets of the outermost stars.

Galileo's astronomical telescope was a relatively simple two-lens system as shown in figure 1. When larger versions of the telescope were constructed, they produced blurred, but colorful images. The reason for such an image was due to the fact that a single lens tends to bend the shorter wavelengths of light a greater amount than it does the longer (reddish) wavelengths. Thus, the image focused at one color (wavelength) is out of focus for the other colors. This phenomenon is known as chromatic aberration and explains the reason a prism produces a spectrum of varying colors. Experimentation in this young portion of telescope development proved that the only way to circumvent the problem was to increase the focal length of the single lens. Telescopes of 150 feet and longer were not uncommon but were unwieldy and therefore, virtually useless.

But in 1758, a method was found that partially corrected the problem of chromatic aberration. The color problem, it was discovered, depended on the composition of the lens, as well as its shape. In figure 2, a crown glass double-convex lens is combined with a flint glass single-concave ocular and the combination unites the visible range of light fairly well. It is to be noted however, that only the lower end (red-yellow) of the visible spectrum may be united in this manner, and the blue and violet end must be sacrificed, or vice versa. Such a lens combination is called an "achromatic" or "color-corrected" system or lens.

There still exists a basic problem with an achromatic lens in that, since most photographic plates are most sensitive to the higher wavelengths of lights, a color-corrected aperture is suitable for only visible or photographic work — but not both. Therefore, a corrector plate or a filter must be added when a 'scope is to be used for both types of work.

A telescope of Galilean design or any other scope which is made entirely of lenses is called a refracting telescope, or "refractor." The large lens at the end the light enters is called the objective lens and when stating the size of a telescope, one gives the diameter of the aperture of the objective. A modern refractor has a much shorter focal length than its predecessors (approximately 1:15, where the first number is the aperture and the second, the focal length). The ordinary refractor transmits approximately eighty percent of the light which falls upon it. In these respects, the refractor makes a good instrument for celestial viewing.

There are many factors concerning a refractor that perplex the astronomer in his attempt to construct

(*Continued on Page* 26)

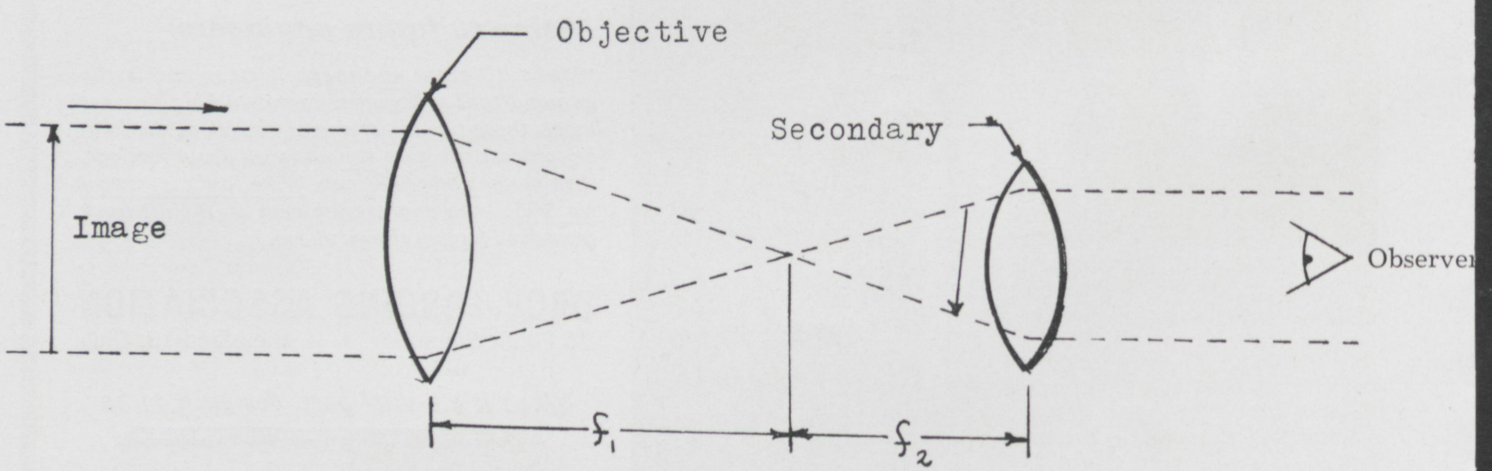
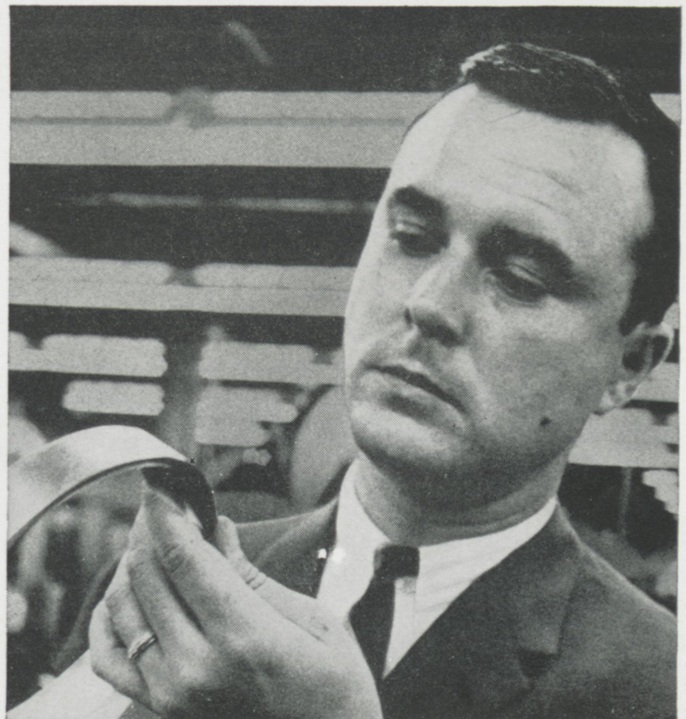


FIG. 1 Simple two-lens system for an astronomical telescope

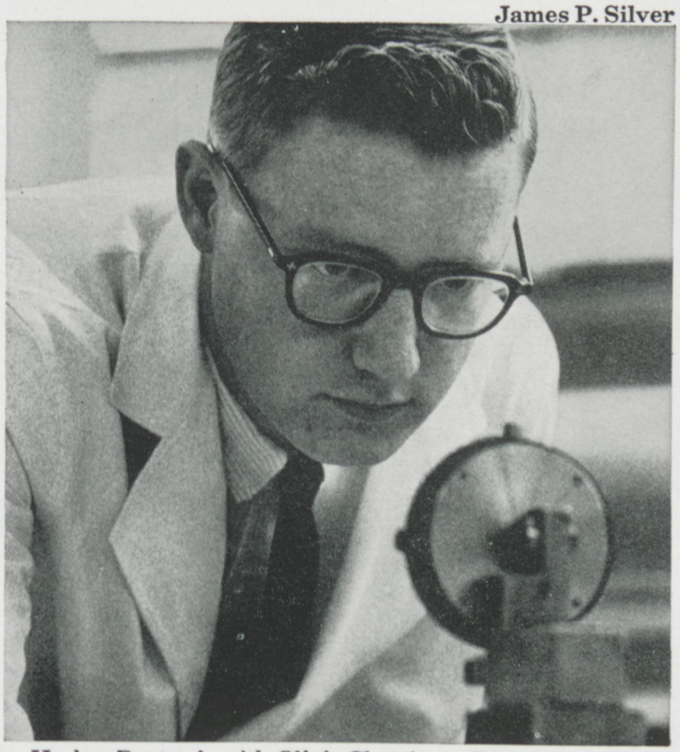
What happened to the Class of '60?

Harlan Marsh Baxter

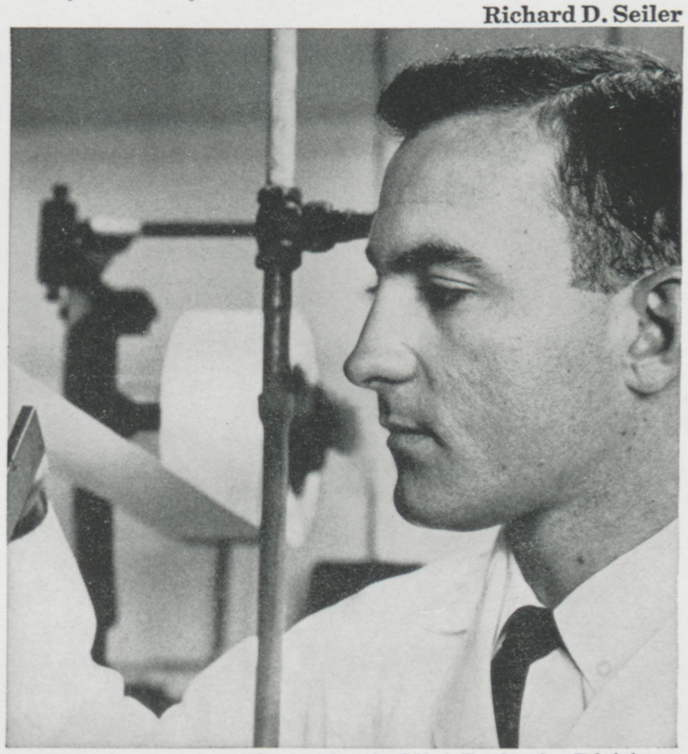


Jerry Dale Shay

James P. Silver



Richard D. Seiler



Harlan Baxter is with Olin's Chemicals Division, developing commercial applications for the new wonder-fuel, hydrazine.

(We're working on new products that would make an alchemist scoff in disbelief.)

Jerry Shay was recently promoted to Technical Advisor in Olin's Metals Division.

(We're moving so rapidly, we haven't had time to master the art of red tape.)

Jim Silver is designing ammunition processing machinery for Olin's Winchester-Western Division.

(One of 6 diversified divisions in 6 major growth industries.)

Richard Seiler is a Research Supervisor in Olin's Packaging Division.

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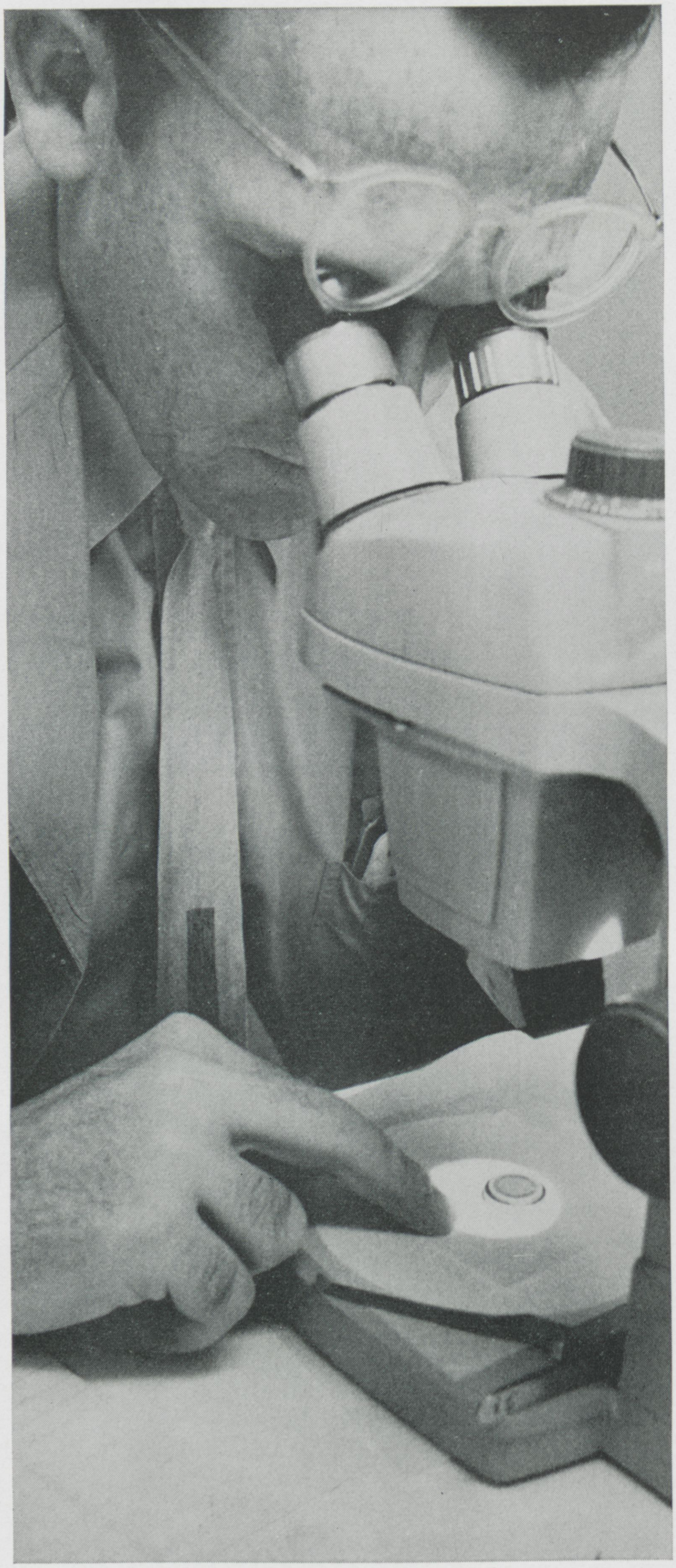

Delco Means Opportunity to George Fitzgibbon

■ George Fitzgibbon is a Senior Experimental Chemist at Delco Radio. He's pictured here examining silicon rectifier sub-assemblies for microscopic solder voids during the development stage.

George received his BS in Chemistry from the University of Illinois prior to joining Delco Radio. As he puts it, "I found, at Delco, an opportunity to take part in a rapidly expanding silicon device development program. The work has proved to be challenging, and the people and facilities seem to stimulate your best efforts."

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Photoelectric Cells

by Stan Henson
Junior E.E.

This is the third article by Mr. Henson to appear in an issue of the **Technic** this year. He has also written "Satellite Communications Systems" and "Thermistors."

With the advent of the Space Age with its missiles and space satellites has come the discovery of many new things and the improvement of many old things. The photoelectric cell is one of the older devices that has benefited from the recent technological advances. The most familiar Space Age Application of photoelectric cells is providing electric power for the space satellites. Although not as exotic as space satellites, there are many other uses for photoelectric cells and it is quite possible for one to run into a photoelectric cell in an application far removed from the launching pad.

According to Webster's New World Dictionary of the American Language, a photoelectric cell is "any device in which light controls the electron emission from a cathode, the electrical resistance of an element, or the electromotive force produced by a cell." This is a nice broad definition but just to be sure to include all photoelectric devices in the discussion a photoelectric cell shall be defined as any device in which light controls an electrical parameter of the device. This definition is general enough to include solar batteries, photoresistors, photodiodes, phototransistors, photovoltaic cells and TV camera tubes in the general classification of photoelectric cells.

Although the photoelectric effect is rather easy to explain in terms of today's quantum physics, it was one of the biggest problems that faced researchers around the turn of the century. Before the discovery of the photoelectric phenomenon it was thought that light could be completely described by classical electromagnetic theory. However, to explain the photoelectric effect Einstein had to develop his quantum theory of light and this marked the beginning of the development of wave mechanics and the modern quantum theories of physics. The solution of the simple problem of photoelectric emission caused one of the greatest changes in scientific thinking that is known.

Even though the explanation of the photoelectric cell was developed about 1900, the development of practical cells had to wait for technology. There have been several photoelectric devices developed over the years such as the photomultiplier tube and the TV camera tube. However, with the development of semiconductor technology has come a multitude of new photoelectric devices. The photodiode, the photoresistor, the phototransistor and the silicon solar cell are examples of the new semiconductor photoelectric devices.

One of these new semiconductor photoelectric cells which the author has found quite interesting is a photoresistor. This is a device made from cadium sulfide whose electrical resistance is a function of light intensity. For a typical photoresistor the resistance varies from about one megohm in darkness to about one thousand ohms in bright light. The cell has a voltage rating of 120 volts AC or DC and a power dissipation rating of 0.2 watts. This cell has been used with a sensistive relay in a light controlled switching circuit and its rating allows it to be used in a wide variety of other applications.

Of all the photoelectric devices available today, the silicon solar cell is probably the most familiar because of its use in space satellites. Not only is the silicon solar cell being developed for powering space satellites but it has great potential for providing electrical power in many other remote areas. Some people even suggest that the silicon photoelectric cell may be developed so that it can be used as a prime source of electric power. So with the idea of powering space vehicles and competing with Public Service Co. with electric power from silicon solar cells, let's take a closer look at the silicon photoelectric cell or solar battery as it is sometimes called.

The silicon solar cell is a semiconductor device which converts sunlight directly into electrical power. Although other substances can be used in photocells (selenium, for instance), silicon provides the best conversion efficiency. Conversion efficiency is the ratio of electri-

(*Continued on Page* 31)

SPACE FLIGHTS

by John Howlett
Sophomore E.E.

As space flights have progressed from unmanned to manned vehicles, engineers have found that they have to consult with the medical doctor in order to design a craft which can safely and comfortably carry man to the farthest reaches of space. In designing rockets for unmanned flights, the engineer considered such factors as speed, acceleration, deceleration, heat, meteor hazards, and others only as they pertained to the rocket. He finds that these factors and many more must be considered in a different light now that men are occupying the space craft.

Man has developed through the centuries so that he is used to living under one general set of conditions. Since man cannot be changed, a method has had to be developed to take his environment with him. This has led to the development of space capsules which approximate man's environment on earth. For short trips this does not have to be completely like the normal environment but as trips become longer and longer, the more closely must earth's environment be approximated. The closer approximation for long trips is necessary primarily because of the psychological effects upon space travelers if conditions are radically different from those to which they are accustomed.

The first condition new to man will be encountered as the rocket blasts off. When taking off from the earth, man will be subjected to a force many times that of gravity. This is something which cannot be overcome. The only thing that can be done is to find the position in which man is least susceptible to damage by this force. Tests have shown that if the g forces work across a man's chest he can stand the most force. Therefore, a prone or supine position is the safest. Experience has also proven a factor. Men who had previous experience in a centrifuge were found to sustain an increased force much better than those experiencing it for the first time.

As man goes out into space he will encounter conditions not found on the earth's surface. The earth's atmosphere provides protection from such things as cosmic rays, ultraviolet rays, and meteorites. However, these will all be encountered as man probes deeper and deeper into space.

Radiation is one of the major problems man will encounter in space. Much of this radiation comes from the sun. The atmosphere of earth provides a protective filter from much of this radiation. Outside the atmosphere, however, man will be subjected to the unattenuated effects of this radiation. It is known that above twenty miles, primary cosmic rays are capable of killing human cells. Ultraviolet rays, those which cause sunburn, are also dangerous above the filtering of the earth's atmosphere. This could be quite serious if there were no way of reducing the effect of these rays. Fortunately, special windows and metals can protect the occupant of a spacecraft from this radiation.

Small meteorites are another problem which will be encountered in space. On earth the atmosphere has again acted as a protective device and all but the largest meteorites burn up well above the surface of the earth. Outside the atmosphere they will puncture the skin of the spacecraft causing the pressure to drop. Pressure is an important factor in obtaining the correct environment for a man in space. As pressure decreases the blood will actually boil from the body's own heat. Thus a large pressure drop would soon cause death. It has been determined that a meteor of 6mm. diameter will puncture a sheet of aluminum 2.5 cm. thick. Because of the great weight this would entail in a rocket, the object has been not to keep out the meteors but rather to have a very thin shell that the meteor can easily puncture thus avoiding the danger of an explosion on impact. An explosion would result in a larger hole (consequently a large pressure drop) than would be caused by the meteor going cleanly through the skin. A small hole like this could be repaired before the pressure dropped to a dangerous level. It has also been suggested that the inner shell of the ship could be surrounded by another shell which would reduce the impact of the meteor before it reached the inner shell. (*Continued on Page* 30)

THE BELL TELEPHONE COMPANIES SALUTE: BOB BUCK

When a new microwave transmission system was needed to connect Detroit, Flint, and Lansing, Bob Buck (B.S.E.E., 1960) designed it.

Bob has established quite an engineering reputation in Michigan Bell's Microwave Group during his two years there. And to see that his talent was further developed, the company selected Bob to attend the Bell System Regional Communications School in Chicago.

Bob joined Michigan Bell back in 1959. And after introductory training, he established a mobile radio maintenance system and helped improve Detroit's Maritime Radio system—contributions that led to his latest step up!

Bob Buck, like many young engineers, is impatient to make things happen for his company and himself. There are few places where such restlessness is more welcomed or rewarded than in the fast-growing telephone business.

BELL TELEPHONE COMPANIES

AEROSOL SPRAYS

by Bruce Johns
Soph., Ch.E.

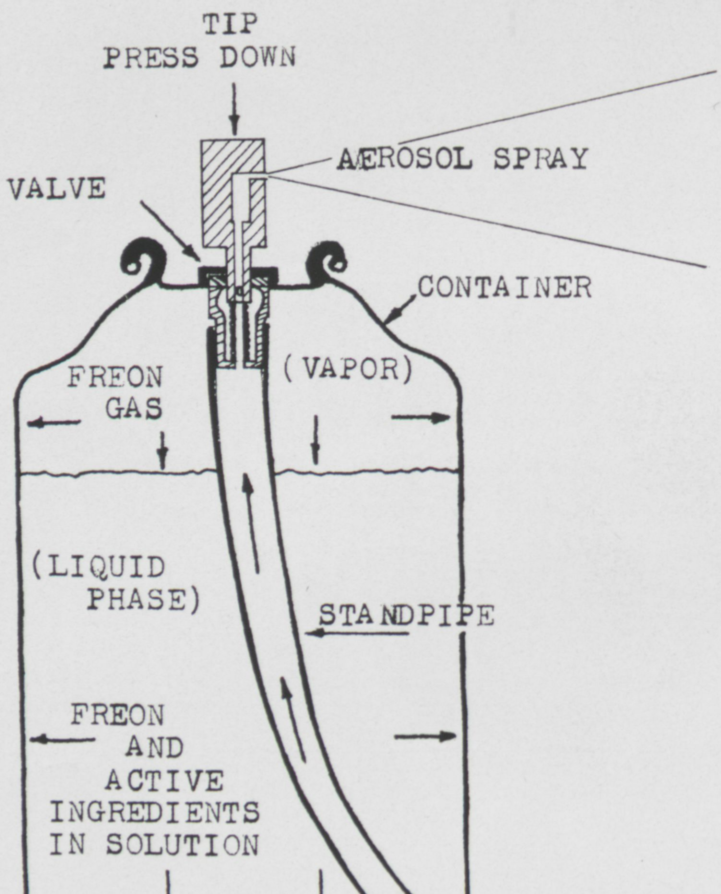


FIG. 1.
AEROSOL SPRAY CAN WITH
FREON PROPELLENT

We are living in age of aerosolization. Everything eligible is being put into a can to make it more convenient. Although their use has increased in only the last 20 years, aerosols have been in existence since the beginning of the century. An aerosol is a self-dispensed, pressurized, self-propelling product, dispensed by use of some condensable or non-condensable gas. Its forerunners were developed in 1899 when two inventors, Helging and Pertesh, developed a pressurized container using methyl and ethyl chlorides as propellents. During the period between 1903 and 1933 these gasses were used in many pharmaceuticals, perfumes, colognes, and foams that were patented as aerosols. In 1935 the first fluorinated hydrocarbons were developed in the search for a non-toxic refrigerating gas. During experiments with dichloro-difluoromethane and other related gasses, it was discovered that these gasses acted as good propellents. In the early 1940's, a chemist named Goodhue developed the principles of the new propellents for use in the application of insecticides. The ingredients of any can could now be sprayed into the air or onto many kinds of surfaces.

(*Continued on Page* 24)

(Photos by Bryan Carter)

miss technic for march

This month's Miss Technic is Miss Cammi Bogusz, a nineteen year old sophomore at St. Mary-of-the-Woods College. Cammi is a drama major, and her extra-curricular activities include plays and radio and TV work. She likes folk music, show tunes, and she is also an amateur ventriloquist. Her favorite sports are swimming and playing pool. Cammi's vital statistics—6.81×10^4 grams, 161 centimeters in height, 86.4-58.4-88.9 centimeters in perimeter at randomly chosen points—prove conclusively that her home town, East Chicago, Indiana, produces things much more interesting than steel.

The Depressant Drugs

by Tom Wegman
Freshman

The depressant drugs—defined as those which in moderate quantities relieve pain and anxiety, cause mental and physical relaxation, and usually sleep—range from the mild to the very strong. Under the classification of depressant drugs come the barbiturates, anti-histamines, alcohol, opium, morphine, those drugs contained in tranquilizers, and many others. Their effects range from a gentle calming effect to that of unconsciousness and death, depending upon their potency and the dosage under which they are given. The depressant drugs sometimes seem to be acting as stimulants, in that they seem to cause active or exciting behavior. This is misleading, the reason being that the drugs depress the mental controls that usually keep such behavior in check.

The more dangerous of these depressant drugs are opium, morphine, and heroin. The reason for their being so dangerous is that they are so addicting. Opium, a brown sticky paste, is obtained by thickening the juice gotten from a species of poppy, grown mainly in Southern Asia. The drug opium and all those derived from it are addicting. Morphine which is comprised of about ten to twenty-four per cent of opium is used by physicians to relieve intense pain. The dosage is nevertheless kept small, for large doses can cause stiffening of the muscles, an uncertainty and jerkiness of action, loss of memory, unconsciousness, and large doses can cause death. Heroin, a white powder resembles morphine, from which it is made. Heroin was at first thought to be non-addicting and was sometimes used in treating cases of morphine and opium addiction. It was later found that heroin was even more addicting than morphine. The pains from the deprivation of this drug are so intense that those trying to obtain the drug become violent in trying to get the desired dose. Another drug, codeine, is about one sixth as strong as morphine and is used for the same purposes as morphine.

Narcotics, especially those mentioned previously, affect the higher brain cells. They effect the motor level with the small brain at the center. This part of the brain is the controlling factor in co-ordination, speed, skill and strength. Larger doses affect the medulla, that section of the brain which controls breathing, circulation, digestion and excretion. The larger doses affecting the medulla may cause cessation of these basic life processes, thus causing death.

Barbiturate drugs also fall under the category of depressant drugs. They are probably better known as sleeping pills. Some of the barbiturate drugs when injected into the blood stream may very quickly produce unconsciousness. Large quantities cause intoxication similar to that produced by alcohol.

Large doses of the barbiturate drugs have been used in experiments with rats in which the barbiturates cause an individual to go into an electric shock. Electric shocks have long been used for the treatment of mental cases. Dr. James L. McGough, a University of Oregon psychologist, reported that the shorter the time between training and administration, the greater the memory loss of the rat for the maze running problem. He also reported that the amount of drugs given were sufficient to cause unconsciousness but not death. The drugs caused a twenty-five to thirty per cent memory loss up to three hours after the drug was administered, and none up to six hours. To contrast the memory losing effects of the barbiturate drugs, it takes a shock large enough to cause convulsions and unconsciousness given within an hour of the training period to cause a memory loss equivalent to that of the injection of the barbiturate drug.

One of the drugs, sodium pentothal, when injected directly may cause an individual to go into a semi-conscious state. He can then be asked questions to which he may answer more truthfully than had he been awake. This drug is sometimes referred to as the "Truth Serum." Barbiturates are becoming a more serious problem than morphine and heroin because the sleeping pills containing barbiturates can be so easily obtained and there is so great a danger of their being taken in too large a dosage.

The antihistamine drugs are also used as sleeping pills. Sleep-eze, Nytol, Dormin, and Sominex are examples of these sleeping pills. The antihistamine drugs do not contain barbiturates. Instead they contain a sedative ingredient called an antihistamine drug which is chiefly methapyrilene (the trade name of which is Histadyl). Nytol and Sominex also contain a pain killer called

halicylamide. As to the effectiveness of the antihistamine drugs, I quote Dr. Louis Lasogna, Director of Clinical Pharmacology at the John Hopkins Medical School. "Presumably these [antihistamine and scopalamine] drugs have come to be promoted as hypnotics because of the drowsiness observed as a side-effect attendant on their use in the treatment of allergic disorders and in the prevention of motion sickness. How effective are the preparations? No one really knows. Every physician is aware of the ability of most antihistamines, given in sufficient dosage, to affect the central nervous system, sometimes with resultant stimulation, usually with sedation, occasionally with both."

The next question is, how safe are they? They are probably safe if they are taken in prescribed dosage, but it is not advisable to take an extra large dosage if the small one seems ineffective. They will probably produce the side effects besides sedation, of dizziness, incoordination, blurred vision, nervousness, anorexia (loss of appetite), frequency of urinatin, skin rashes, and sometimes blood changes. As was stated earlier, these will probably not come about if the antihistimines are used according to directions.

In 1561, Jean Nicot, a diplomat, failed in his mission of getting Queen Catherine de Medici's daughter married to the King of Portugal. Nicot won favor back again by picking up an American weed (called tobacco) in Lisbon. The most important ingredient in tobacco is that of nicotine. It cleared Queen Catherine's headaches by making her sneeze hard enough to clear out her sinuses. Although nicotine isn't necessarily used to clear up the sinuses, it can be called a depressant. It cannot be rightfully called a narcotic because it could probably not be able to be consumed in great enough amounts to bring on the stuporous stage which is a common effect of the narcotics. Nicotine nevertheless can cause a loss of memory span and also a decline in the power of association.

The most common talked about depressant of today is of course the tranquilizer. Most psychiatrists agree that psychic drugs have been only moderately successful, and at times complete failures. It should be remembered that these drugs cannot cure disease, but can merely alleviate the symptoms. The effectiveness of the drugs is hard to measure because many times the symptoms are of such a minor nature and the changes brought about by the drugs, if any, are almost imperceptible. Tranquilizers do range in effectiveness. They range from highly potent drugs for persons with uncontrollable tremors, fear, delusions or hallucinations to the very mild, for the less troublesome anxiety-tension states. The side effects of the tranquilizer vary from the most unpleasant of sleepiness, to the more rapid heart beat, dryness of the mouth, subnormal temperature, sensitivity to sunlight and low blood pressure. Phenothiazine drugs, the drugs that make up certain tranquilizers, have been found to have little more benefit in mental patients than a placebo (dummy pill). In spite of the sometimes limited effect, tranquilizers have been used in the treatment of psychiatric outpatients and for troublesome patients in general practice.

Psychological experiments have shown that alcohol, often thought of as a stimulant, is actually a depressant. Alcohol effects the brain centers which control the voluntary behaviors and emotions, and affects the lower centers only in severe intoxication. At Yale, over two hundred psychological investigations were carried out on alcohol. It was found that muscular output showed a decrease of about ten per cent. In the light flash test, the efficiency to respond to light flashes decreased from six to thirty-five per cent an hour after drinking. The continuous adding efficiency test showed that there was about six per cent greater error in children, and about thirteen per cent in adults. It was found that it took twice as long to memorize twenty-five lines of poetry when a glass and a half of whiskey was taken on an empty stomach. Reasoning ability was also found to decrease by almost sixty-seven per cent after the consuming of one half pint of whiskey. In another experiment, subjects were given ninety proof whiskey, consumed on an empty stomach. Within fifteen minutes after consumption the subjects were given difficult calculus problems, it was found that not until the alcohol content reached one milliter of absolute alcohol per kilogram of body weight did it effect their reasoning ability.

During the tests at Yale many questions were answered about alcohol and the person indulging in it. The personality of the drinker was found to be more selfish, materialistic, tolerant, affectionate, and impulsive. The drinker seemed to be a moodier and less optimistic person. The questions, does liquor help a person to temporarily overcome his anxieties and fears were also answered. They found that alcohol does reduce and sometimes completely eliminates fear and anxiety. The problem of using alcohol for this purpose, however, is that of the risk of becoming enslaved to it. In the tests conducted by the United States Air Force, alcohol was to have lowered the perception of recognizing colors. This perception was sharpened by the consumption of coffee. The flow of ideas to the brain was said to be increased also. They were however, less effectively organized and less integrated. Alcohol was thought to "loosen the tongue." Recent studies show a sometimes opposite effect. In some circumstances alcohol may ward off mild feelings of depression and anger, and still also it may increase these feelings. The idea that one can drive more efficiently after having a few is wrong. The only reason is that the driver drives more carefully (in some cases) because he knows it will affect his driving.

In conclusion, the depressant drugs can be useful tools, but in order for them to be used as such, they must be treated with care and respect.

INTRAMURAL ATHLETICS

Written by Larry Sachs, Soph., Math.

Intramural and inter-fraternity sports furnish many Rose students the opportunity to release excess energy, if any energy remains after school work is done. and also the chance to let off steam that has slowly been building up. The school provides both the facilities and a director for a wide variety of sports

Mr. Jim Carr took over the duties of Intramural Director this year after serving for many years as basketball coach of the Engineers. By successfully budgeting the money from the expanded General Intramural Fund and being extremely aware of the students' interests, he has greatly enlarged this year's program. More teams have been entered in every sport while cross-country, badmitton, and a free throw tournament were added for the first time. Another first at Rose was a class in karate taught by one of the students.

Soon after the start of school in September, football begins at the two fields set up on the area surrounding the baseball diamond. Volleyball and basketball pick up when shorter days and colder weather bring outside activities to a halt. The climax of the basketball competition is a tournament to determine the over-all champion. Bowling also runs through the winter months. High team standings are naturally the focus of the competition, but the men are in individual contention too as the top scorers are chosen to represent Rose in various regional meets such as the one that was held at Purdue in February.

Softball and a track meet are the highlights of the spring season. Yet golf, tennis, and a ping-pong tournament also attract a large number of students.

Charts No. 1 and No. 2 show the number of students participating in each sport and the number of students engaged from each class, respectively. These percentages indicate quite a larger degree of participation than might first be realized since many students take part in more than one sport and since varsity athletes are not allowed to compete during the seasons that they are on one of Rose's varsity teams.

In each of the major sports, points are given to each class based on the standing of their top team. Forty points are awarded for first, thirty-six for second, thirty-two for third, and twenty-eight for fourth. The Sophomore Class of 1966 is currently leading, having captured a first in football and being tied for first in basketball.

The biggest handicap of the expanded schedule is the shortage of playing time and facilities that are necessary in order to allow each team to play a reasonable number of games. Some of the contests cannot be started until the varsity team has completed its practice. Jim Carr has hopes of enlarging the football and basketball areas to accommodate a 100% increase. Also under discussion as possible in the near future are plans for handball courts, bowling alleys, and even a swimming pool.

Sponsored by the I-F Council and with complete backing of the Rose administration, inter-fraternity sports are widely participated in and are enjoped by many spectators other than the large turnout of fraternity men. The institute again provides the equipment and facilities; but the four fraternities, Alpha Tau Omega, Lambda Chi Alpha, Sigma Nu, and Theta Xi, pay for the referees and buy their own uniforms.

Trophies are awarded in football, basketball, and softball each year. Any team winning the trophy in a particular sport for three years in a row retires the trophy. An all-sports trophy is also given to the fraternity that places highest in the combined standings from all three sports. Last year was the start of an annual pledge basketball tournament which is tremendously competitive.

CHART #1

	Total No. partici-pating	Percent of total enrollment
Football	210	37
Basketball	194	34
Volleyball	118	21
Bowling	128	23
Softball*	180	31

CHART #2

	*Total No. partici-pating	Percent of total enrollment
Freshman	148	77
Sophomore	88	51
Juniors	56	47
Seniors	49	53
Total	341	59

(*Spring sports not included)

AEROSOLS

(*Continued from Page* 16)

Since World War II, aerosols have increased tremendously in production and sales. The increases have been able to come about because of the technological advances in production methods and in the manufacture of the container and materials. To understand this just follow the production line as some jobber fills a contract on his aerosol filling line.

The first problem for the aerosol jobber is to select the proper kind of can for the job. Tin plated cans are used principally because of their strength and because of the large number of coatings that must be used to protect the can from such corrosive products as shaving cream, shampoos, and quaternary ammonium disinfectants. Although glass and plastic are probably seen often as containers, they constitute less than 10% of all containers used. In spite of their design features, glass and plastic are limited in many applications because of their lack of strength. Aluminum and stainless steel are used where spray quality and non-corrosive properties are needed.

Once the can is chosen it is started on the line through an unscrambler which feeds the cans on to the line as fast as they are needed. On entering the aerosol line they first proceed to the filling pot which fills the cans with the aerosol product. The pot usually works on the principel of a gravity feed. As the cans proceed under the pot, electronic timing devices take over and open spouts under the pot just long enough for a predetermined amount of material to fall into the cans as they are stopped under each spout.

After being filled with the active ingredients the can proceeds on and receives a valve. Beside the propellent, the valve is probably the most important part of the aerosol product. The valve works on the idea that as some external pressure holds the valve open the vapor pressure in the can forces liquid (that

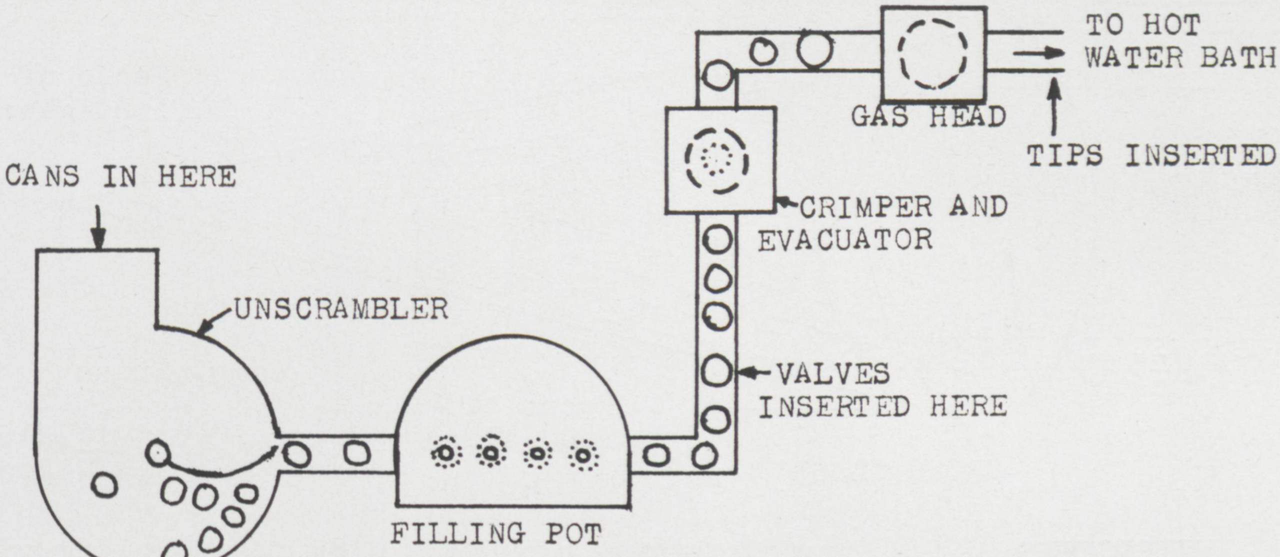


FIG. 2.
AEROSOL CAN FILLING LINE FLOW DIAGRAM

is mixed propellent and active ingredients) through the temporarily opened mechanism. When external pressure ceases the valve springs closed and seals airtight. Besides the standard valve shown in Fig. 1, special valves have been developed for various products and desired features. For example, the metered valve was developed to allow only a limited and measured amount of material through the valve before it closes, no matter how long pressure is exerted on the tip. Also, valves for powdered materials, and one shot valves for fire extinguishers, have been developed. The variations in valve design permit changes in the rate of dispensation of material, the pattern of spray, the direction of spray, the size of particles, and other desirable features.

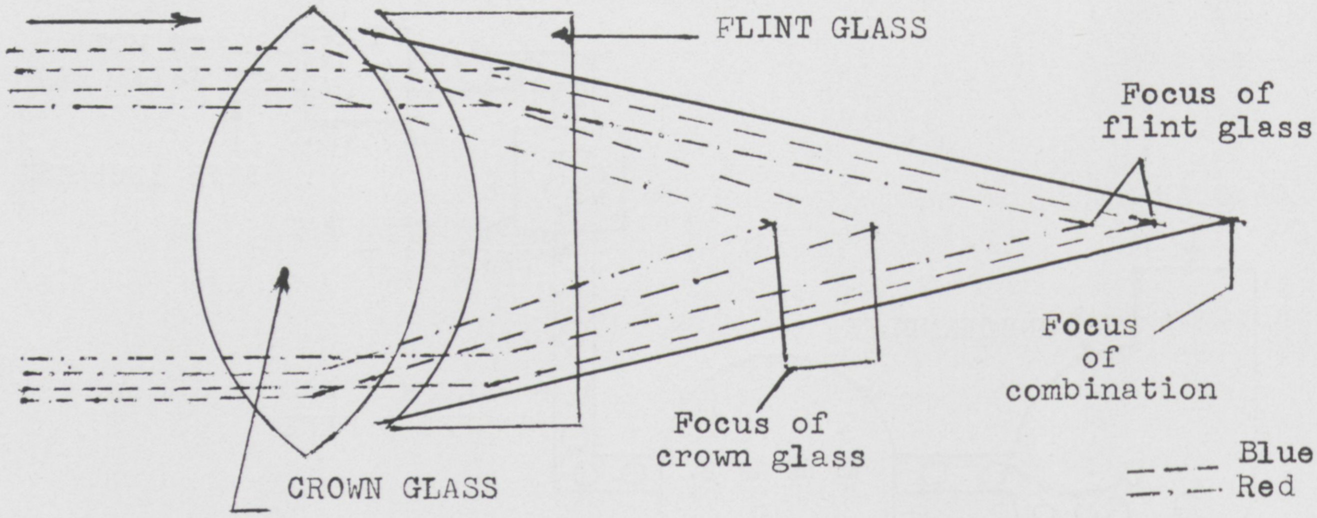
The line of filled and valved cans now proceeds to the crimper and evacuator where each can is crimped while the air is being evacuated. It should be noted that the can is crimped on the inside lip of the valve by pushing the metal of the valve outward under the roll of metal at the top of the can. This method of crimping provides maximum strength to resist high pressures. Air is evacuated from the container to decrease the internal pressure and enable the propellent to enter more easily through the valve.

As mentioned before, the evolution of propellents has partly caused the increase in aerosol use. Since there are a variety of propellents, the propellent used for a particular job depends on the nature of the container, the pressure desired, and the spray pattern needed. However, all propellents used today have a few common characteristics that are required; (1) all fluorocarbons must have a vapor pressure between 15 and 100 psig at 70°F, (2) all propellents must be non-toxic, especially with food aerosols and hygenic products, (3) they must be chiefly inert to avoid reaction with ingredients and can, (4) they must be nonflamable and nonexplosive.

Among the propellents used most often today are the fluorocarbons and the straight hydrocarbons with a minor emphasis on some special gasses such as CO_2 and N_2O. Most aerosols, however, use fluorohydrocarbons. The most popular of these compounds are the refrigerants Freon-11 ($CC1_3F$) Freon 12 (CCI_2F_2), and 1, 2-dichloro-1, 1, 2, 2-tetrafluoroethane ($CC1F_2CC1F_2$). Straight hydrocharbons run in second place usually because of their flamable nature. Gasses such as butane, isobutane, and propane have many of the properties of good propellents. While the above compounds are more universal, CO_2 and N_2O are reserved more for products such as foods and shaving cream. In order to overcome special problems, it has been discovered that propellents can be mixed to take special advantage of a desired combined property such as density or vapor pressure.

The addition of the propellent to the can is accomplished by use of a high pressure head with a needle valve in its center. As the head comes down on the can the needle valve pokes through the can's valve and injects the proper amount of propellent. After this step the process is essentially complete. All that remains is the insertion of the tip and the testing of the can in a hot water bath for leaks and overfull cans.

These are the basic procedures and materials used in the aerosol industry today to make its wide variety of products. Aerosol products cover a broad spectrum; from hair sprays and dressings, shaving creams, and tooth paste, through fragrance products and pharmaceuticals, down to insecticides, fire extinguishers, and a large variety of surface coatings.



TELESCOPES

(*Continued from Page* 10)

larger and better telescopes. The most obvious is the fact that a lens can be supported only along its edges and therefor, when made too large will tend to bend and cause the figure of the glass to change. Also, a piece of glass intended for use as a lens must be perfect throughout since light goes all the way through it. Also, the lens must be figured on four sides. The solutions to these problems were found in mirrors.

A spherically curved mirror acts as a lens in focusing the light rays at a point. Also, a mirror does not discriminate against different wavelengths of light since the light does not change its media of transmission when reflected from a mirror. Hence, no chromatic aberration. Unfortunately the spherical aberration of a spherical mirror is much greater. Therefore, a parabolic reflecting surface replaces a spherical mirror in general applications. Another advantage to the mirror is that it can be made to have a shorter focal length than a lens (1 : 5 or less). Diagram 3 shows the parabolic mirror and how it is incorporated into a telescope.

The reflecting telescope lends itself to a variety of types of construction and four are shown in the accompanying diagrams (4 - 7). The illustrations show the different points of focus and they are named as follows:

Fig. 4 Newtonian — the most common construction of reflecting telescope, especially among smaller instruments, the objective mirror reflects light to a plane mirror inclined at a 45° angle, which reflects the light into the eyepiece.

Fig. 5 Cassegrain — the second most common method of building, the objective reflects the light to a convex hyperboloidal mirror which in turn reflects the beam down through a hole in the center of the mirror where the eyepiece is placed.

Fig. 6 Coude' — here a small plane mirror reflects the light to another mirror which again reflects the light along the polar axis of the mounting enabling the observer to place his equipment (e.g. eyepiece, camera,

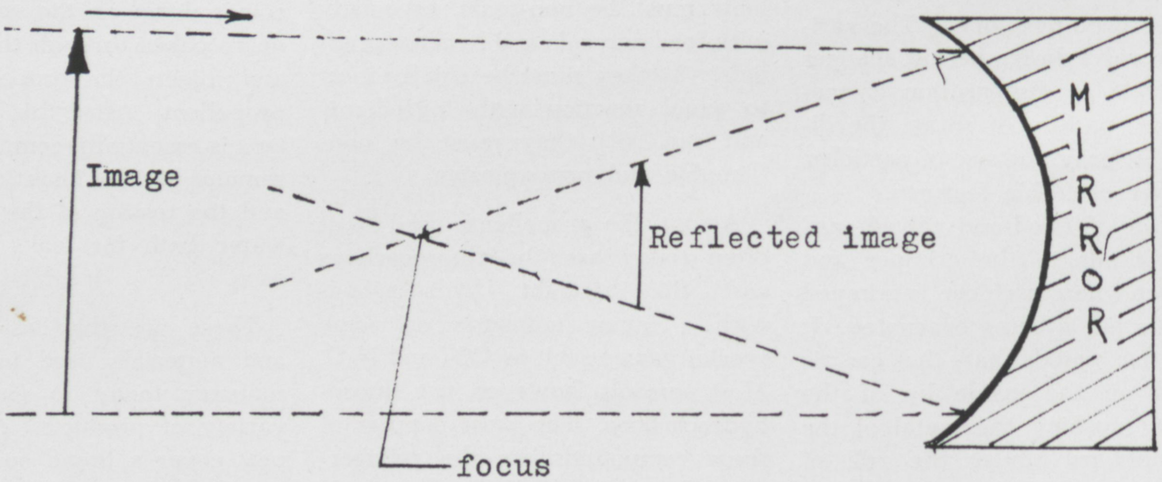


FIG. 3 A mirror and its reflecting capabilities with respect to astronomical telescopes.

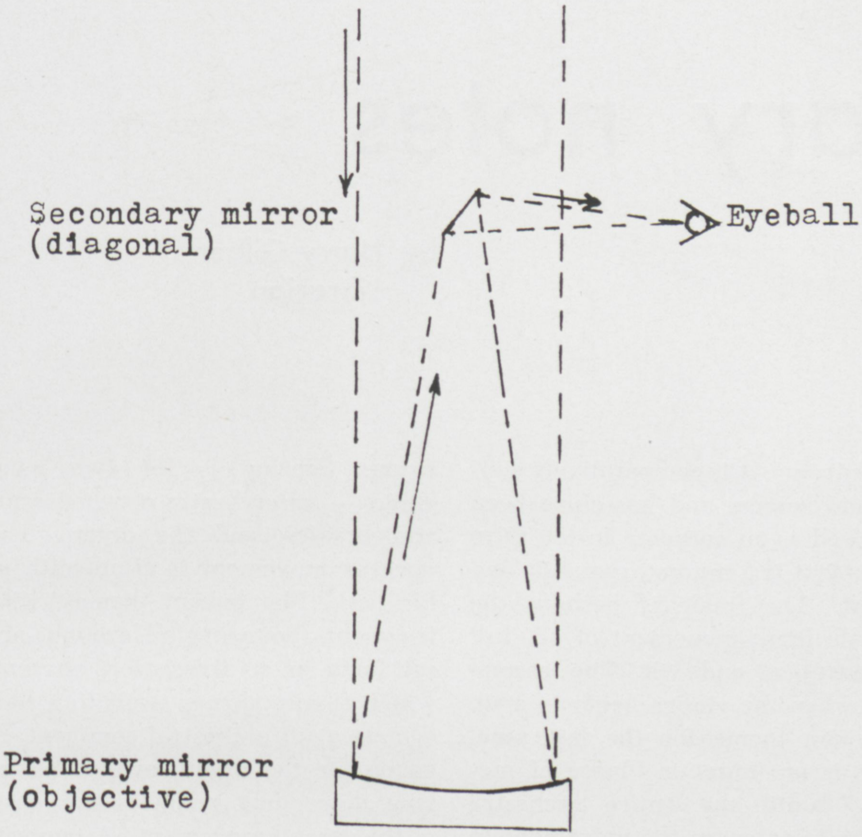


FIG. 4 The NEWTONIAN reflector

FIG. 5 The CASSEGRAIN reflector

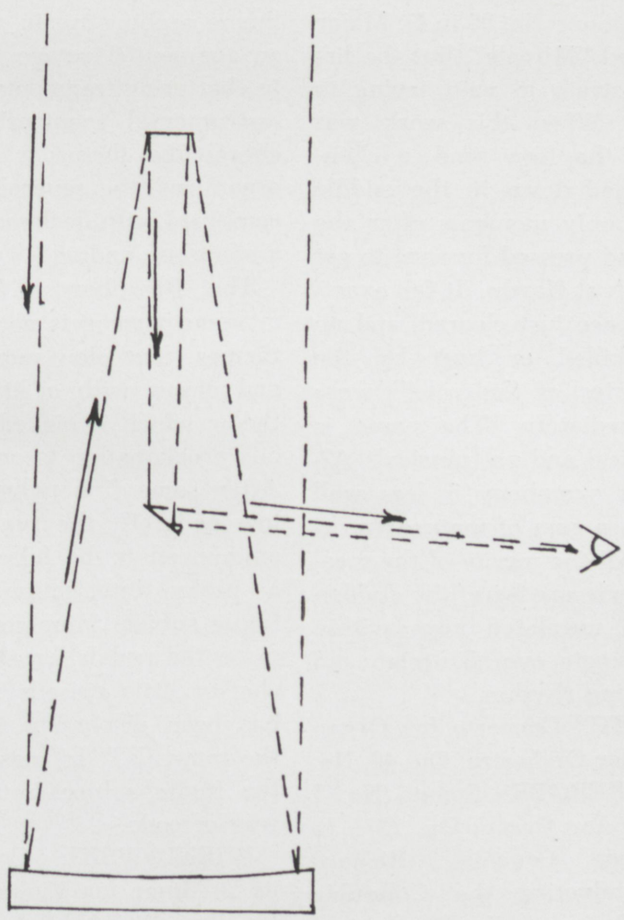


FIG. 6 The COUDE' focus reflector

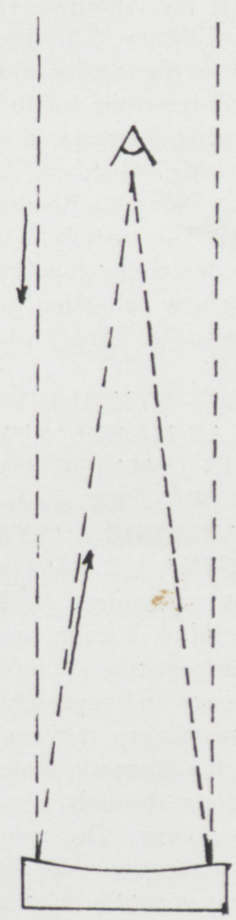


FIG. 7 The PRIME Focus reflector

library notes

by Harry Gilbert
Librarian

Through the efforts of the previous librarian, Professor Carson W. Bennett, The Rose Library has developed the basis for a very fine record library. Many student and faculty members make continuous use of this fine collection. In recent months there have been many inquiries and suggestions concerning new acquisitions for the record collection. In the first week of February, Columbia Records made a generocs donation of sixty long-playing Columbia Masterworks records to the Rose Library. The library staff, on behalf of the faculty and students of Rose Polytechnic Institute, would like to publicly express our appreciation to Mr. Goddard Lieberson, President, Columbia Records for this fine gift. This article will be devoted to describing the first records from this new collection to be made available to the library users.

HAYDN: SYMPHONY NO. 102 IN B-FLAT MAJOR. SYMPHONY NO. 96 IN D MAJOR ("Miracle"). BRUNO WALTER conducting the PHILHARMONIC - SYMPHONY ORCHESTRA OF NEW YORK. In the first movement of Symphony No. 102, after a calm and assured *Largo* introduction, there appears great energy and aggressiveness and an extraordinary advanced treatment of the thematic material, with modulations through a number of surprising keys. The recapitulation leads to a stirring *coda*. The second movement is subtle in orchestration, using muted trumpets and muffled kettledrums. It is comparatively simple and serene, and has since been arranged as an anthem. In the third movement is a minuet, romantic and robust. The finale is perhaps the most brilliant movement of all, full of invention and wit. The second half, when the violins begin to state the main theme for the last time, there is an imitation "lapse of memory" until the entire orchestra breaks in to carry the movement to its exuberant conclusion.

The Symphone No. 96 in D. Major is nicknamed "Mircale", but the listener will strain in vain trying to hear why. When this work was played for the first time, a chandelier crashed down in the middle of the hall only moments after the audience had pressed forward to get a better look at Haydn. It fell exactly in the space just cleared, and no one was killed or hurt by the mishap. Cries of "miracle!" were heard immediately. The name is thus historical and not musical. Although this symphony is less well known it is a gem of mature workmanship. All the merits of the master's late style are here, the sudden jumps into unrelated keys within the consummate overall design and steady driving rhythm.

HINEMITH: Concerto for Organ and Chamber Orchestra, Op. 46, No. 2. RHEINBERGER: Sonata No. 7 in F Minor for Organ, Op. 127. E. Power Biggs Organist. Richard Burgin conducting the Columbia Chamber Orchestra In the First of these selections the orchestra is unusual. Scoring is for two wind choirs — an orchestra of woodwinds and brasses, and the organ. The opening movement is Hindemith at his best. Flamboyant themes, with fragments bouncing all around, are set forth in an irresistible rhythm, which finally shrugs itself to a halt against gruff orchestral comment. A canon for the organ, over a recurring descending pedal is the basis of the second movement. A trumpet flourish heralds the finale, the fugal theme arching up in arpeggio over an augmented octave, to scatter into chattering fragments. After some instrumental contrasts, a broad choralelike theme is given to the organ and the several subjects are combined with declamatory effect to a sonorous ending.

The Rheinberger Sonata's first movement projects no less than fine themes. The slow movement opens and closes with a little four note theme which is picked up in sonorous proclamation to open the finale. After some fine polyphony over a low pedal C, the fugue subject is announced to be followed later by a perky interjection. The main fugue subject later comes "stalking in on the pedals, brushing aside the cheeky little episode theme, which has been disporting itself high on the manuals." In massive harmony the fugue subject sounds forth by way of coda.

WIENIAWSKI: Concerto No. 2 in D Minor for Violin and Orchestra, Op. 22. SAINT-SAENS: Introduction and Rondo Capriccioso, Op.

28. RAVEL: Tzigane. Isaac Stern, Violinist. The Philadelphia Orchestra, Eugene Ormandy, Donductor. The three movements of the Concerto No. 2 in D Minor are connected and heard without pause. The first, *Allegro moderato,* was taken more *moderato* than *allegro* by the composer. After an orchestral exposition of the material the violin works out a free development, a kind of bravura rhapsody which without exhibitionism nevertheless demands the utmost in technique from the fiddler. An orchestral summation leads to a slow, quiet clarinet bridge to the second movement. Here the composer outdid himself, revealing an instinct for lyric melody that in this example achieved an air of such remarkable beauty that it has become a concert selection in its own right. The composer's cadenza leads into the finale. This *Allegro moderato,* taken now with the emphasis on the *allegro,* is titled *a la Zingara,* Gypsy style. Acrobatics and pyrotechnics take the center of the stage here, punctuated by occasional drawnout gypsy flourishes.

The small masterpieces of Saint-Saens are remarkable. Every note is as functional as a jewel in a Swiss watch and it can hardly fail to please as the measures are ticked off in phase after phase that is logical and satisfying. Like a machine for perpetual motion, the *Introduction and Rondo Caprissioso* continues to endure in musical programs by virtue of the rightness, trueness, the perfection of calculation it reveals. The weights and waters of its score fall, everytime, into perfect alignment for the full enjoyment of the ear.

Ravel, in Tzigane, is at work on a tour de force. It was his habit of mind to throw himself violently into the musical reformulation of an ethnic or social essence. Tzigane is a kind of whirlwind composite of all gypsy violinists, forever. As a dealer in rare essences, Ravel was perhaps the first musical chemit.

TELESCOPES

(*Continued from Page* 27)

etc.) in one place and never move it when changing the scope's position. This type of scope is difficult to make and is found only in larger observatories.

Fig. 7 Prime focus — here, the ocular for viewing is placed at the focus of the mirror. For this reason, only very large telescopes may be of the prime focus type. A reflector need not be of one construction only, and as a matter of fact, the largest telescope in the world, the 200-inch reflector at Mount Wilson, California, can be used as any one of the above instruments.

There are many more types of scopes, but all are based on the principles given here. Recently, electronic gadgets, spectroscopes, and other such devices have been added to increase the versatility of telescopes, but still, the heart of all the scopes is the mirror or the lens, and it will be that way for years to come.

SPACE FLIGHTS

(*Continued from Page* 14)

Weightlessness is one of the problems encountered in space which is partly psychological. This sense of weightlessness is felt by the occupants in a spacecraft when it is coasting in space. Man uses his weight as a form of orientation. Thus, under weightless conditions, he must learn to orient himself by some other means. Sight alone may be enough but more experience is needed on this subject. As with many other factors, time is important in the weightlessness factor. Man can withstand short periods of weightlessness; but can he stand weeks or even months?

Finally, upon re-entry, man is unable to withstand the extreme temperatures created by the friction of the atmosphere. Therefore his craft must be designed in a manner which will effectively keep this heat from reaching him.

These are just a few of the problems which must be overcome in designing the manned spacecraft. There are many other design problems which have nothing to do with the special problems created in space. These have to do with the everyday life processes of man: respiration, food and water, and the disposal of human wastes. These must be carried on in space just as they are on earth.

For short flights, the oxygen necessary for respiration could be carried along in the form of liquid oxygen. For long flights the problem is somewhat different. A human being consumes about an ounce of oxygen per hour. This would develop into a serious weight problem if liquid oxygen had to be carried for long flights. The use of plants to provide the necessary oxygen has been considered. Algae has been found to give out a large quantity of oxygen. Algae also offers the combined advantage of providing a food substance.

This brings us to the subject of food and water to be carried on the trip. For short trips food will be in the form of bite size food bars and water will be carried in plastic bags. For longer trips with more powerful rockets where weight will not be such an important factor, food will be canned or dried and it is expected that a method will be devised for recovering water from the atmosphere within the spacecraft and from body wastes.

The ultimate in space travel will come when a complete life cycle can take place on board the spacecraft. This has been envisaged with the algae mentioned earlier. The algae would provide food and oxygen for man. In turn human wastes could be used to fertilize the algae. Studies of these problems are currently being carried on by NASA and other scientists. Some of these problems, such as deceleration and acceleration can be effectively simulated on the groung while ones such as the problem of meteor penetration can be solved only after more experience in space. The solution to these problems will enable man to travel to other planets and perhaps someday to the stars.

PHOTOELECTRIC CELLS

(*Continued from Page* 13)

cal energy output to light energy incident on the cell. Silicon photoelectric cells have a maximum theoretical conversion efficiency of a little over 20% and production-type cells now available have conversion efficiencies of 12 to 13%.

A typical silicon photoelectric cell is a rectangular wafer of silicon about 0.4 inch by 0.8 inch by 0.02 inch thick. It will deliver about 40 milliamperes of current at 0.4 volts in bright sunlight. This wafer is a piece of n-type silicon with a thin layer of p-type silicon fused onto one surface. The side with the p-type silicon layer on it is the active side which is exposed to the light.

A very complex and, consequently, expensive manufacturing process is required to construct these silicon solar cells. In all, about forty different processes are involved in the manufacture of the cells. There is a lot of research going on to simplify the manufacturing process. One technique of semiconductor manufacture that appears to be applicable to photoelectric cells is the thin-film process. It is expected that higher quality cells can be produced at lower cost by using thin-film techniques.

There are many factors that effect the operation of silicon photoelectric cells. Some of these factors are: the light intensity, the spectral distribution of the light, the angle of incidence, the cell area, the cell temperature and the external circuit. As might be expected, the electrical power output of a cell is linearly proportionaly to the light intensity. An interesting fact related to this is that the output of a solar cell is about 15% greater in space than on earth due to the filtering action of the atmosphere.

Photoelectric cells, like the human eye, respond only to a certain band of wavelengths. A typical cell provides output for light in the band 5000 to 10,000 Angstroms. Any energy outside of the response band that falls on a cell just increases the temperature of the cell. Unfortunately, the power output of a silicon photoelectric cell decreases about 0.6% for each degree Celsius increase in cell temperature. For space satellite power supplies, the solar cells are often covered with thin glass filters that reduce the unwanted radiation outside the usable range of the cell. This keeps the cell temperature lower and provides higher conversion efficiency.

The active area of a photoelectric cell is one of the factors that determines the power output. As the area of a cell is increased the conversion efficiency decreases due to poor current collection. To help prevent this loss of efficiency the cells are "gridded." That is, several current collecting metalic strips are placed on the cell instead of just one. These extra strips are usually arranged in a grid pattern and hence, the name "gridded" cells. A "gridded" cell usually has about 1% better conversion efficiency than a "non-gridded" one.

The power output of a single photoelectric cell is rather small but, as with common chemical batteries, the cells can be wired together in series and parallel combinations to increase the power output. Space satellite power supplies with power outputs of up to 250 watts have been built using silicon photoelectric cells.

Although it is not yet economically feasible to build an electric power generating plant using photoelectric cells to compete with Public Service Co., photoelectric cells are being used in multitudes of new applications. One of these applications is readout units for punch-card and paper tape reading equipment. Response times of less than 20 microseconds can be achieved with readout units using silicon photoelectric cells.

A silicon photoelectric cell can be used in almost all applications where a device is needed to convert light to electricity. This is possible because the silicon cell has no moving parts, is quite simple and reliable, has a very long life expectancy and is small in size and very rugged mechanically. With these qualities, it is reasonable to expect that silicon photoelectric cells will be used in more and more applications in the future.

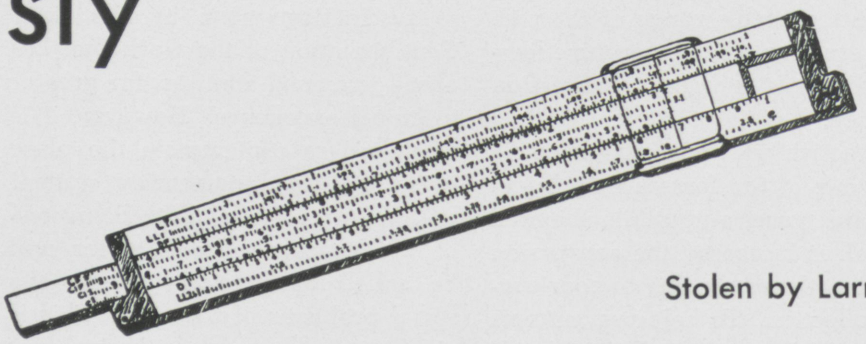
As with almost everything, there is still room for improvement in photoelectric cells. The engineering student of today can look forward to fascinating work in this field. Contemplation of the work that lies ahead is a good stimulus for greater technical excellence. However, it is also good to contemplate the place in society that engineering student will be expected to take. Being one of the educated, the engineer will be called upon to help solve the social problems of the time. This is a calling that should not be ignored.

The time of leaving social problems to the Ladies Aid Society is rapidly drawing to a close. The social problems, such as, unemployment, segregation, automation, labor relations, economics, taxes, etc., etc., etc., are growing day by day and will require the work of the finest minds available to solve them. It is not only logical but necessary that the highly trained problem-solving Rose engineer be a leader in solving these problems.

Many engineering students think humainties are a waste of time but consider the following: The engineer is well-known for building wonderful time and labor saving devices. This is great for everyone except possibly the 1 to 2 million people who are losing their jobs each year because of automation. In a few years there will be a fairly large group of people who may be getting hungry since they do not have jobs. If these people would happen to recall who built the machines that cost them their jobs, they might start thinking unkind thoughts about engineers and if things really got bad, these people might decide that eating engineers would be better than starving.

Of course this idea is ridiculous (or is it?) but the point remains that there are many growing social problems that the engineer must help solve. Just in case, you might remember that photoelectric cells can be used very nicely in warning systems to protect the laboratory from the roaming mobs.

sly droolings



Stolen by Larry MacDonald, Jr. M.E.

The engineer was out with a flirt, and when his buddy left the table to buy a paper she pursed her lips invitingly and leaned across the table toward her date and, putting her face against his, whispered, "Now is your chance, darling." Glancing around hastily, the engineer muttered, "So it is!" and quickly leaned over and drank his buddy's beer.

* * *

Faculty advisor: "Let's not have any more jokes about sex, drinking, and profanity."

Joke editor: "Ok, I'm tired of putting out this magazine any how."

* * *

Hear about the fullblooded Indian lass who says it isn't difficult at all to have fun with a beau and a few errors?

* * *

Husband: "You know, I feel ten years younger after I shave in the morning."

Wife: "Did you ever think of shaving after supper?"

* * *

He: "Why do the most important men on campus always get the prettiest girls?"

She: "Oh, you conceited thing you."

* * *

Two sexy young starlets were sipping drinks in a Hollywood bar. "You remember that backless, frontless, sideless evening gown I wore to the sneak preview last week?" one asked.

"I'll say," the friend replied. "It was a sensation."

"Well," the first said, "I just found out it's only a belt."

* * *

In a night club one evening, a very pretty girl was wearing around her neck a thin chain, from which hung a tiny golden airplane. One of the young men in the party stared at it so that the girl finally asked, "Do you like my little airplane?"

"As a matter of fact," he replied, "I wasn't looking at it. I was really admiring the landing field."

* * *

Bus. Ad. student: "I have a splinter in my finger."

Engineer: "Been scratching your head?"

* * *

An engineer caught his girl in a fraternity brother's arms. To their startled expressions he calmly replied, "I don't mind if you neck with my girl but there is going to be one hell of a fight if you don't get your hand off my fraternity pin."

* * *

"He says I don't know how to dress, huh! Well, tonight I'll wear my low cut dress and show him a thing or two."

The ocean was rough. As the steward was taking a bowl of soup to a stateroom he lost his balance on the uncertain deck and poured the contents into the lap of an old gentleman asleep in a deck chair Keeping his wits, the steward tapped the old man and asked solicitiously, "I do hope you feel better now sir."

* * *

Bigamist—Large fog over Italy.

Rabbit hole—Hare raid shelter.

Steam—Water crazy with the heat.

Rich man—Ordinary man without son in college.

* * *

A very pretty but very young girl came into the bar and sat down. The waitress went over to the bartender and said:

"Does she look old enough?"

"For what?" asked the bartender.

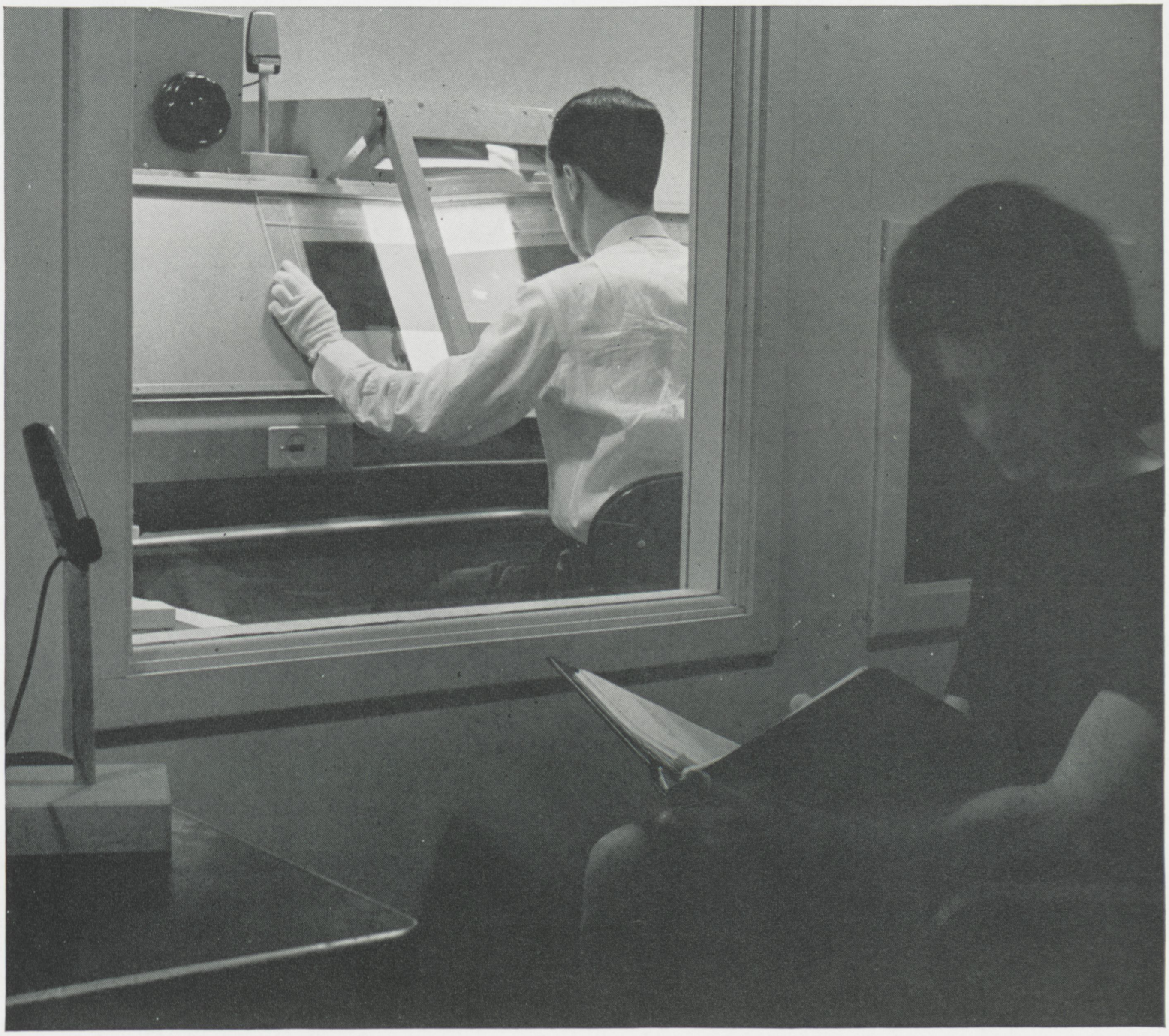
* * *

A controversial figure is when you're not sure how much of a girl's shape came from a store.

* * *

Textbook style: The puissance of hydrochloric acid is incontestable; however, the corrosive residue is inharmonious with metallic persistance.

Chem. E. style: "Hydrochloric acid eats hell out of steel."



WE MAKE INDUSTRIAL ENGINEERS SWEAT

Might as well scare off the ones who wouldn't like it. Some of the unscared will in a few years be referred to as "they" when people say, "At Eastman Kodak, *they* can afford to do it this way—"

The reason we can afford to do things the best way is that we are successful. The success can be attributed in part to a fear worth fearing: of failing to deliver the best possible performance that the customer's hard-won dollar can buy.

Sheer devotion on the part of the work force, though beautiful to see, will not of itself deliver the goods. Somebody must first come up with a sensible answer to the question, "Exactly what is it you want me to do, mister?"

Thus a young industrial engineer may find himself acting as his own first subject in a study he has set up to find the physical and psychological conditions that best favor alertness against film emulsion defects. If he saw the need, sold his boss on his approach, and has earned the approbation alike of the pretty psychologist who will be running the experiment, the industrial physicians (who study what is humanly possible, feasible, and healthful muscularly and perceptually), the cold-eyed man from the comptroller's office, the Testing Division chief (who has dedicated his division to the descent of an asymptote), and the inspectors (who will find a month after switching to the new method that at home they are shouting at their kids less often)—then we know ways to make him glad he chose to learn the profession of industrial engineering at the company which the leaders of the profession often cite as its ideal home.

Naturally, industrial engineers aren't the only technical people we seek. Not by a long shot.

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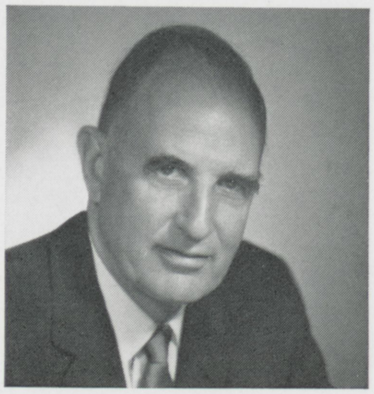
Define Your Career Objectives!

■ An interview with W. Scott Hill, Manager—Engineering Recruiting, General Electric Co.



W. Scott Hill

Q. **Mr. Hill, when is the best time to begin making decisions on my career objectives?**

A. When you selected a technical discipline, you made one of your important career decisions. This defined the general area in which you will probably begin your professional work, whether in a job or through further study at the graduate level.

Q. **Can you suggest some factors that might influence my career choice?**

A. By the time you have reached your senior year in college, you know certain things about yourself that are going to be important. If you have a strong technical orientation and like problem solving, there are many good engineering career choices in all functions of industry: design and development; manufacturing and technical marketing. If you enjoy exploring theoretical concepts, perhaps research—on one of the many levels to be found in industry—is a career choice to consider. And don't think any one area offers a great deal more opportunity for your talent than another. They all need top creative engineering skill and the ability to deal successfully with people.

Q. **After I've evaluated my own abilities, how do I judge realistically what I can do with them?**

A. I'm sure you're already getting all the information you can on career fields related to your discipline. Don't overlook your family, friends and acquaintances, especially recent graduates, as sources of information. Have you made full use of your faculty and placement office for advice? Information is available in the technical journals and society publications. Read them to see what firms are contributing to advancement in your field, and how. Review the files in your placement office for company literature. This can tell you a great deal about openings and programs, career areas and company organization.

Q. **Can you suggest what criteria I can apply in relating this information to my own career prospects?**

A. In appraising opportunities, apply criteria important to you. Is location important? What level of income would you like to attain? What is the scope of opportunity of the firm you'll select? Should you trade off starting salary against long-term potential? These are things you must decide for yourself.

Q. **Can companies like General Electric assure me of a correct career choice?**

A. It costs industry a great deal of money to hire a young engineer and start him on a career path. So, very selfishly, we'll be doing everything possible to be sure at the beginning that the choice is right for you. But a bad mistake can cost you even more in lost time and income. General Electric's concept of Personalized Career Planning is to recognize that your decisions will be largely determined by your individual abilities, inclinations, and ambitions. This Company's unusual diversity offers you great flexibility in deciding where you want to start, how you want to start and what you want to accomplish. You will be encouraged to develop to the fullest extent of your capability—to achieve your career objectives, or revise them as your abilities are more fully revealed to you. Make sure you set your goals realistically. But be sure you don't set your sights too low.

FOR MORE INFORMATION on G.E.'s concept of Personalized Career Planning, and for material that will help you define your opportunity at General Electric, write Mr. Hill at this address: General Electric Co., Section 699-10, Schenectady, N. Y. 12305.

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