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Rose Technic Staff
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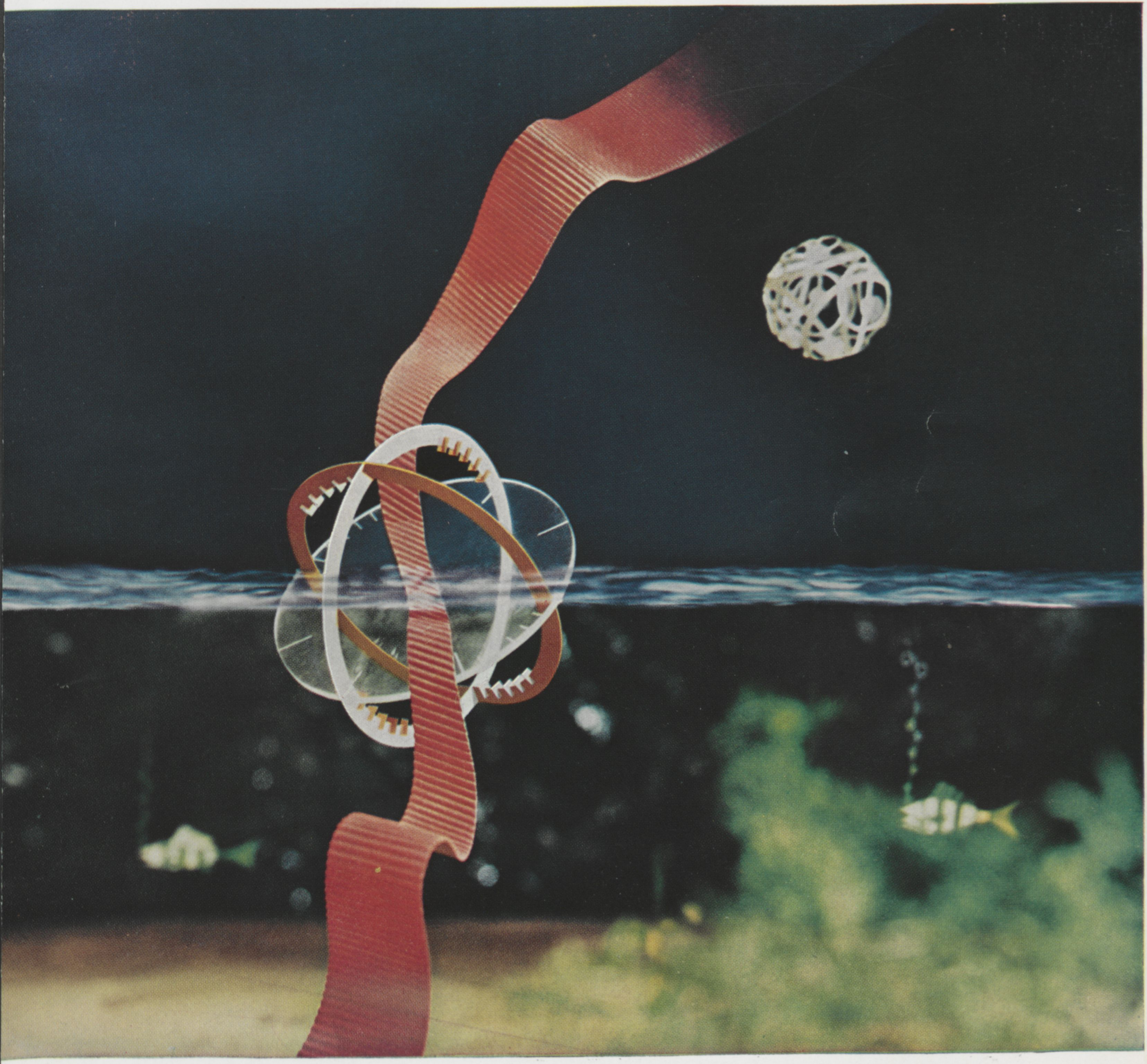
October, 1960



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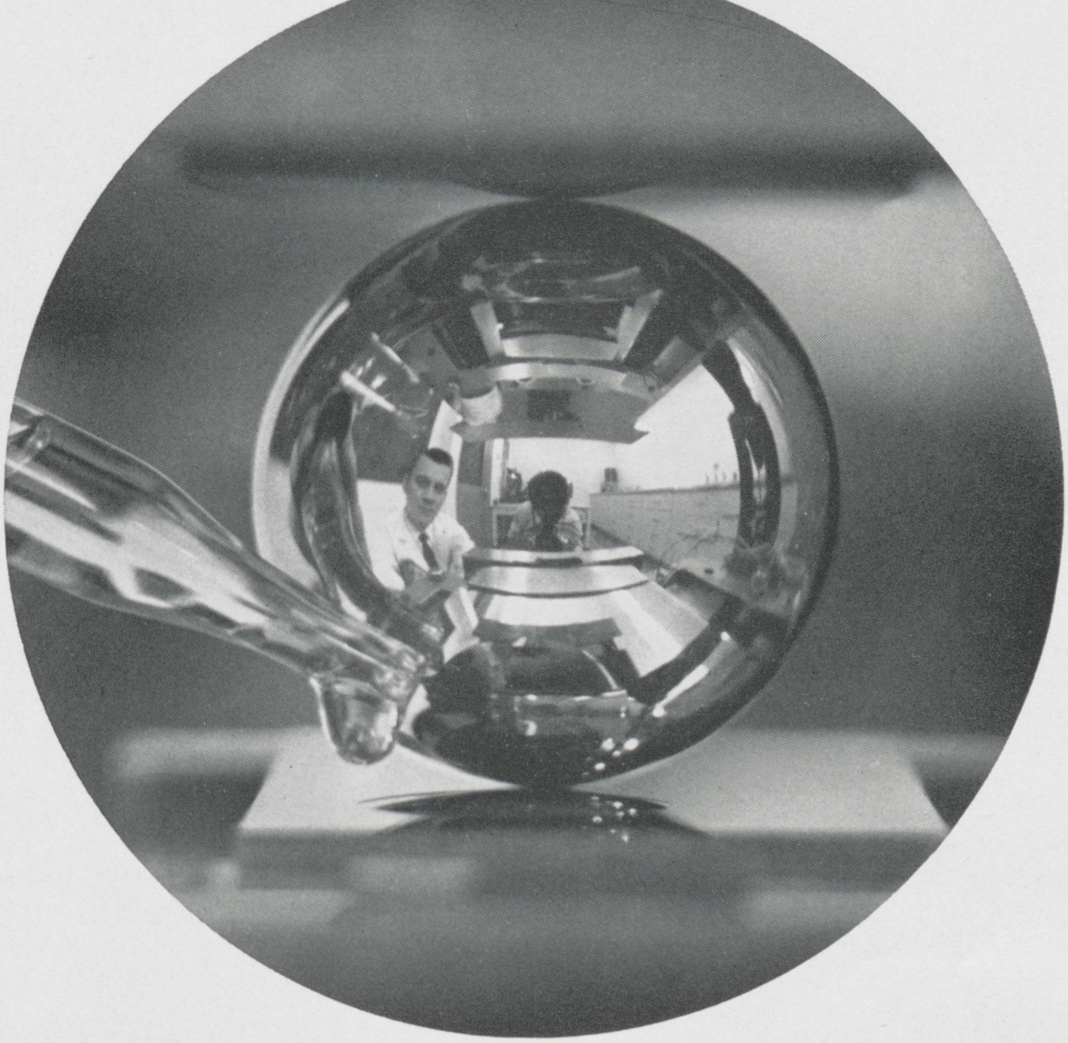

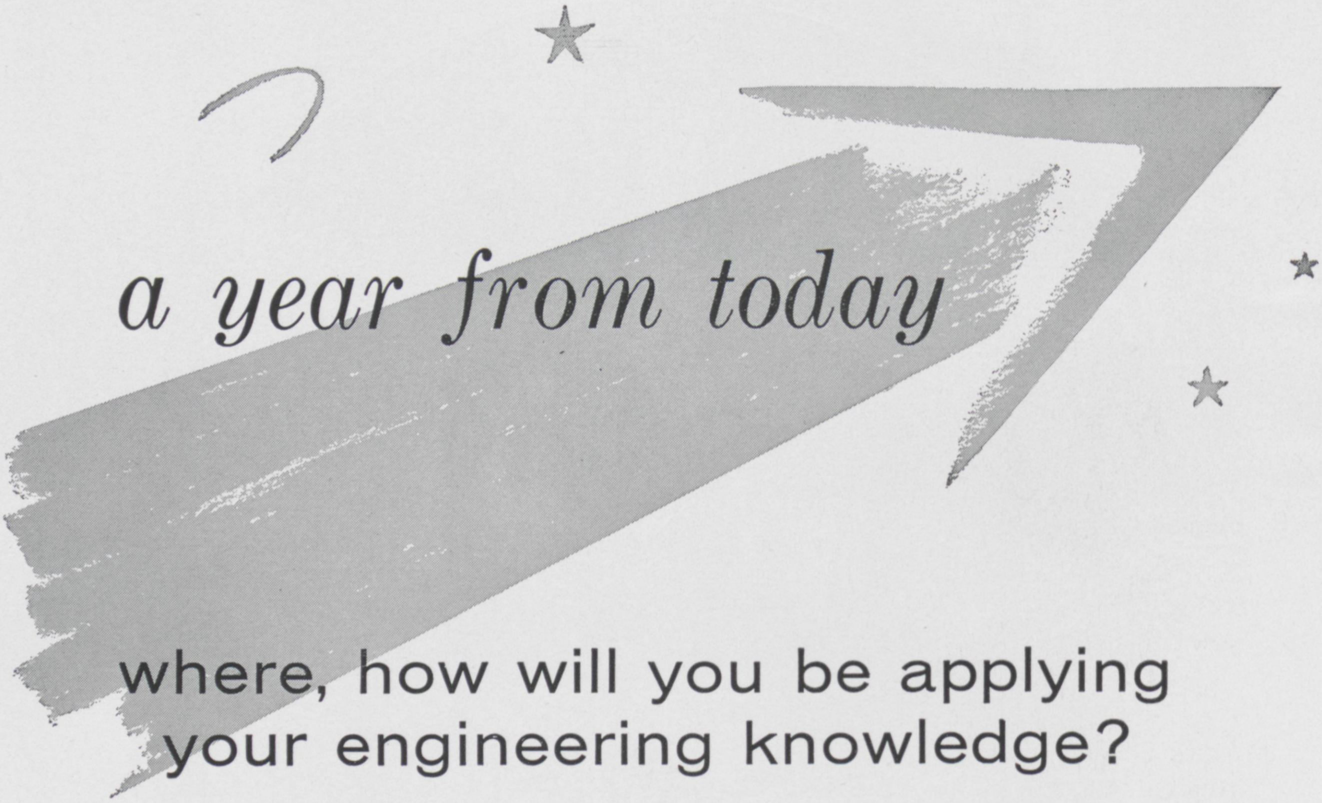

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Rose Technic

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Symbolic picture of gyroscope courtesy of Bell Aircraft.

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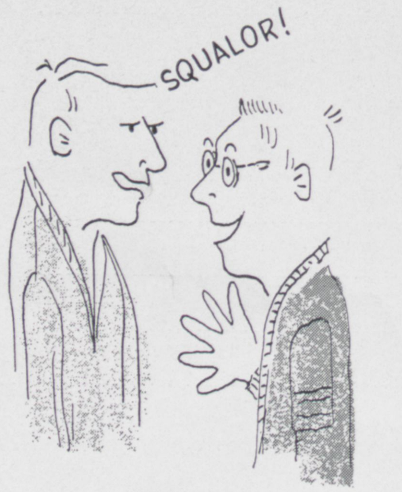
ELDOR, SOMETIMES I GET THE IDEA THAT COMPANY RECRUITING REPS ARE EXAGGERATING TO US. DON'T YOU FIND IT THUS?

AS YOU KNOW, ALBRECHT, I HAVE ACCEPTED AN ENGINEERING POSITION PRIMARILY ON THE BASIS OF AN HONEST, FORTHRIGHT PRESENTATION.

THEY SAID THAT I WOULD BE WORKING ON NEW UNCHARTED TRAILS THROUGH THE UNIVERSE...WITH THE ONLY LIMITS THOSE IMPOSED BY MY IMAGINATION.



I WILL LIVE IN AN ULTRA-MODERN ALL ELECTRONIC HOME SNUGGLED AMONG THE PINES AT THE EDGE OF A CRYSTAL BLUE LAKE.

WITH MERELY A DOUBLE GARAGE, ONE OF MY SPORTS JOBS WILL HAVE TO SIT OUT IN THE YEAR-ROUND PLEASANT WEATHER.

THEY TOLD ME EXACTLY WHAT MY SALARY WOULD BE, AND I'LL HAVE TO SET ASIDE (TEMPORARILY) MY PLANS FOR AN OCEAN-GOING YACHT.

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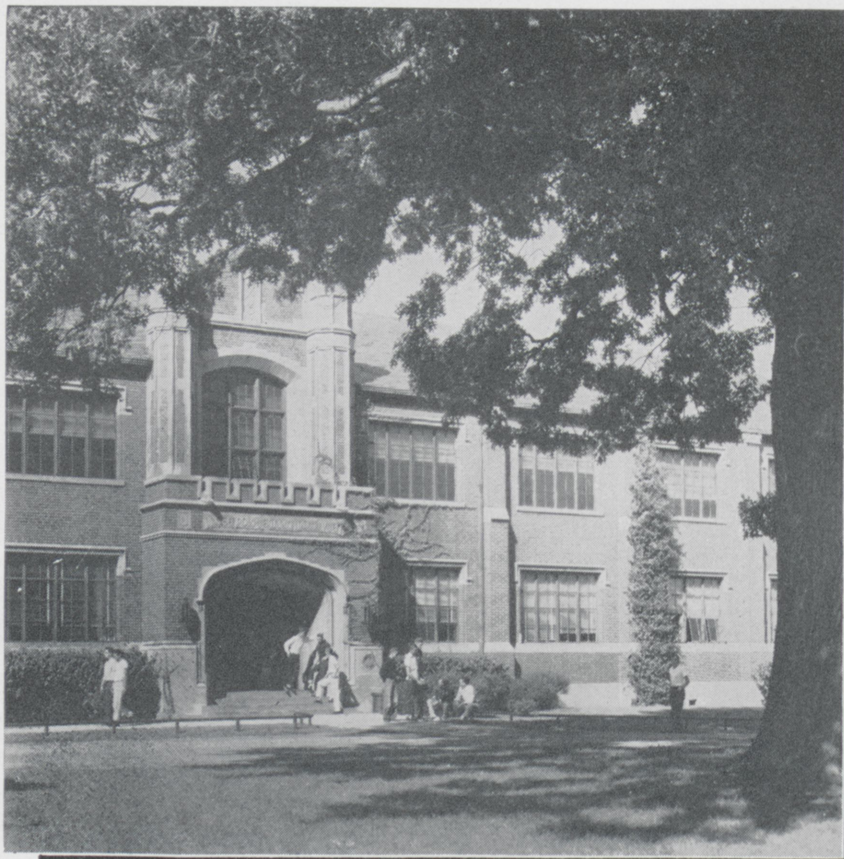

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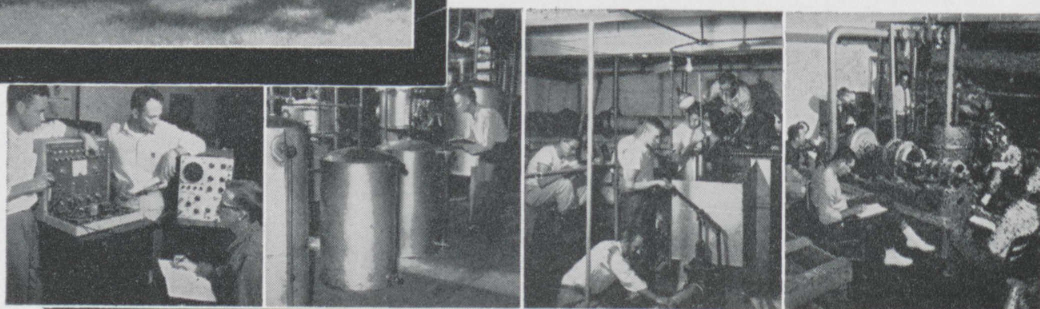

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Unprofessionalism At Rose?

Recently, portions of the main building's front hallways and rooms have undergone a bright new face lifting. Most alumni who attended Homecoming this fall saw that indeed this remodeling has added a cheerful new environment to the school. However, many persons were dissatisfied in the manner in which the project was conducted.

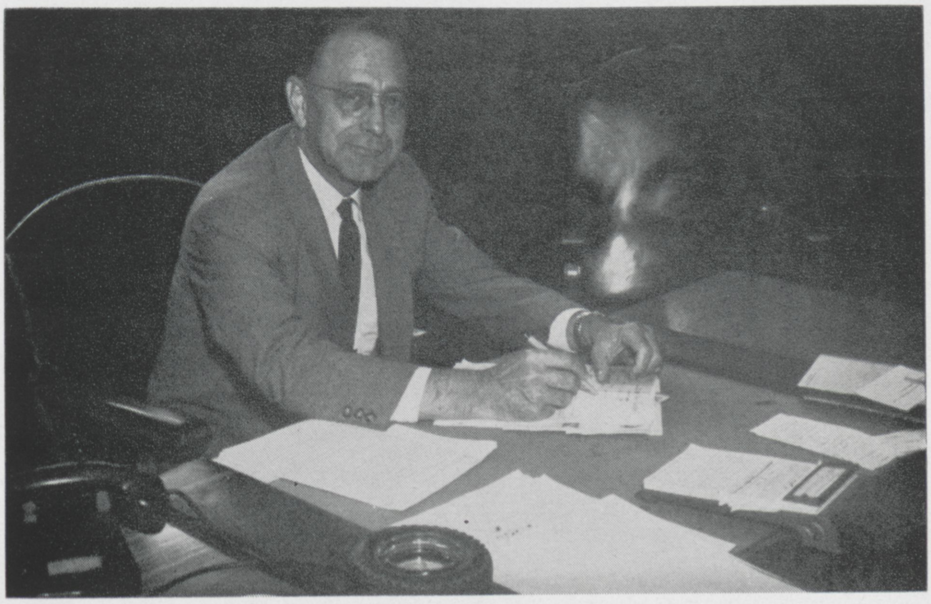
Rose engineers are instilled with the spirit of professionalism and the need for practicing engineering economics. This fall, however, several facts were uncovered concerning the planning and procedure involved in this project which seem to indicate that it may not have been accomplished in the most professional manner.

Is it true that only one contractor was asked to bid on this job which involved several thousand dollars? It seems that a project of this importance would merit consideration by more than one general contractor before the contract was granted. Is it also true that the contract given had only a rough estimate of the total cost and did not even include a time limit specification? The inclusion of such a clause certainly might have effected the completion of the construction nearer to the expected performance date which was the beginning of the school year. Many will attest to the fact that students were subjected to poor classroom and study conditions by a rather noisy and confused front hallway for a period of five weeks.

Many people would be interested in knowing how much overtime went into the project at the last minute in order to complete it before Homecoming and how many changes were made in the plans after construction had begun. Plan changes cost money; overtime costs money, and certainly originally high contract prices cost us money. This is money that Rose definitely should not waste by means of poorplanning and practices.

I certainly hope that the future expansion program, which will greatly exceed in cost and proportions the recent additions, is not conducted in this seemingly unprofessional manner.

D. A. T.



From the

PRESIDENT'S DESK

Welcome to the Class of 1964. Welcome back to the Classes of 1963, '62 and '61. Hello, again to all Rose Alumni wherever you maybe. Another school year is underway and we hope that this will be the biggest and best year ever for Rose.

Our motto is top quality engineering and science education to a small enough group so that individual attention to each student is a reality.

This year we instituted a week-long orientation progam for the members of the Class of 1964. It is our hope that this program has started the Freshman Class on the right foot. Each Freshman is assigned a Faculty Advisor and a Faculty Advisor and a Faculty Advisor and a Student Counselor. No Faculty Advisor has more than twelve Freshmen to advise. It is hoped, therefore, that each Freshman will take advantage of the opportunity to work closely with his Faculty Advisor in order to do well in his studies and to learn how to adjust to life at Rose. It is the objective of the Faculty and the Administration to help every qualified student to graduate from Rose and to advise those who do not appear to have either the interest on the desire to be scientists or engineers to find a suitable career elsewhere.

We do not want any student to fail for lack of guidance.

As the members of the Freshmen Class become adjusted to life at Rose, they, along with the Sophomores, Juniors, and Seniors, begin to think more fully about their career roles after graduation. The editors of THE TECHNIC this year have arranged a series of articles by successful Rose graduates in various phases of the engineering and science professions. These men will tell through the columns of THE TECHNIC about the nature of their work what importance they give to the courses they had at Rose and what traits of personalities are important to cultivate for success. See the first article in this series entitled "EXECUTIVE MANAGEMENT" on page 10. The staff of THE TECHNIC is to be congratulated on the new series of articles.

NEW SERIES

OBSERVATIONS Of SUCCESS

PART I: EXECUTIVE MANAGEMENT

by Mr. G. L. Berry
Chief Engineer
Jones & Laughlin Steel Corporation

"OBSERVATIONS OF SUCCESS" is a series of eight articles written by oustanding alumni of Rose—men who are truly giants in their fields—to describe for you the nature of their particular field of engineering, the elements of their college training which were most helpful to them, and the traits of their personalities which were invaluable to their success. The fields of engineering to be discussed in later issues in addition to Excutive Management will be Sales, Research, Design, Production, Personnel Relations, Teaching, and Purchasing.

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

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

When I attended Rose over thirty years ago, my schedule included subjects like Foundry and Machine Shop and extensive training in Drafting and Surveying. Subjects like these have been almost eliminated from today's engineering curriculum. This trend in engineering education is directly analogous to the changing attitudes toward engineers in the business world, and you will find it profitable to reflect on these symptoms of change. At the time of my graduation, engineers were uniformly regarded as highly trained—but poorly educated. Employment opportunities in this era reflected the popular estimate of engineering abilities then prevalent. Most jobs available at that time really fell into the skilled worker classification. In sharp contrast to this situation, you will graduate in an era where engineering leadership is practically synonomous with business success in many leading industries. And the engineer, because of his key role in the mainstream of developments that shape the fate of his company, will be called on to an increasing degree to deal with problems that were once considered the province of others.

For the past twenty-five years I have been employed in the steel industry, and this has been not only a period of rapid growth but also of technical revolution. Today, there is much discussion about "growth industries", patricularly by market analysts. Most of us are aware that the post-World War II era has been one of explosive population growth in this country. However, the nature of the growth in the steel industry is not so widely known. During this same period of steeply rising population level, the annual consumption of steel, *per capita,* has also increased rapidly. This increased consumption per capita, when superimposed on the population curve, has created a market curve that rises almost exponentially. In 1940, the installed capacity *per capita,* was 1,237 pounds, while in 1959 this had increased to 1,681 pounds. Capacity increases of this magnitude have presented an ever increasing opportunity for process changes, and the engineer has become, more than ever before, the pivot on which our industrial machine is balanced.

During this same time the mature engineer has also realized his educational shortcomings. Responding to this challenge, engineering educators have done much to overcome them. I think the contemporary engineer is a well educated man, and of all graduates, I think he is probably the best educated man—best educated in the sense of being better equipped to understand and to cope with the important problems of our time.

We live in a world competing desperately for technological supremacy. The pressure of constantly rising costs is already showing signs of jeopardizing the U. S. position in world markets. Somehow, an increasing measure of ingenuity will have to be directed toward this problem, not only in technological development but in decision making. This can best be illustrated perhaps by taking a look at my company—Jones & Laughlin Steel Corporation, the fourth largest steel producer in the industry. In the ten year period between 1950 and 1959, J&L steel making capacity increased by 67% to 8,125,000 tons annually. What is even more significant, our earning power has increased at a faster rate due to judicious selection among investment alternatives.

Over the past several years, J&L has executed the most comprehensive improvement program in its history. I will cite several elements of this program to illustrate the importance of innovation. In 1957, Jones & Laughlin became the first major steel producer in this country to install a Basic Oxygen Furnace plant. The new ingot making facility has been an outstanding success. Now I note that of all additional ingot capacity built by the industry in 1958—some 7 million annual tons—42% was accounted for by Basic Oxygen Furnaces, a process that was virtually unknown in 1950. The success of this process is primarily attributable to technological advances in cryogenics—permitting the production of low cost, high purity oxygen, and in iron ore benefication—which increased the productivity and lowered the cost of blast furnace hot metal. Our first installation was designed to produce 81 ton heats of steel, and it does so consistently on a 45 minute cycle. This production rate is so revolutionary when contrasted with the traditional eight-hour open hearth cycle that the product has been characterized in one way as "Instant Steel".

Another typical example of technological progress in the steel indus-

(Continued on page 28)

ASTRO

(Author's Note: This series of five articles is designed to familiarize the reader with the basic fundamentals of a major science, Astronomy. The series will by no means cover the field of Astronomy in its entirety; rather, it will show the reader in what way Astronomy can be studied and enjoyed by every person. At the end of each article there will be a series of questions that will adapt themselves to what has been covered in the text of the article.)

PART I

CELESTIAL COORDINATES. As with any form of science or mathematics, the study of the heavens requires a system of coordinates by which we may be able to make ourselves understood to anyone who will be using our information. In analytic geometry, physics, calculus, and numerous other sciences, coordinate systems such as the rectangular, polar, and spherical are well known to the scientist and engineer. Likewise, astronomers have a need for a system of coordinates that will suit their specific needs. This system has been realized in the form of what is known as Celestial Coordinates. This system is rather immobile inasmuch as it considers our own planet, Earth, as its origin. This rather narrow-minded fact restricts us to one rigid frame, since, from any other vantage point in the universe, the system is not at origin. In other words, a translation of origin will throw the whole system in to turmoil and all values will have to be recalculated. With this in mind, we shall then proceed in our defining of the celestial of coordinates.

The system by which we obtain the coordinates of the stars is one that is similar to the system by which we obtain the position of objects and places on our own terrestial sphere. We should, therefore, begin with a discussion of our terrestial coordinates and then expand this to the discussion of the road maps to the heavens.

If we regard our planet as a sphere (actually it is an oblate spheroid), we may note that any circle which is located on this sphere and has its center at the geometric center of the sphere is known as a great circle. If a circle on the earth does not have its center at the earth's center, it is known as a small circle .

We know that the earth rotates daily about an axis. This axis has been assigned the titles of North and South Poles at its extremities. The great circle that lies halfway between the north and south poles (90° from either pole) is known as the Equator. If halves of great circles are drawn on the sphere, connecting the two poles, we have what is known as the Meridians. By simple Euclidean geometry, these meridians are perpendicular to the equator. One other concept must be added to complete the terrestial coordinate system, and that is the Latitudes. The Parallels of latitude are small circles whose planes are parallel to the plane of the equator, and hence are also perpendicular to the planes of the meridians.

The things that have been previously discussed are illustrated in Figure 1. With the addition of the terms longitude and latitude, we have a complete mapping system of our planet. As the name implies, latitude is the measure of a distance north or south of the equator measured in degrees. Since there is only

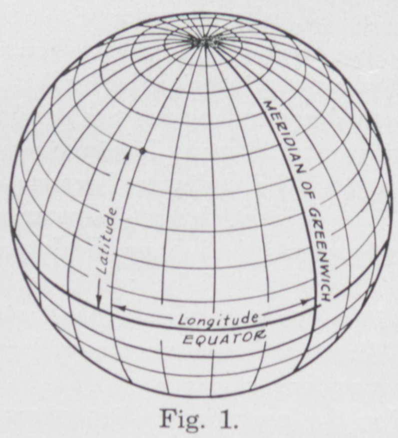


Fig. 1.

90° between the equator and either of the poles, the values of latitude must take on numbers of 90° or less. The term longitude applies to the number of degrees along the equator east or west of the prime meridian to the meridian through the point in question. This concept ranges in value from 0° to 180° either side of the Prime Meridian. The Prime

NOMY

by Jay Hirt, senior math

Meridian is the 0° meridian which passes through the original site of the Royal Greenwich Observatory in England.

Now we shall extend our system of coordinates into the heavens. If we draw an imaginary line extending from our North Pole to infinity, we may regard the point directly above our North Pole in the heavens as the North Celestial Pole. If we now extend the plane of our terrestial equator infinitely, we may regard this as the Celestial Equator. Notice now that we have formed a sphere of infinite radius with its center being the earth. This infinite sphere is known as the Celestial Sphere.

We must now define a few more terms in order to complete our concept of the celestial sphere. With respect to the observer anywhere on the earth, there is a point directly above him and a point directly below him. These points are known as the Zenith and the Nadir, respectively. If the observer were to imagine a great circle 90° from his zenith and nadir, this would be his Celestial Horizon. Note that this horizon varies considerably from the visible horizon, which is usually irregular. With these coordinates, the observer is able to map celestial bodies by the use of the Horizon System. To do this, he regards himself as being in a semi-circular shell, once more of infinite dimensions. By picking out a star, he may find its azimuth and altitude, hence pinpointing it in the heavens. The azimuth is the number of degrees measured along the horizon from the north direction in an easterly rotation. The value of azimuth may vary from 0° to 360°. This is the Horizon System counterpart of longitude. The altitude of the body is measured along the celestial meridian, a vertical circle through the zenith perpendicular to the horizon. This altitude is the number of degrees that the body is above the horizon. This altitude is the number of degrees that the body is above the horizon, necessarily being between 0° and 90°. If the observer wishes to get his vertical bearing on the body by use of the zenith, he may realize that the Zenith Distance is the complement of the Altitude, that is

Zenith Distance = 90° — Altitude.

The schematic view of the Horizon System is shown in Figure 2.

Returning once more to our celestial sphere, we need only one more thing to give us the ability to use a system similar to that of the Horizon System in placing heavenly

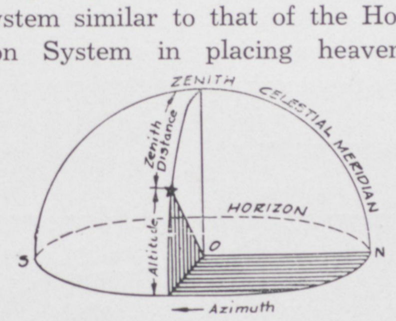


Fig. 2.

bodies. If the meridians of the earth were extended to this infinite sphere, we would have what are known as hour circles. They pass through the poles on the celestial sphere and, hence, are perpendicular to the celestial equator.

We must be sidetracked once more before we can complete our coordinate system. This is in order to discuss the concept of the Ecliptic, which is the apparent path of the sun during its annual journey around the celestial sphere. This path is inclined to the celestial equator at approximately 23.5°. In the spring of each year (about 21 March), the Ecliptic and the celestial equator meet in what is known as the Vernal Equinox. This point is the basis of the beginning of the celestial coordinate system.

Returning once more to our celestial sphere, and keeping in mind the Horizon System and the vernal equinox, we may now define our system for finding the star of our choice. This is by the use of Right Ascension, which is the number of hours or degrees measured eastward from the vernal equinox to the hour circle of the body along the celestial equator, and Declination, which is the number of degrees, or angular distance, north and south from the celestial equator along the hour circle of the star.

Hence, we now have a means by which we can find any star in the heavens at any time by merely quoting its right ascension and declination. This concept is shown in Figure 3.

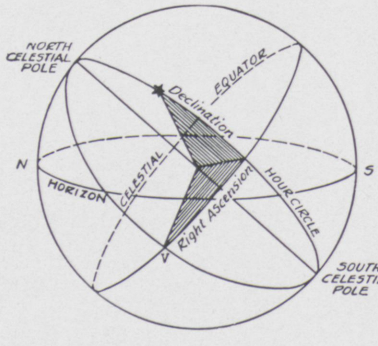


Fig. 3.

If we now return to the idea of the Ecliptic, we may find a few more terms that are of interest. As previously mentioned, when the ecliptic and the celestial equator cross paths in the spring, we have the vernal equinox. When, once more, they meet in the fall, we have what is known as the autumnal equinox. During the summer, the ecliptic reaches a maximum distance away from the celestial equator which is known as the summer solstice. Also, in the winter, we encounter the winter solstice, which is the maximum distance that the ecliptic is away from the equator in a northerly direction. This is shown in Figure 4.

We have talked about and decided upon a system of coordinates by which we can map the heavens by giving two values, right ascension and declination, with respect to the constant references of the celestial

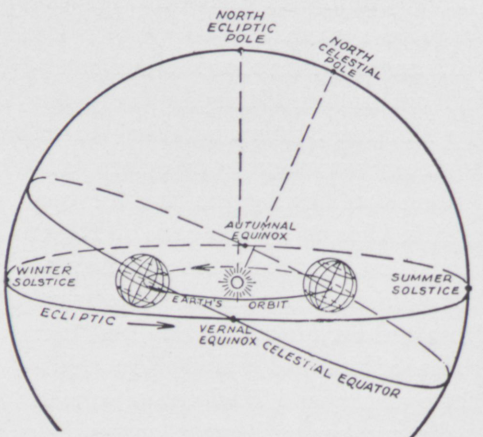


Fig. 4.

sphere. It is interesting to note that we are not too far from wrong in these figurings, due to the diurnal motion of the heavens, which is the apparent circular motion of the stars. The images seen through a refracting astronomical telescope, since it uses lenses, are always real and inverted, but inversion is not actually a disadvantage, because the objects being observed are not of a shape that it matters if they are upside down or not.

There are many things that plague the astronomer with respect to lenses. These are generally known as lens aberrations. These fall into many classes, such as spherical aberration, coma astigmatism, curvature of field, distortion, and the chromatic aberrations. The latter is one of the most important of the lot.

To explain chromatic aberration it must be realized that light waves are different in length. When these different wavelengths are refracted through a lens, they are "bent" to a greater or lesser extent. This may be shown in diagram form (Figure 6).

Now that we have a basis for the refracting telescope we shall discuss it. The refracting telescope makes use of a lens system consisting of two or more lenses. The simplest kind of refracting telescope the objective are parallel. The image produced by these rays is formed in the focal plane, which is a plane passing through the focus perpendicular to the axis of the lens. This image is called the first image. The function of the eyepiece is to magnify the first image, which is done by placing it so that the first image is just inside its focus. This is shown in schematic form in Figure 7.

This motion centers around the north celestial pole, giving us traces of circles concentric in nature with their center at the north celestial pole.

TELESCOPES. There are two basic types of telescopes in use in the field of Astronomy at the present time—the refracting and the reflecting. To understand the workings of these instruments, we must first acquire a basic knowledge of optics. In order that we may all start from the same point, I will briefly explain the inner workings of the lens systems of the two above-mentioned instruments.

If we consider all of the heavenly

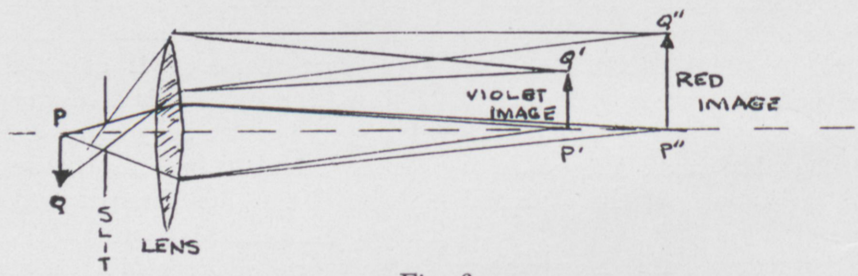


Fig. 6.

consists of only two lenses. The one that is nearest the object (sun, moon, stars, etc.) is called the objective. Its function is to produce an image of the object under observation. The other lens, through which the observer views the image, is called the eyepiece.

Since the objects to be viewed are at great distances, we may once more assume that the rays entering

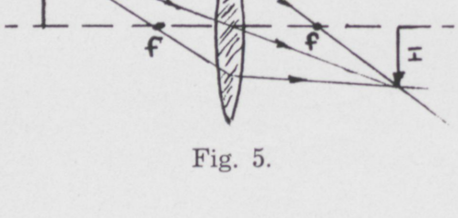


Fig. 5.

bodies as point sources of light, including points on the sun, by the time the emitted waves have traveled to the earth, they may be regarded as being parallel, that is the concentric circles may be regarded as being so large that their radius is infinite, thus any portion of their circumference may be said to be a straight line. When these waves come into contact with an object such as the earth they are either reflected, refracted, or absorbed. We shall talk only about the first two.

In Figure 5 we show how light rays react when coming in contact with a lens. This is known as refrac-

(*Continued on page* 30)

THE LESSONS OF KOREA

Submitted by H. Ambrose, Capt., U. S. Army

Ten years ago, early in the morning of June 25, 1950, under cover of an artillery barrage, tanks and infantry units of Communist-ruled North Korea struck southward across the 38th Parallel in a full-scale invasion of the unprepared Republic of Korea.

There are important reasons why this act of armed aggression and the events that followed should never be forgotten. First of all, the ability of the United Nations to act quickly to stop the aggressor was given its first test. Equally important was what the United States and the rest of the free world learned about their adversary—international communism—for this is the enemy the free world faces today, not only in Korea but throughout the world.

In less than 24 hours after the surprise attack of 25 June, the Security Council of the United Nations (which the Soviet Union was boycotting at the time) branded the North Koreans as guilty of a "breach of the peace" and demanded an immediate cessation of hostilities and withdrawal of North Korean troops. When the invader failed to comply, the Council called upon member nations to give all possible help to the Republic of Korea to repel the attack and restore peace and security in the area.

On 27 June, President Truman announced that the United States would send air and sea forces "to give the Korean Government troops cover and support." Then, on 30 June, he ordered occupation troops of the 24th U. S. Infantry Division to be flown from Japan to Korea.

Material contributions to aid Korea were made by more than 40 countries. Fifteen countries in addition to the United States contributed ground, naval, or air forces. A United Nations Command was created, and General of the Army Douglas MacArthur, U. S. Far East Commander, was appointed Commander in Chief.

While the United States provided by far the greatest bulk of fighting forces, arms, and equipment, the United Nations had proved that it could act in an emergency. Its participation in the Korean conflict was the first such collective action against aggression in history.

In the Korean conflict 33,629 American fighting men were killed in action, and more than 100,000 were wounded. The casualties of the Republic of Korea: 58,000 killed, 176,000 wounded, more than a million civilians killed, and another million wounded or injured. The tides of war left 100,000 Korean orphans and some 284,000 widows with 517,000 dependent children. About 8,000,000 South Koreans were driven from their homes.

As you read these figures and think of the losses, the terrible suffering and destruction caused by the Communist invasion of a small country, which is still threatened today, you may ask, "Was our effort to bring peace to Korea worth what it cost?" Before answering this question, another must be asked: "What would have happened if we had not gone to the aid of the Republic of Korea?"

First of all, the Korean conflict made us understand, clearly and finally, that the Communists will use every possible means to attain their goal of world domination. The Soviet leaders instigated the North Korean attack on the Republic of Korea and supported it with arms, planes, and equipment. This unprovoked aggression shocked us out of our complacency, made us sharply aware of the magnitude and deviousness of the Communist menace, forced us to appraise Communist capabilities more realistically. For the first time in our history, we did not lay down our arms and demobilize immediately after the fighting stopped. Instead, we and our allies have built up our defenses with weapons of such power that it would be exceedingly dangerous for the Communists to try to take over more territory by force of arms. This the Communist rulers know, too. The U. N. action in Korea proved to the Communists that the free world could, and would, resist aggression.

What would have happened if the United States and the United Nations had not intervened in Korea?

(Continued on page 26)

Fraternity

ALPHA TAU OMEGA

Frst of all we at Alpha Tau Omega wish to welcome all the alumni to this years Homecoming festivities at Rose. An open house will be held at the fraternity house Friday night. The house will also be open throughout the weekend to alumni and visitors.

The organization of the homecoming display is in the capable hands of Brothers Jack Munro and Dave Starnes. With the men in the chapter putting forth their time and effort the trophy will remain at Alpha Tau Omega for another year.

The crew at Gamma Gamma turned out in full force this summer to give the old homestead a much needed paint job. The paint began to fly Labor Day weekend, and the brushes were finally laid down the next weekend just before the beginning of school. It looks like a professional job and improves the appearance of the house tremendously.

The "Terrible Tau's" football squad is looking forward to this years inter-fraternity football season. With the returning of several lettermen and a few additions at key positions the "Terrible Tau's" are sure to improve on last year's record. With a few breaks this season they could even land near the top of the final standings.

We are happy to have Brother Tom Keeling join us at Gamma Gamma. Tom comes to us from Psi Chapter at John Hopkins University in Baltimore, Maryland, and is originally from Pittsburgh, Pennsylvania.

Congratulations are in order for Brother Fred Wright who is now engaged to Miss Judy Stelle of Indianapolis.

That's all the news for now. School has started again, and Alpha Tau Omega is on its way to another great year.

Scott Herrin

LAMBDA CHI ALPHA

It was a long hot summer for those of us Seniors who spent six "fun-filled" weeks at Fort Leonard Wood, Mo. But it seems that the boys back home were doing alright for themselves. Four brothers became pinned and one sort of over did it and got married. Bill (Trummy) Young and Miss Daryl Pifer were married August 25. The wedding was attended by a large group of the brothers who wished the handsome couple well and a safe journey on their honeymoon in New Orleans. Since the wedding was held in Danville, Illinois, the brothers took advantage of this cultural center of the Midwest and did the town as a tribute to a brother lost in marriage.

George Newman is pinned to Miss Patsy Pershing of Wittenberg University, Springfield, Ohio. Patsy is a member of Chi Omega sorority. Ed Blahut is pinned to Miss Bonnie Vanata of Riverside, Illinois. Warren Griffith has finally settled down and has lost his pin to Miss Debbie Smith, Gamma Beta at I.S.T.C.

Bill Fenoglio has "Flipped". After nearly 21 years of blissful freedom, Bill has become pinned to a very pretty nurse, Miss Becky Williams of St. Vincents School of Nursing in Indianapolis. We hate to see such a good card player as Flip "bluffed" out of his pin.

The 27th Lambda Chi Alpha General Assembly was held in August at Cincinnati. Brothers Andy Hrezo, Jerry Hahn, Bill Barone, Bob Checkley, and Don Dekker attended the informative sessions. These men brought many new ideas about fraternities in general, as well as suggestions for improving our chapter.

As this article goes to press the I-F football season is just beginning. The △XA team looked strong in its opening game defeating TX 24-13.

Until then—

Bob Amos

SIGMA NU

Last summer on July 20, Sigma Nu and Rose lost a great alumnus GARY VERN ANDERSON, graduate of 1960, was fatalty injured in an auto crash. Brother Jim Bauch, who was with Gary, sustained head and back injuries, and is now all right. Gary, not only a leader on campus in athletics, scholarship, and organizations, had been social chairman, Eminent Commander, and alumni contact officer of Sigma Nu. His leadership and fellowship will always be remembered by those who knew him, for to know him was to like, admire, and respect him.

Miss Helen Scherfey stepped into "Mom" DeGraff's place as house mother this year. Mom De Graff, forced to retire by her doctor after fourteen "wonderful" years, as she

Notes

put it, is living with her son in Louisville, Kentucky.

The house is *full* this year with twenty-three living in the house and twenty-six taking meals. Dave Herrington and Mike Sullivan didn't return this year. Dave is going to U. of I. and plans to return next year; Mike plans to return next semester. Forty-five actives and three pledges make a grand total of forty-eight members.

New initiates are:

TOM BROWN
ROSS DRING
NEIL IRWIN
JOHN TOOLE
DON PIERCE
RICH DAUGHERTY
JOE GRUMME

New pledges are:

BOB SMITH
MIKE JOHNSON

Wedding bells are breaking up the old gang. Brother Tom Gallatin married Miss Kay Washburn, Ron Higginbotham married Miss Phyllis Quick, and Dick Shade married Miss Sarah Krumme. Ed Kostra and his wife Gail had a baby girl, Karen Lynn.

Sigma Nu is still strong in the varsity football line-up, with Bill Yochum, Allan Raquet, Dan Kingery. Don Pierce, Steve O'Neil, Meador Hill, and Jim Kvasnica. Our married lettermen who aren't out for varsity this year will be in with our undefeated interfraternity squad of last year, under the coaching of Dick Landenberger. We were in a three-way tie for first place for the all-sports trophy last year, and are looking forward to a better year this year.

Rich and Bob Carter were the delegates to Grand Chapter in Portland, Ore., and Dick Landenberger toured Europe with the All-America Chorus. Among them, they travelled many thousands of miles.

Sigma Nu won the I-F Sing last May for the second consecutive time. Song chairman Bob Carter already has a song picked out for this year.

Brother Dick Irey, class of '58, visited us recently. Dick is doing graduate work at Purdue. We're hoping that many other alumni will find it possible to stop in and visit with us this year.

Bob Carter

THETA XI

Four Theta Xi's have relinquished their pins. George McLellan bestowed his Badge of Honor to Miss Kitty Doyle, Jim Malone gave his to Miss Barbara Batman, Chuck DeWeese absent-mindedly sent his to the laundery, and Brother John Henke apparently gave his away during a recent lost weekend. If you are pinned to John, please call Crawford 6294 after 4:30 P.M.

Athletic Chairman Larry Cunningham is readying his charges for the coming IF football competition. Battle-scarred veterans returning to the "Cowardly Nine" include Brothers Gross, Wardle, Blase, Malone, McGivern, Ransford, Pool, McCardle, and Lanning (whose nose is still bent from last season). Rookies are Brothers McClure, Roberts, and Murray.

Kappa Chapter has acquired two new pledges, senior John Bott, from New Albany, Indiana, and sophomore Pat Hauert, of Kankakee, Illinois.

Twenty men are presently residing in the house. For the benefit of those faculty members reading this article, all of the brothers are diligently working to better the chapter cumulative average. For the benefit of those who know better, you would do well to catch the show at the 6th Avenue.

The most popular fashions among TX seniors this fall are cord suits with vests. No less than five of the old timers have acquired one in the last week. Sincere and heartfelt thanks go to Larry Cunningham, ace chapter shoplifter.

Don Niedringhaus and George McLellen, Homecoming Co-Chairmen, have adopted a theme for this year's display and are currently hard at work organizing the construction plans. The only item constructed so far is a giant-size screw. The Terre Haute Legion of Decency has sent us several threatening letters concerning our choice of a theme.

Few tasks are more trying than attempting to fulfill a *Technic* 300 word minimum requirement at 2:30 A.M. I can barely restrain myself . . . . . in fact, I never could restrain myself, but my parents were very understanding and sent me a rubber sheet.

And that, dear editor, makes 326 words.

Bob McCardle

GENERAL SYSTEM

The progress in mathematical analysis in the last one half century is beyond all precedent. The last man to look out over the whole field of analysis of his time was the great mathematician Poincare', and he was able to do so largely because the greatest works in analysis in his day were his own creations. Today the scope of mathematical analysis is so vast that probably no mathematician is competent in more than one province of the entire domain of this science.

What is the particular mode of reasoning used by these mathematical analyists that allows them to be progressing so rapidly in their discoveries of new theories? Engineers and technicians ask why these manipulaters of symbols can formulate and predict with great accuracy the behavior of systems that they have never before encountered.

I will try to answer this question by the postulate of a scientific field called General System Theory. General System Theory is a logico-mathematical field, the subject matter of which is the formulation and derivation of those principles holding for systems in general. The great teachers, past experience and trial and error methods of analysis by experiments, have taught scientists that there are general principles that hold for systems, irrespective of the component elements and the relations existing between the elements. By using the principles of General System Theory, the art of abstracting mathematical rules, mathematical purists have been able to derive "special" system laws by the introduction of appropirate conditions.

Let us now investigate how this process of analysis by General System Theory is conducted. First, the analyst is confronted with a 'physical' system as an object of curiosity, and he wishes to predict its behavior under various circumstances. For reasons of discussion, let us propose the analyst is investigating a system of a finite number of stars, say N in number. After the analyst has the system of question in mind, his total personality is called upon to create an ideal mathematical model of the system—that is, to formulate "functions" that may exist between the objects of curiosity treated now as point mass particles. The reader will of course understand that when we speak of a 'model', we do not mean an actual reproduction on a small scale. We use the word—for want of a better—to describe our simplified mental picture of a physical object. Surely a great insight and intuition for abstraction is an essence of the personality of the analyst for his ability to translate scientific problems into 'mathematical statements'.

Having formed the ideal model, the analyst now investigates the physical system in terms of *arbitrary* positions, velocities, densities, etc., of its elements, and consequently creates "propositional functions" relevant to his problem. By a propositional function, is meant an infinum—valued statement, containing one or more variables, such that when single values are assigned to these variables the expression becomes a one-valued proposition. In relation to the problem of the N stars, the infinum—valued mathematical statement, X occupies position Y at time T relative to the point O, would exemplify a propositional function. This infinum — valued statement subjected to the appropriate condition — star occupies a position of constant distance two light years from Star, relative to the position of Star—exemplifies a proposition.

Next, mathematical reasoning is applied to the proposition function. This means that differential or finite equations of motion are to set up and solved and formulas are to be developed to give answers to interesting questions. All the reasoning will consist of the substitution of symbols: concepts, words, mathematical signs; all in lieu of reality.

However, as in all games, this reasoning must conform to a set of fast and hard rules which we shall call postulates. A postulate is merely some statement which we agree to acept without asking for proof. Some scientists have defined postulates as "self-evident facts." For our particular system, the analyst might postulate that the shortest distance beween any two stars is a straight line connecting these stars. This assertion seemed self-evident until the advent of the hyperbolic geometries; now, the validity of this assertion rests upon what space is being geometrized.

Once and for all the postulates are

THEORY

by Jim Gates, senior, math

laid down. These include statements governing all the permissible moves of the elements of the system in question. However, having stated a particular set of postulates, what can one do next? One question that is a must about a given set is this: Is the set the most exact? The logician realizes that the more assumptions he makes, the greater are his chances of a non-convincing proof. Thusly, he reasons within his postulates, completely ignoring the system now, to see if any one postulate is a consequence of the others.

By General System Theory, these postulates, a group of interrelated propositional functions, with all the consequences derived from them, usually called theorems is termed a 'doctrinal function." A doctrinal function thus has no specific content because it deals only with the variables X, Y, T, and O; instead, it merely estabilshes definite relations between these variables.

With the establishment of the doctrinal function of the system in question, which will allow him to completely analyze this one particular system, the analyst now wonders what would result from his work if he abstracted this given doctrinal function with respect to no specific content. If the analyst follows this process of abstraction, letting his thought be governed only by "dreamed of possible" manipulations of his new symbols, he finds that he can deduce a set of interrelated doctrinal functions. General System Theory classifies this formulated set of functions a "system function".

The question now arises, however, as to what use is this system function. The analyst knows that if any system is traced to its system function, he may be able to make a further *independent* investigation of the ways this system may compare with others of completely different origins. However, again his reasoning must be controlled by logic. First he must accept completely the newly derived system and use exclusively the new terms in this system in the comparison. He must perform new experiments which his new terms suggest and compare the conclusions of these experiments with "experience". Only in this manner can he investigate how one system translates into another.

If one characteristic appears in all formulations of the comparison, it is a sign that this characteristic is intrinsc and independent of the structure of the system function first derived. At this stage, the mathematical logician must resort to the process of de-abstraction on this intrinsic characteristic to try to find for what other physical system could this intrinsic characteristic be deduced to be the system function. It is due to this power of reasoning of efficient analysts that much of the knowledge about systems has been greatly simplified.

For reasons of exemplification of this process called General System Theory outlined above, let us cite a fairly recent historical example of the generalization of the system first considered—that of a system of N stars. After the motion of the stars in our solar system had been worked out in detail more than sufficient for commercial purposes—navigation, the construction of almanacs, etc. — certain astronomers and mathematicians began a serious attack on the sidereal universe. How were the inconceivably complex motions of a swarm of mililons upon millions of stars to be unraveled? A direct assult by Newtonian dynamics was out of the question. How then did these men propose to attack the problem?

It is a long story, so I shall indicate only the general tactics of one engagement. For reasons that may easily be imagined, the actual problem was replaced by a highly idealized perfection of itself. Instead of regarding the swarming stars as the gigantic bodies they probably are, the mathematicians perceived them as a cloud of equal particles. With this assmuption, the galaxy was idealized into a perfect gas where the stars were the molecules in this hypothetical vapor. A great deal was already known about the mathematical behavior of gases when this point mass particles assumption was made. The kinetic theory of gases gave these experts in mathematical prediction an opportunity to compare the two systems. The entirity of kinetic mathematics was leveled at the idealized gaseous galaxy. Among other questions which the mathematics was thorough enough to answer was this: Is the galaxy of stable structure, or will it disperse

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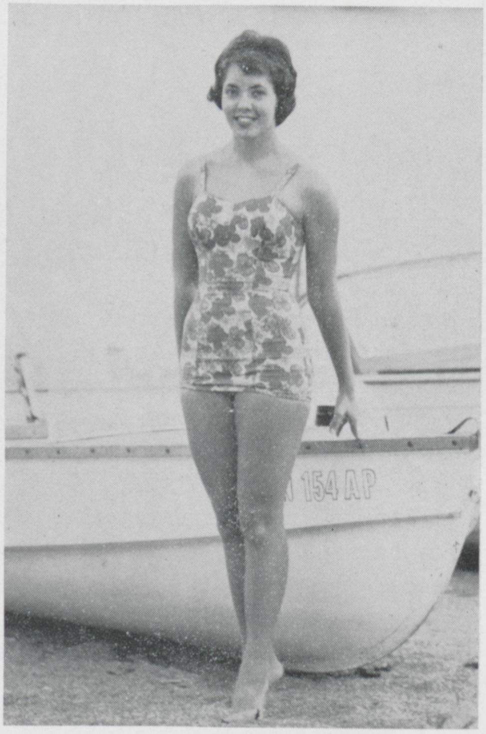
Miss Technic of October

Well, hello, there, Mr. Rose! Say, we'd like you to meet a friend of ours. Miss Gwenn Taylor, meet Mr. Rose. Mr. Rose, you'll be happy to know Miss Taylor is a freshman at Indiana State and lives at Burford Hall. A native of Evansville, she's a P.E. major, and she's interested in archaeology. She goes for men who can assert themselves and has a natural distrust for any guy who drives a sportscar. As far as her personality is concerned, she weighs 120 pounds, she's 5 feet 6½ inches high, and her measurements are . . . ahhh . . . well, that IS getting a little personal, now, isn't it?

As you can gather from her lovely pictures, Gwenn's beautiful smile is something that could never be "posed". You can readily see we are extremely fortunate to be able to start our MISS TECHNIC feature with a girl of such dimension.

You can nominate your girl (or somebody else's) to be the Technic's "Girl of the Month" by submitting a snapshot of her to any member of the Technic staff. If she is selected by the editorial staff as the "Girl of the Month" our experienced photographer will take her picture to grace our pages, and she will automatically become eligible to enter the fabulous "Miss Technic" beauty contest to be held at the Technic banquet at the end of the year. So talk fast, fellas, and good luck.

. . . . . And now, if you've finished dreaming of what Gwenn would look like in a dress, why not turn to page ten? There's an extremely valuable article there on Executive Management written by Mr. G. L. Berry, an alumnus of Rose who is now Chief Engineer for the Jones & Laughlin Steel Corporation.



"I just don't understand why . . . .

. . . . You'd ever want to take pictures of . . . .

. . . . Little ol' me."

Photographs by Andy Breece

Gwenn Taylor, Miss TECHNIC of October, strikes her most glamorous pose against the striking background of scenic Izaak Walton Lake. Here's one vote for Gwenn!

MY WORK AT N.A.F.I.

by Lloyd Heif, soph.

Rose students are fortunate in that they may apply for summer engineering jobs offered by industry through the Placement Office. A wide variety of jobs are available in industries engaged in a diversity of activities ranging from the production of oil to the testing of guided missles. These corporations, located across the width and breadth of America, give Rose studentsthe enviable opportunity of working in their chosen profession before they become a part of it. This series will present the expriences and observations of eight students who have been engaged in summer engineering work.

This summer I worked at Naval Avionics Facility Indianapolis (NAFI). On June 13th, the first Monday after finals week, I arrived at work just before 8:00 A.M. The other students who had applied for work were there in the personnel waiting room. When the Personnel Department was established for the morning, and ready to do business, Mr. Cliff Coplen and Mr. Robert Knight ushered us into another room to discuss our summer assignments. There is some choice in the matter and, if the student has a preference, an honest attempt is made to see that he gets it. When the time came for me to be assigned, I was informed that the Technical Evaluation Division, where I worked last summer, had decreased their allotment for students. My location for the summer was to be with the Industrial Engineering Department which is under the Research and Engineering Division.

My knowledge of Industral Engineering was only what I could remember from Engineering Computations. When I explained that my interest was in the field of electronics, Mr. Coplen reminded me that experience can be gained in each and every division of engineering. After some thought and more questions, I decided to take Mr. Coplen's advice and see what I could learn about Industrial Engineering.

Mr. Coplen took me to the area where I would work, and introduced me to the branch group with whom I would work. Mr. Edward Rhea was my immediate supervisor and, above him, Mr. James Allison.

One of the first things I learned was how to develop the light-sensitive paper used to rearrange desks, work benches, machinery, and the physical boundary of an office area to establish a more efficient working pattern. Al Zetzl, Purdue Mechanical, and I had many occasions to use this picture presentation to show the other departments what we had found to be the best arrangement for physical and paperwork efficiency.

On the first day, our group was informed that the Shipping and Receiving Branch of Supply felt that they could use more room. At that time, the receiving area was sufficient, but, if a "crash program" was assigned to NAFI by the government, we would need more room to receive the incoming materials for manufacturing. Since most of the materials received were placed on "pallets" to protect the wooden floor, we discussed and did research on the various "Materials Handling" methods to determine which would fit the need of Shipping and Receiving if we gave them another area of one thousand square feet which had been proposed previously. We measured desks and machinery in order that they might be properly located on the light-sensitive layout. Aisles were established to conform with the turning radius of the pallet-lifting trucks and the flow of paper work.

Before Al and I completed the plan for Shipping and Receiving, we were delegated to help another branch of Supply called Stock Control. Since the Military has millions of items which need to be controlled, they have originated a Federal Stock Number (FSN). The manufacturers have their own system of numbers to catalog what they supply. These sets of numbers need a cross-reference index in order that the Navy may purchase and store the material. Our problem was to determine if NAFI could use a computer, or IBM punched cards to cross reference the FSN to the manufacturing number, or vice versa. We made many trips to the Stock Control Branch to discuss the prob-

(*Continued on page* 26)

Library Notes

by Carson Bennett and Winifred Kitaoka

"Libraries and reference works have made possible the present intellectual and practical equipment of civilization. No man could hope to memorize our vast store of information and opinion. Knowing where to find vital information quickly is as indispensable as knowing how to use it effectively." — A. W. Littlefield

* * *

Many of you may already know that Mrs. Anita Jackson has left the Institute to join her husband Robert, a Rose graduate of 1959, in Crestline, Ohio, where he is an engineer. Mrs. Jackson, who served faithfully and capably, is presently in charge of a branch of the Mansfield Library. We wish her the greatest success in her new position.

Mrs. Jackson's replacement at Rose is Mrs. Winifred Kitaoka who was graduated this June from Indiana State Teachers College. Mrs. Kitaoka is originally from the Island of Hawaii and has for the past few years called Terre Haute her home.

* * *

As this school year begins our thoughts turn from our summer activities to school and study. Some of us return as upper classmen, but some are at college for the first time as college freshman. Have you evaluated your methods of study?

The library has books that will help you answer the question, and possibly help you overcome your problems.

From the pen of Samuel Smith we have the *Best Methods of Study,* a practical guide for the student. For the college freshman this volume presents a brief summary of suggestions that may be applicable to his immediate needs and endeavors to answer the urgent questions, What shall I do? and How shall I do it?

Edward S. Jones presents a chapter on "Aggressive mastery of assignments" in his book entitled, *Improvement of Study Habits.* These suggestions we believe are worth some consideration:

1. *Plan.* Learn to lay out your work for the evening hours of study.
2. *Think around the subject.* Look carefully at the chapter headings, the preface and the conclusion of each chapter.
3. *Summarize.* Writing down the substance of what one reads helps one to arrange his ideas meaningfully, and guarantees better retention.
4. *Select key passages and words.*
5. *Get the heart of your author's biases or "big ideas."*
6. *Analyze and understand.*
7. *Predict future test questions.*
8. *Recite.* Recitation means duplication and the only real test on a series of ideas is to talk them out or write about them.
9. *Be prepared to expand on ideas.*
10. *Be flexible and resourceful.*
11. *Organize your own ideas.*

These are a few titles we suggest for a good start this year:

This is the Way to Study by Howard E. Brown, is addressed to college students who have experienced difficulty in concentrating and study.

Students will find William H. Armstrong's *Study is Hard Work* very interesting. Mr. Armstrong claims, "studying *is* hard and remains hard," but learning to study well makes the effort pleasant. His purpose is to help you study more efficiently.

So this Is College by Paul H. Landis is an informal book which gives sympathetic briefing on adjustments a college freshman must make during the first months of college.

William J. Reilly provides the college student with a self-study manual entitled, *Life Planning, for College Students.*

FROM THE NEW BOOK SHELF

Show Red for Danger, by Richard and Frances Lockridge

"When a famous actress dies its a case — and a chase — for Captain Heimrich." Here is a mystery you might try to solve. It is filled with people who do their best acting in real life, which complicates the case. For Heimrich it is a tough case, and a frightening chase.

Fuel for the Flame, by Alec Waugh

The action of this story takes place in an imaginary island in the China seas. It is a long, many-charactered, constantly exciting story of what happens to men and

(*Continued on page* 36)

Research and Development

Compiled by Jon Modesitt, soph. e.e.

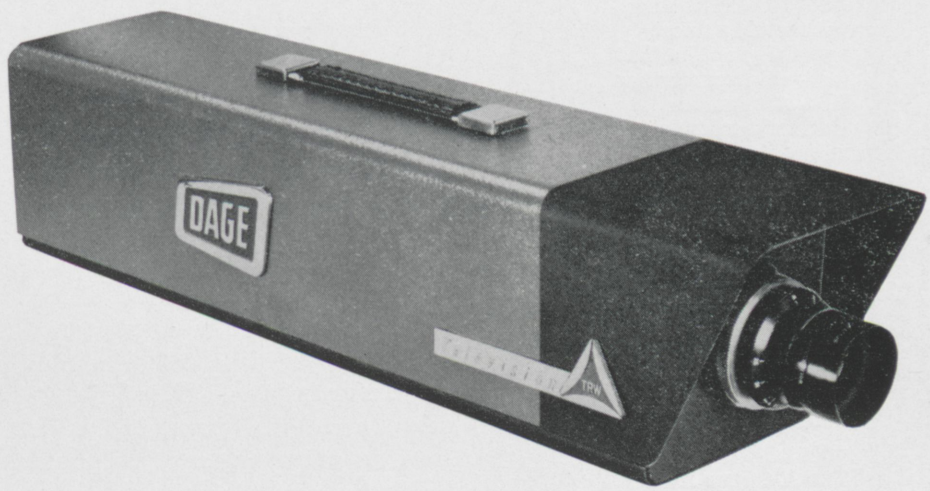
PORTABLE TV CAMERA

Television cameras for use at low light levels have been announced by Dage Television Division, Thompson Ramo Woolridge Inc. Called the Dage Model 81 Industrial 10 Camera, the small portable instrument utilizes an Image Orthicon camera tube to overcome the problem of television monitoring at low light levels. Through complete tranzistorization, a light-weight 800-line resolution camera is provided.

A tranzistorized pre-amp is mounted within the camera that is operated remotely from the camera control. The output of the pre-amp is to drive the low impedance coax cable. Camera control is of modular construction to provide ease of servicing and maintenance.

Camera adjustment, beam, target potential, and other controls appear on the front panel assembly. Connectors for camera cable are grouped on the rear panel.

Some interesting data on the Dage television is presented below.



Camera Assembly

Dage 10 Camera Model No. 81

Resolution—800 lines horizontal

Video output signal—1.0 volts peak-to-peak, positive

Video output signal impendance—75 ohms, terminating

Video output connectors—Multi-bulkhead cable

Dimensions—5" x 5" x 20"

The camera control (Dage Model No. 775) has a resolution and video output impedance the same as the camera assembly. It has a video output signal of 1.4 volts peak-to-peak, negative, and a scanning frequency of 15,750 cps horizontal and 60 cps vertical.

NUCLEAR INSTRUMENT BRIDGE

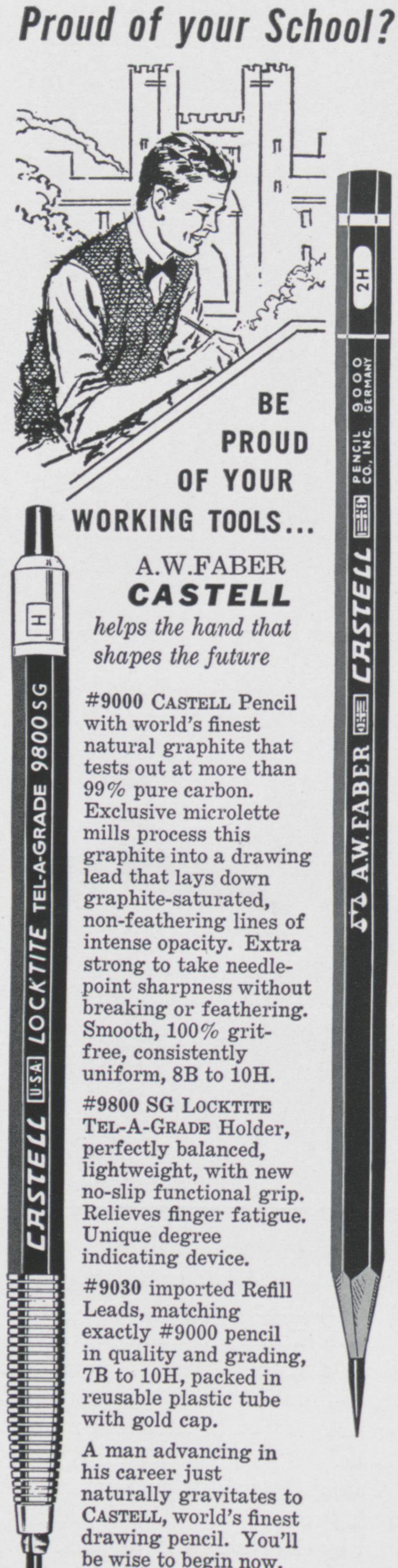
A bridge, moving over stainless steel rails—machine finished to watch like precision—may become a figurative span between the ages of jet and nuclear powered aircraft.

The mechanism has been installed at the Atomic Energy Commission's Reactor Testing Station in Idaho where a major effort is directed toward tests of shielding materials for use in future atomic powered planes.

The bridge and its automatic positioning controls were developed and built by the Nuclear Equipment Department, Mechanical Division of General Mills. The entire unit weighs 30 tons.

The rails, made of Allegheny Ludlum Steel Corporation stainless steel

(*Continued on page* 32)



LESSONS ON KOREA

(*Continued from page* 15)

First, the Communists would have overrun the Korean peninsula, a stepping stone for a jump-off to Japan. Failure of the free world to check them in Korea would have been an open invitation to try other ventures in aggression. Small countries, with no expectation of assistance from the strong, free nations, would be easy victims. And, at last, when we ourselves would be faced with a choice between fighting or surrender, the odds would be overwhelmingly against us.

Korea taught us a new concept of warfare—limited war. The action in Korea has been described as a small, or limited, war. Neither side used its full strength against the other. We did not bomb the Communist bases on the other side of the Yalu, and the Communists did not bomb our bases in Japan. Both sides were aware of the danger of igniting another global conflagration —World War III.

We have learned something new about Communist treatment of prisoners of war. We know that it varied to fit the situation, yet its ultimate aim was always the same—to make captives serve the cause of international communism. With this knowledge so bitterly acquired, we can steel ourselves against Communist tactics used in the past and against new ones that may be devised in any future war.

We have learned how effective propaganda is as a Communist weapon. It is a weapon the Communists are still using and will continue to use with skill. Every incident with propaganda value that occurs in Korea the Communists eagerly distort and broadcast to the world.

And we learned from the tedious truce negotiations that the Communists are masters of duplicity, doubletalk, and delaying tactics; that they use negotiations not to arrive at an agreement but to win a victory. Any attempt to deal with them requires the utmost patience, firmness, and wisdom.

MY WORK AT N.A.F.I.

(*Continued from page* 22)

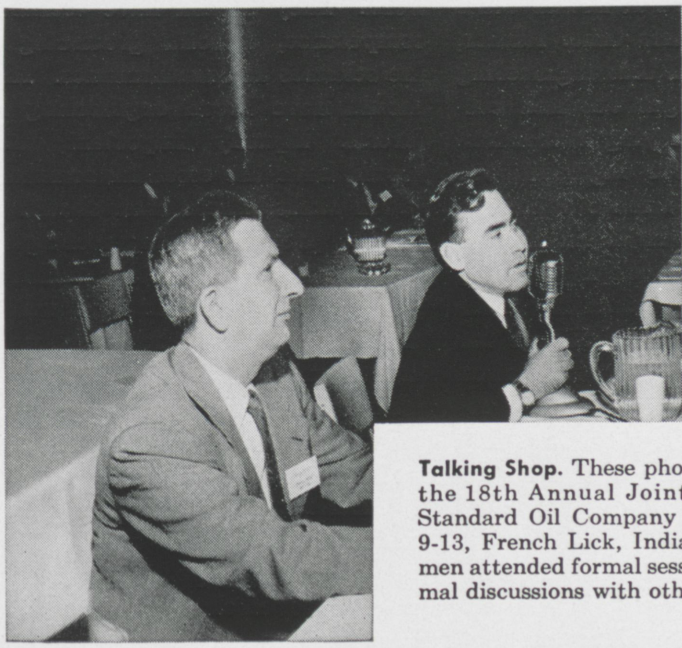
lem from their viewpoint. We found that, in most cases, one FSN had at least a dozen manufacturing stock numbers, and, in some cases, as many as five hundred. This became the prohibitive factor of having a cross-reference magnetic tape. When the problem first came to us, we had hoped that there would be a possibility of having the computer give the name and address of the manufacturer also, but that would take more tape and computer time. NAFI, in order to speed up their manufacturing, decided they would buy more material from local vendors and less through the Naval Supply System.

If and when the Shipping and Receiving wall would be moved, Stock Control and Purchase Control would need a new seating arrangement. Two, or three layouts were made in the quest for self-improvement.

In general, this Industrial Engineering Department has the purpose of helping other groups solve their problems. New seating arrangements, improving, originating a work process, establishing original wiring in a work area, arranging a machine design to protect the machinist from poison particles, designing a new lighting arrangement to fit the seating plan, and improving ideas on storing materials are just a few of the problems that arise and are assigned to the Industrial Engineering Department.

The last project I worked on was drawing an electrical wire twister. The wire would be more flexible if it was twisted, and the diameter of the wire and sleeving would be smaller than loose wires in sleeving. The twisted wire was to be pulled through the sleeving by motor. The sleeving would be enlarged by air pressure, and a "plug" would send a pulling wire through the sleeving.

From this department, I had associations with several other groups, and gained a better knowledge of how they could work together.



Talking Shop. These photographs were taken at the 18th Annual Joint Technical Meeting, Standard Oil Company and its affiliates, May 9-13, French Lick, Indiana. More than 350 oil men attended formal sessions and enjoyed informal discussions with other scientists.

"SHOP-TALK" SESSION FOR SCIENTISTS

In a company where scientific research ranges all the way from palynology to metal stress, the need for an exchange of information is imperative. Much of this can be accomplished with written reports. However, Standard Oil has found that a "Shop-Talk" conference once each year accomplishes a meeting of scientific minds that is even more satisfactory.

This year, at Standard's 18th Annual Joint Technical Meeting more than 80 technical papers were presented to 350 technical experts and representatives of other departments. Discussed were such subjects as the potential use of atomic energy as a commercial fuel source, electronic computer controls, and the use of $80-an-ounce platinum in making higher octane gasolines. In addition to these formal meetings, small discussion groups and conversations between individuals contributed to the exchange of ideas. The result was a stimulating five-day period that saw new ideas take shape. The meeting benefited everyone—scientists, the company, and consumers.

This type of meeting, which Standard pioneered, is another example of scientific leadership by Standard, and another reason why men with technical training find a Standard Oil career offers unusual creative encouragements.

STANDARD OIL COMPANY

STANDARD

THE SIGN OF PROGRESS...
THROUGH RESEARCH

EXECUTIVE MANAGEMENT

(*Continued from page* 11)

try involves the application of computer control equipment to continuous process lines. Flat rolled steel moving at 2,000 Ft. per minute will have its hardness and other characteristics continuously monitored and at the same time, process variables will be automatically adjusted to produce plate of optimum metallurgical quality.

While J&L as well as other U. S. industries are directing their effort toward maintaining and improving our position in world trade, we still have an overriding obligation to assist and advise other engineers of the free world. This exchange of technology has now grown to substantial proportions. During the past summer, I have been visited by engineers from a dozen different foreign steel companies, and our company has sent several engineers to various parts of the continent to observe new developments in steel mill technology. All this might seem to indicate that we should increase our engineering forces. I do not advocate such a move at this time. Rather, I feel it is essential that engineering excellence be sought out and cultivated. I am not saying that industry cannot use more engineers, but I am emphasizing a more important need—the need to maintain consistent improvement in our engineering educational standards. In my company the competitive challenge for quality, efficiency and innovation demand more and more creative engineering. This is typical not only of the steel industry but of industry as a whole.

I have referred to the steel industry, talked some about J&L, and emphasized the degree of urgency attached to technical progress in our business. Finally, I want to respond to your editors' question, "What are the characteristics that J&L will look for in engineers?" First of all, it should be recognized that we are seeking higher caliber graduates than we have ever required in the past. These engineers should be educated men—in the true sense of the word. They should have technical competence, a solid grounding in the sciences and mathematics. They should have broad engineering interests. Equally important, they should have the essential communication skills. These men should be able to prepare an engineering report, deliver a paper to a technical group, and participate in a conference which requires both expression and listening skills.

As I noted in my opening paragraphs, engineering educators have made many of the necessary changes in climate and curriculum to prepare you for the business world. J&L and many other prospective employers have improved clerical and technical assistance so that engineers may function at maximum effectiveness. Executive management, reacting to increasing competitive pressures, is looking to engineers for product and process innovation. You must ask yourselves if you will be able to capitalize on this opportuinty by bringing a full measure of technical excellence and personal enthusiasm to your job.

Why college men choose careers with Du Pont

Every year, several hundred new college graduates choose Du Pont. Many Masters and Ph.D.'s do, too.

From time to time we learn from recent graduates the factors which led to their decision to join this company. They cite more than half a dozen reasons. Here are four of the most important:

OPPORTUNITY AND RECOGNITION

They were aware that college-trained beginners go right to work with men who have achieved.

For example, research chemists work with individuals who've done successful research. New engineers work with pros, some of whom have designed new plants, or devised new manufacturing methods, or distinguished themselves in some other way. And other graduates, with B.A. or M.B.A. degrees, go to work with leaders who've been successful in Sales or Advertising or Treasurer's, or another of Du Pont's many departments.

They had been told—and rightly—that Du Pont rewards individual achievement. And they were eager to start achieving.

RESEARCH CREATES NEW PRODUCTS; NEW PRODUCTS CREATE NEW JOBS

Men like working for a company that believes in research, enough to invest in it . . . $90 million a year!

The fact is that important new products come from Du Pont laboratories and go to Du Pont manufacturing plants with frequency.

Here are but a few since World War II: "Orlon"* acrylic fiber followed nylon (soon after the war). Then came "Dacron"* polyester fiber, "Mylar"* polyester film, "Lucite"* acrylic lacquer and "Delrin"* acetal resin.

These, and many others, have created thousands of new jobs . . . in research, manufacturing, sales . . . in fact, in *all* Du Pont departments.

DU PONT BACKS EMPLOYEES WITH HUGE INVESTMENT

New graduates feel that every facility is provided for doing the job well.

Last year, Du Pont's operating investment per employee was $32,500. Since much of this was expended to provide the most modern and best of equipment to work with, it further increases the chance for individual achievement.

This applies to men in lab, plant and office.

DU PONT PROVIDES STEADY EMPLOYMENT

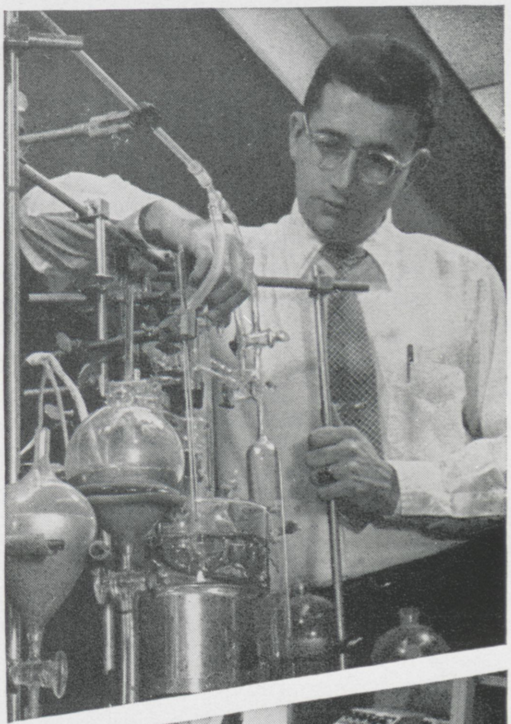
Career seekers appreciate the importance of security.

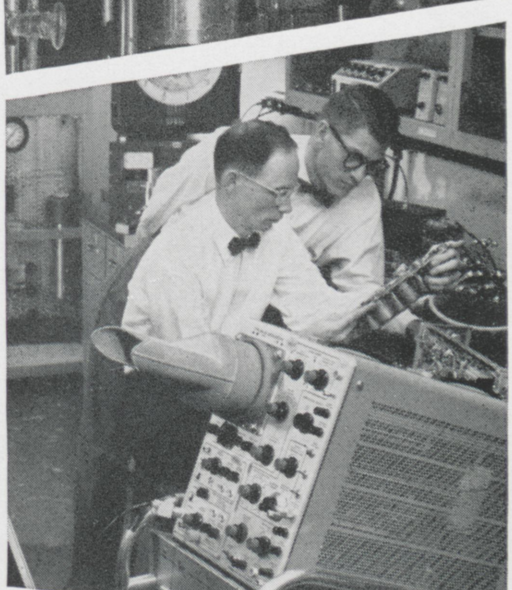
Today, the average annual turnover rate at Du Pont is less than one-third that of industry nationally.

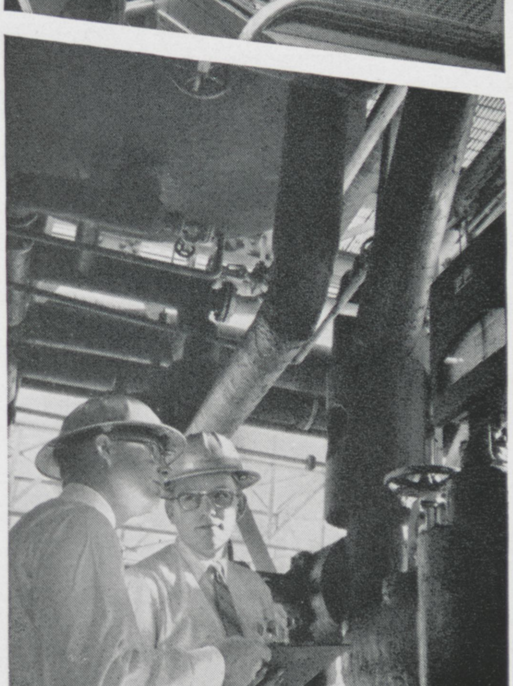
• • •

These, and many other reasons, draw new talent to Du Pont each year.

Prospective graduates, M.S.'s and Ph.D.'s interested in learning more about job opportunities at Du Pont are urged to see their Placement Counselor, or to write direct to E. I. du Pont de Nemours & Co. (Inc.). They should tell us the course they are majoring in so we can send literature that is most appropriate.







DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

*REGISTERED DU PONT TRADEMARK

(*Continued from page* 14)

tion. Since the object lies outside of the focal point of the lens it is regarded as being real and inverted when we see the image. Three rays are used in order to show the construction of the image.

The two lenses are double convex and this proved unsuccessful due to the effect of chromatic aberration on focusing. The modern refracting telescope is known as the Achromatic Telescope and is essentially the same except for the objective. The objective in the achromatic is made of two lenses, one made from crown glass and the other from flint glass. This compound lens is made by cementing the two components together with transparent Canadian balsam. The crown lens is a converging lens and the flint lens is a diverging lens. A diagram (Figure 7) is shown below, giving the geometric solution obtained by using a compound objective. This method enables the first image to be focused clearly on the focal plane and eliminates much of the chromatic aberration.

It should be added that the size of the telescope refers to the aperture. Thus if we have a 15 inch telescope, the aperture of the objective lens (or mirror) is 15 inches in diameter.

We shall now talk about the reflecting telescope. As mentioned earlier, light is either refracted or reflected by objects that it encounters. The refracting telescope makes use of the former, while reflected light is the basis for the reflecting telescope.

When light is reflected, i.e., bounces off the surface, it may do any number of things, depending upon the type of surface that it comes in contact with. If the surface is planer and the light rays hit the surface at right angles, the light will reflect back on itself. If the surface is diverging, the light will come to a point of focus, provided that the surface is regular, and we disregard spherical aberration for the time being.

This concept is the basis for the reflecting telescope. When the light is brought to a focus an eyepiece may be used, as in the refracting telescope, for magnification and observation, as shown in Figure 8. There are four main classifications of reflecting telescopes; the prime focus, the Newtonian focus, the Cassegrain focus, and the Coude focus. These are shown, in principle, in Figure 9.

The size of telescopes of a reflecting nature are designated by the diameter of the reflector, or mirror. In comparison, the refracting telescope is usually of a smaller size than the reflecting type since a refracting lens, or objective, must be supported only around its circumference. However, the reflecting telescope's mirror may be supported from underneath as well as around the circumference. It is obvious that if a piece of glass were supported around its circumference only, there would be some degree of sag if the glass was big enough. Thus the size of the refracting telescope is limited. The largest refracting telescope is the 40 inch at Yerkes observatory. The 200 inch Hale telescope on Mount Palomar is the largest reflector. It has been found that no lens system over 40 inches in diameter can be supported without distortion of image due to sag in the lens.

Before we leave the topic of the reflecting telescope we should touch on a subject already mentioned—spherical aberration. This is caused since the focal point is not the same for different portions of the mirror, and it is especially prevalent in spherical mirrors. The remedy is the use of paraboloidal mirrors.

(*Continued on page* 38)

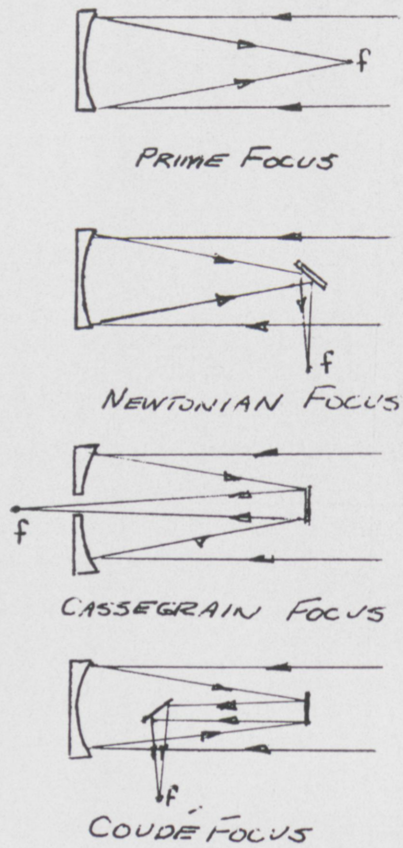


Fig. 9

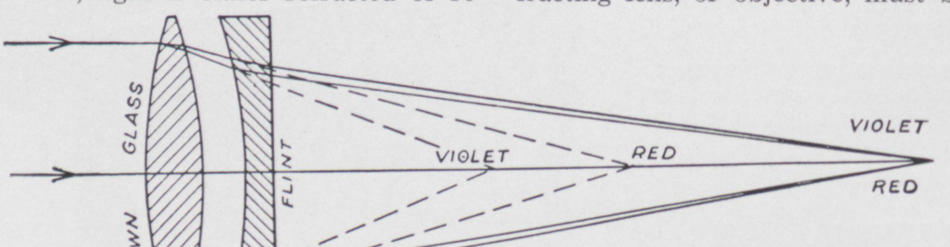


Fig. 7

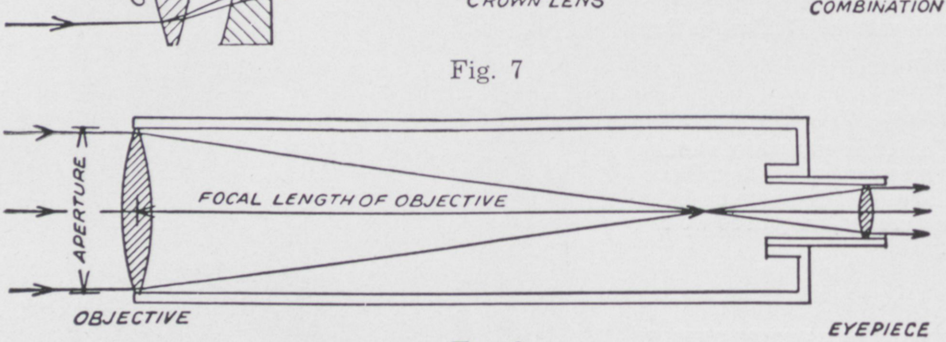
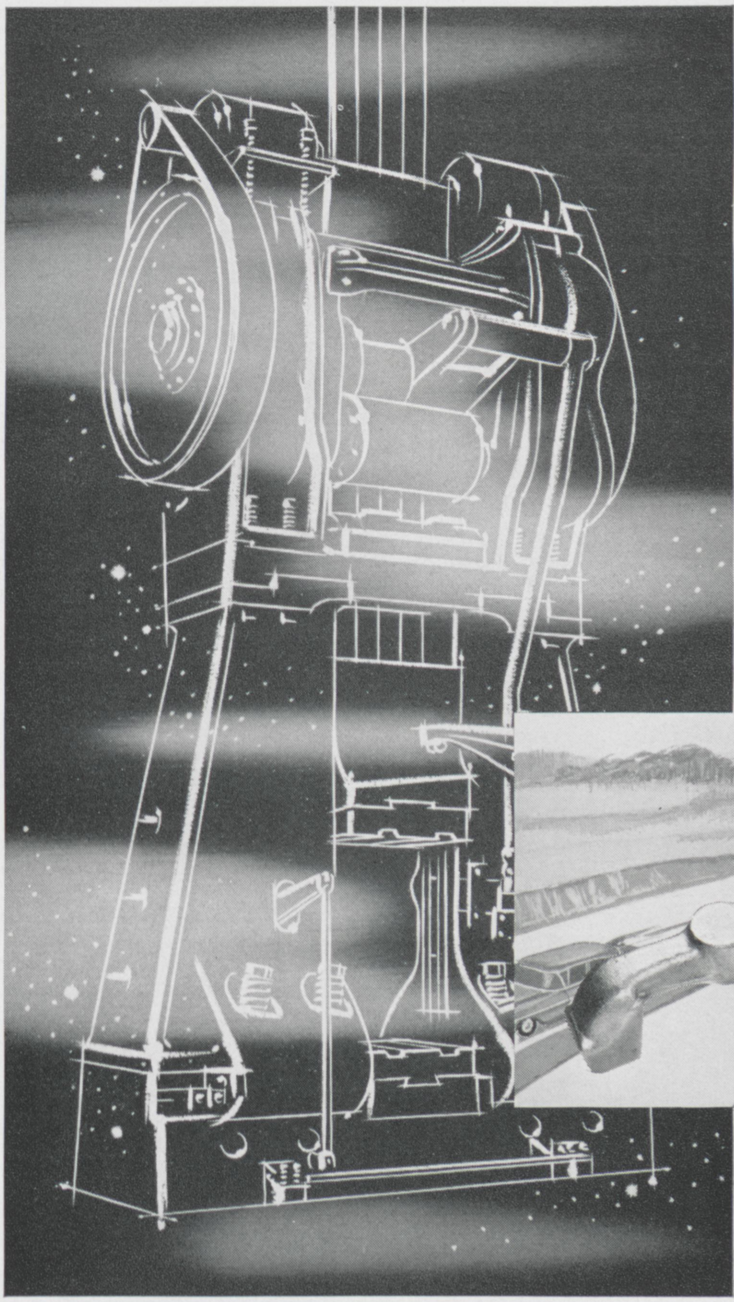
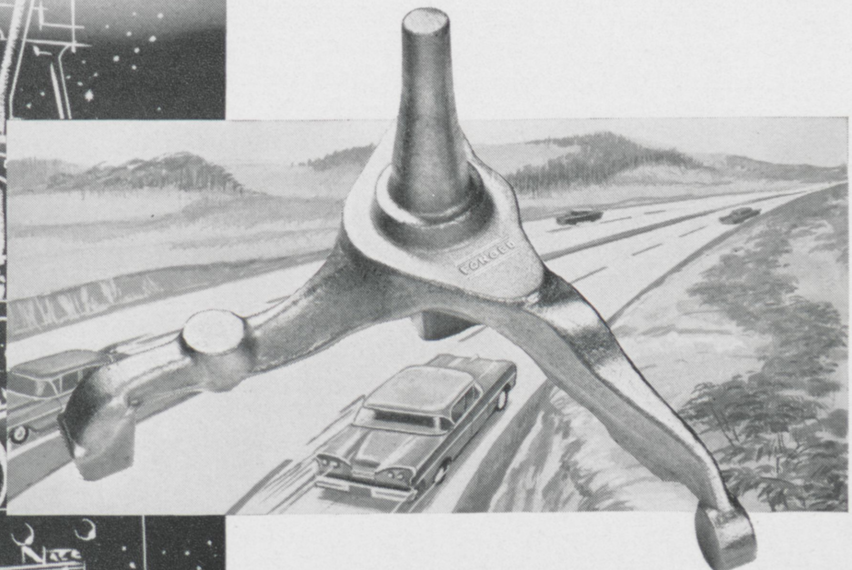


Fig. 8



Modern board-lift forging hammer

SHOCK-STRENGTH of steering spindle soars by designing it to be forged



By designing front-end spindles to be forged, automobile and truck manufacturers practically eliminate danger of failure of these vital parts, even under sudden turning stress that can reach thousands of foot-pounds.

Start your designs by planning to use forgings everywhere there's a high degree of stress, vibration, shock, or wear. Forged parts withstand them all better than parts made by other fabrication methods. And forgings have no hidden voids to be uncovered after costly machining hours have been invested . . . the hammer blows or high pressures of the forging process compact the *better* forging metal, make it *even better*.

Write for literature on the design, specification, and procurement of forgings.

When it's a vital part, design it to be FORGED

Drop Forging Association • Cleveland 13, Ohio

Names of sponsoring companies on request to this magazine.

RESEARCH & DEVELOPMENT

(*Continued from page* 25)

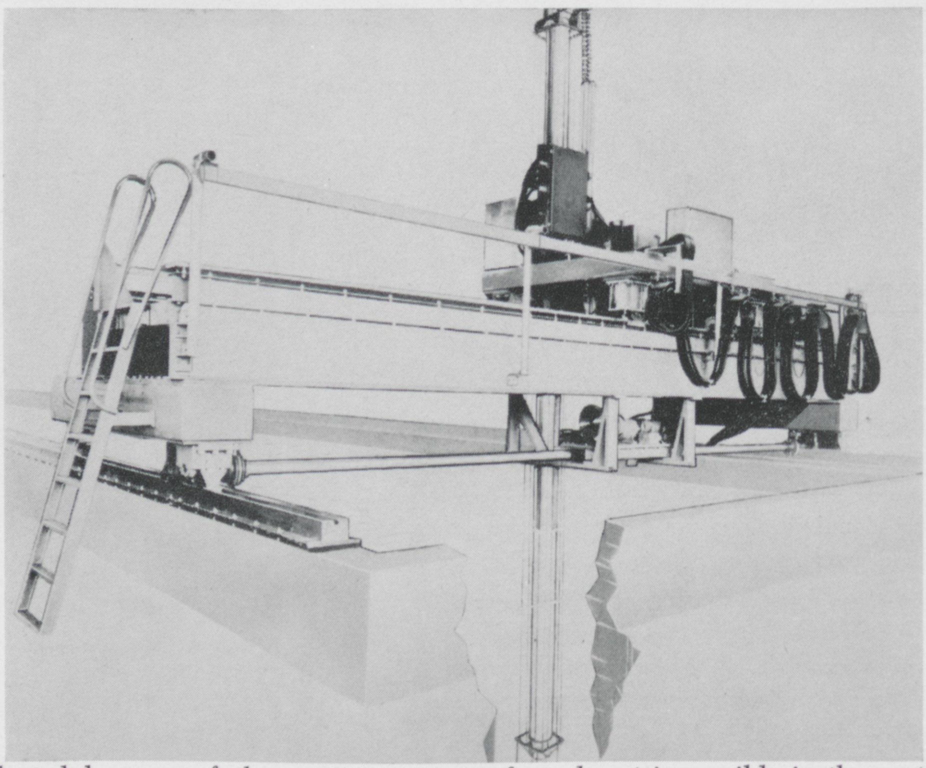
Types 310 and 405, must support the 30-ton load. All contact surfaces on the rails—equipped with integral racks—require a 30 micro-inch finish.

The nuclear instrument bridge will be operated by the Aircraft Nuclear Propulsion Department of the General Electric Company, a prime contractor in the nuclear aircraft program.

The bridge spans two 30-feet deep water pools. By remote control, it will position radiation-measuring probes with extreme accuracy in either of the pools—located end to end and separated by a center wall. A mast—part of the bridge—will actually position the rediation probes or detecting instruments.

The automatic positioning system includes an analog-to-digital encoder. The control system can be preset to automatically move the mast to any position in either pool.

The stainless steel rails were selected because of the precision requirements and because of the metal's corrosion resistance. The rails are amounted in close proximately to the pools where relative humidity will, at time, approach 100 per cent.



DIGITAL COMPUTER

Developed for the use of GMC Truck engineers, a new "electronic brain" which analyzes the truck performance eliminates many "trial and error" test runs. The new electronic testing system is basically a medium size digital computer. The basic truck features and the road condition of the given route are "fed" into the machine by means of cards. The computer analyzes the cards. The truck's performance characteristics are then punched electronically on other cards.

The electronic computer system was checked during development stages by actual field tests. Through this test, the machine computations and the field tests varied only fractionally. The chart of two truck performance characteristics accompanying this article gives the theoretical shift points and miles per hour as computed by the electronic brain.

The new electronic brain also makes possible the comparison of various truck components without worrying about climatic conditions, a feat almost impossible in the past. Cataloging and arranging data, solving difficult mathematical problems and analyzing operational information are also accomplishments of this new electronic brain.

ADVERITISING INDEX

GENERAL SYSTEM THEORY

(*Continued from page* 19)

in space? The real answer (I have forgotten what it was) is of little consequence for an example. All I want to show is the chain of abstraction, deduction, and materialization, and how the last of these links was made.

It stands to reason that this last link mentioned above, the most important step in the comparison, warrants further attention. In the system formulations each step was closely governed by logic where as in this latter process, materialization, the rules to be followed are far less exacting. We have noticed before that it takes a great insight and intuition for abstraction on the part of the analyst to formulate all the possible new system functions, but this requirement is small in comparison to the insight necessary to materialize his functions to some unrealized physical system. General System Theory has proposed that the most efficient way to maintain creative inductive reasoning in this materialization process is by the use of the analogue method.

Thus the analyst now indulges in conceiving analogies to his system, hoping that these analgoies are helpful in revealing "fact-structures". However, the analyst realizes that the criteria for the selection of analogue units that will permit the greatest possible integration of knowledge about the system should follow some sensible pattern. For example, the analogue units should be based on the most substantial physical evidence possible; they should also avoid overlapping. In short, the analogies should be presented in an order as to lead to the best understanding of the nature of the systems.

The building, evaluating, and presentation of analogue units practically necessitates that our analyst works in a group. Group work can easily be seen to be beneficial because a group becomes its own director in improving communication between members and unconsciously integrates all the knowledge of the members. Thus in close teamwork the group evaluates each member's analogies and in turn polishes the most promising analogies which eventually lead to an exact development.

We have now been exposed to the powers that General System Theory grant to system analysis. In fact, we can see where this theory has made great advances already. There has been a great furtherance in the unity of science; also this theory has devised schemes whereby system knowledge can be applied to the non-technical science fields such as biology, psychology, etc. The only factor that limits the power of this theory is man himself. By the introduction of semantics, he is already aware that the language which he uses, governs the way he looks at the world. On the assumption that man will continue to be more perfective in his language and exacting in his thinking, it can easly be seen that General System Theory is unlimited in possibilities for the attainment of new knowledge.

LIBRARY NOTES

(*Continued from page* 24)

their women under the tension of life on this imaginary island — an island which suddenly achieved importance through the discovery of oil.

Lincoln's Youth, by Louis A. Warren

"There's no man in American History with whom the people so desire intimate acquaintance as they do with Abraham Lincoln . . ." Ida Tarbell

This volume covers the years of Lincoln's youth in Indiana, (1816-1830) from age seven to twenty-one.

What was Indiana's role? Dr. Warren made use of his well tried method of pursuing source material of over thirty-five years to contribute this volume. The fourteen Indiana years have a strategic position in the life cycle for they comprise one full fourth of Lincoln's life span of fifty-six years. The Indiana years are highly formative, occupying as they do the long interval between early childhood and young manhood.

"He grew up . . . on our own good soil of Indiana."

Highways Over Broad Waters, by William Ratigan

Mr. Ratigan presents the life and times of David B. Steinman, Bridge-builder.

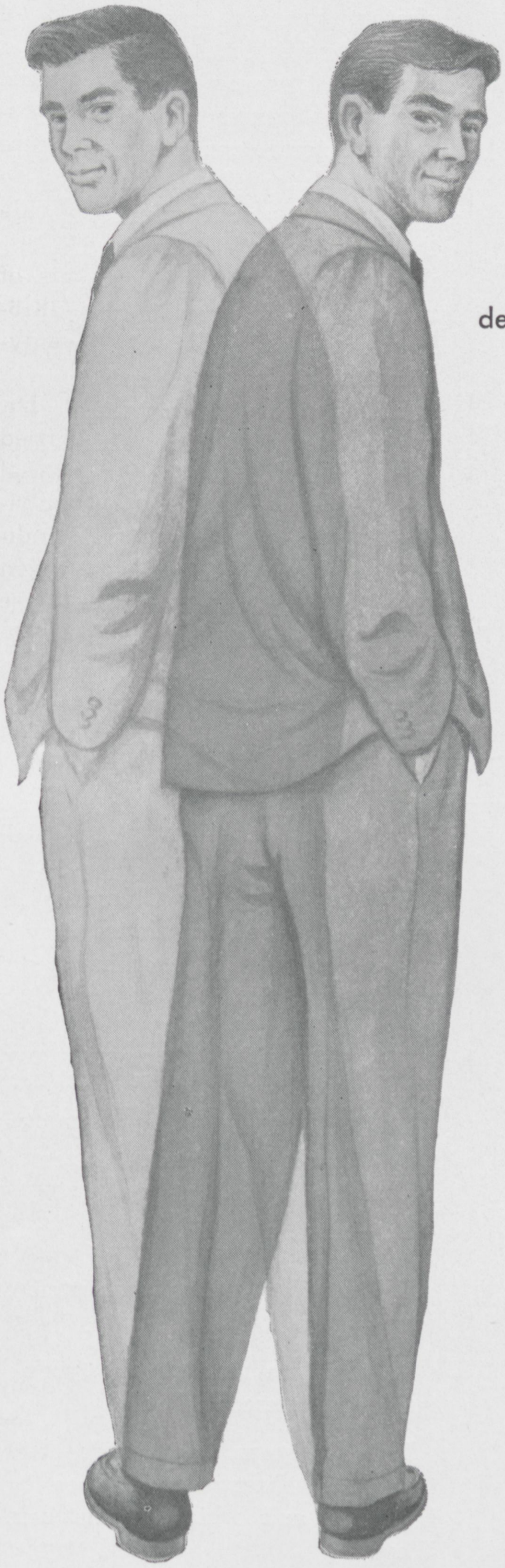
"Someday I'm going to build bridges like that!" he said, at the age of seven, in the shadows of the Brooklyn Bridge.

"Boys grow up and bridges grow old, times change and so does transportation . . ." Today the name of the boy who spoke his dream aloud in the shadows of the bridge is engraved on a bronze tablet on Brooklyn Bridge itself for having converted its two-lane traffic to the modern six-lane passenger-car traffic way.

The boy's dreams materialized into more than four-hundred bridges, on every continent except Africa.

This is a fascinating life story of one famed around the globe as the leading builder of bridges in recorded time.

MEN ...who are Engineers, **look twice** at the many advantages CONVAIR-POMONA offers



NEW PROGRAMS at Convair-Pomona, offer 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. Many other, still highly classified programs, stimulating the imagination of the most progressive thinking scientist and engineer are presently at various stages of development.

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Contact your placement office immediately to assure yourself of a campus interview with Convair-Pomona.
If personal interview is not possible send resume and grade transcript to B. L. Dixon, Engineering Personnel Administrator, Dept. CM-604 Pomona, California.

CONVAIR/POMONA
Convair Division of
GENERAL DYNAMICS CORPORATION
POMONA, CALIFORNIA

ASTRONOMY

(*Continued from page* 30)

Both the reflecting and refracting telescopes have two methods of use: as a visual instrument and as a photographic instrument. It has already been explained how the visual part of astronomy takes place with the use of the eyepiece. However, if the astronomer were to rely on visual knowledge of the heavens only, many things would be missed, since the astronomer is human. Thus, it was found that, if the eyepiece was removed, a photographic plate could be placed in front of the opening. This enables the astronomer to make a lasting record of the skies which he can study at other times. This also means that things that may have been missed by visual means are caught on the plate.

Most of the work that is being done in astronomy now is a photographic type. Many things that would have not been found for years, or ever, have been found by photographing the heavens.

* * *

REVIEW QUESTIONS

1. What may the Celestial Coordinate System be related to with respect to another coordinate system?

2. What are the two types of telescopes, and the largest size that each has reached, and limitations on size?

3. What is the equator system of coordinates?

4. What is the Ecliptic?

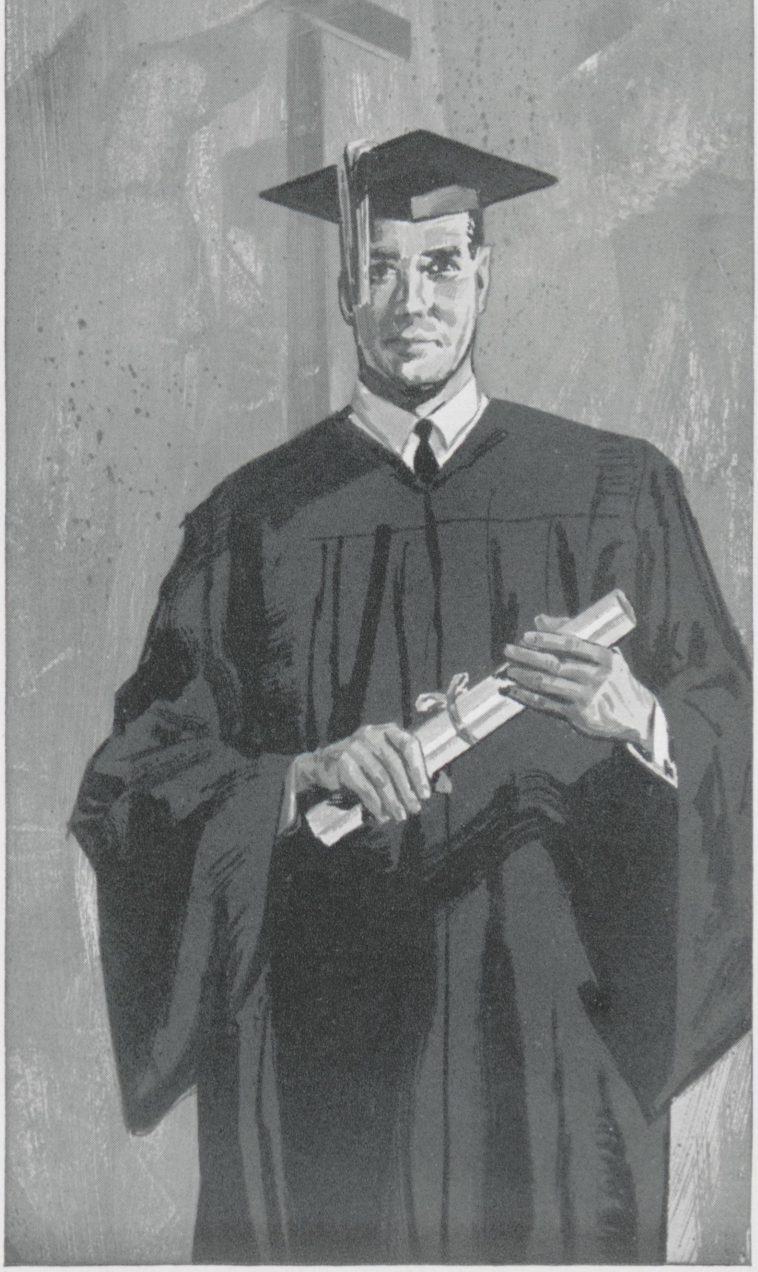
5. Describe the Horizon System of coordinates.

6. What are the four (4) types of reflecting telescopes?

7. What types, or methods, of astronomical observation are now being used and which is the best? Why?

* * *

NEXT MONTH: THE MOON, ITS SURFACE FEATURES, AND THEORIES OF THEIR ORIGIN.



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.

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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.

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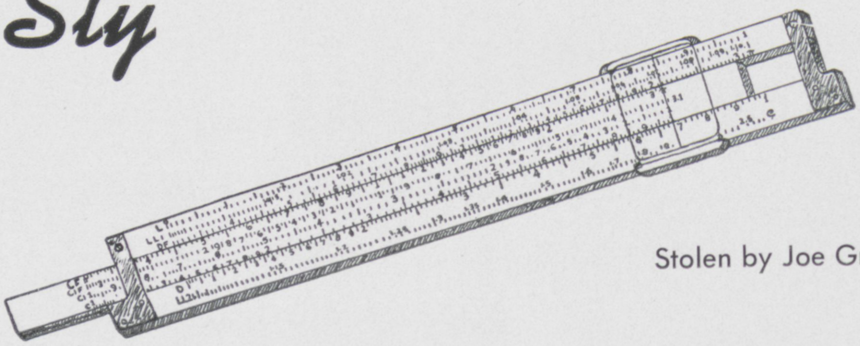
Sly Droolings



Stolen by Joe Grumme, Bob Lovell, Max Goodwin

Since we call professors "profs", it's easy to figure what we ought to call assistants.

* * *

Women find themselves at quite a disadvantage since man can now travel faster than sound.

* * *

"There's one thing I want to tell you before you go any further."

"What's that?"

"Don't go any further."

* * *

Drunk: "What's that crawling up the wall?"

Bartender: "A lady bug!"

Drunk: "Gad, what eyesight!"

* * *

During mock maneuvers an army commander ordered a notice to be displayed on a bridge stating: "This bridge has been destroyed by air attack." But to his chagrin, he noticed through his field glasses that a foot regiment was crossing the bridge despite his orders. He sent his adjutant to the officer in charge post-haste to find out how he dared to defy his orders. An hour later the adjutant was back. "It's all right, sir," he reported "The troops are wearing signs saying 'We are swimming'."

* * *

"Is this a picture of your fiance?"

"Yes."

"She must be wealthy."

* * *

"If angular momentum can't be created, where did it come from in the first place?"

Prof: "Why, the torque brought it."

* * *

M.E. walking up to co-ed: "How many drinks does it take to make you dizzy?"

Co-ed: "Two, and the name is Daisy."

* * *

"I certainly hope it doesn't rain today," one lady kangaroo remarked to another. "I just hate it when the children have to play inside."

* * *

And then there was the mechanical engineer who took his nose apart to see what made it run.

* * *

Mother: "Do you like your new nurse, Jimmy?"

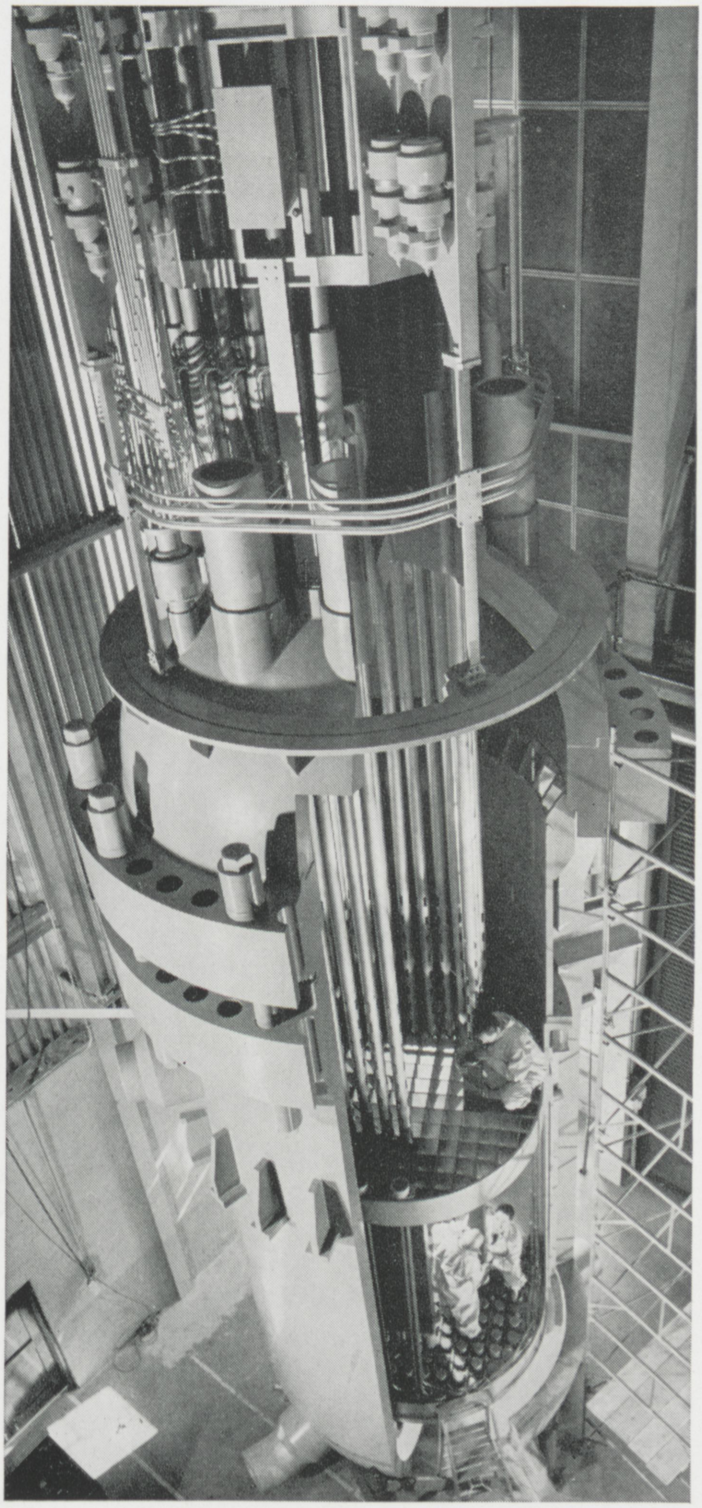
Jimmy: "No. I hate her. I'd like to grab her and bite her neck like Daddy does."

* * *

C.E.: Remember when a woman says "no" she means "maybe", and when she says "maybe" she means "yes."

M.E.: I know, but what does she mean when she just says "Phooey?"

If your sights are set  on nuclear power–



Mock-up of the Shippingport (Pa.) Atomic Power Station reactor which was designed and developed by the Westinghouse Electric Corporation under the direction of and in technical cooperation with the Naval Reactors Branch, U.S. Atomic Energy Commission.

–you'll find **Photography at Work** with you

Already engineers working with nuclear power have learned that only utmost purity of materials and meticulous accuracy in manufacture can be tolerated in a reactor. Steels for the reactors and reactor vessels are checked for make-up and molecular structure with photomicrography and x-ray diffraction. Welds are proved sound and moderators flawless with radiography. And stresses likely to occur are studied in advance with photo-elastic stress analysis.

In this new-day industry, as in any field on which you set your sights, photography plays a part in making a better product, in producing it easier, in selling it faster. It cuts costs and saves time all along the line.

So, in whatever you plan to do, take full advantage of all the ways photography can help.

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

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Kodak
TRADEMARK

One of a series

Interview with
General Electric's Byron A. Case
Manager—Employee Compensation Service

Your Salary at General Electric

Several surveys indicate that salary is not the primary contributor to job satisfaction. Nevertheless, salary considerations will certainly play a big part in your evaluation of career opportunities. Perhaps an insight into the salary policies of a large employer of engineers like General Electric will help you focus your personal salary objectives.

Salary—a most individual and personal aspect of your job—is difficult to discuss in general terms. While recognizing this, Mr. Case has tried answering as directly as possible some of your questions concerning salary:

Q Mr. Case, what starting salary does your company pay graduate engineers?

A Well, you know as well as I that graduates' starting salaries are greatly influenced by the current demand for engineering talent. This demand establishes a range of "going rates" for engineering graduates which is no doubt widely known on your campus. Because General Electric seeks outstanding men, G-E starting salaries for these candidates lie in the upper part of the range of "going rates." And within General Electric's range of starting salaries, each candidate's ability and potential are carefully evaluated to determine his individual starting salary.

Q How do you go about evaluating my ability and potential value to your company?

A We evaluate each individual in the light of information available to us: type of degree; demonstrated scholarship; extra-curricular contributions; work experience; and personal qualities as appraised by interviewers and faculty members. These considerations determine where within G.E.'s current salary range the engineer's starting salary will be established.

Q When could I expect my first salary increase from General Electric and how much would it be?

A Whether a man is recruited for a specific job or for one of the principal training programs for engineers—the Engineering and Science Program, the Manufacturing Training Program, or the Technical Marketing Program—his individual performance and salary are reviewed at least once a year.

For engineers one year out of college, our recent experience indicates a first-year salary increase between 6 and 15 percent. This percentage spread reflects the individual's job performance and his demonstrated capacity to do more difficult work. So you see, salary adjustments reflect individual performance even at the earliest stages of professional development. And this emphasis on performance increases as experience and general competence increase.

Q How much can I expect to be making after five years with General Electric?

A As I just mentioned, ability has a sharply increasing influence on your salary, so you have a great deal of personal control over the answer to your question.

It may be helpful to look at the current salaries of all General Electric technical-college graduates who received their bachelor's degrees in 1954 (and now have five years' experience). Their current median salary, reflecting both merit and economic changes, is about 70 percent above the 1954 median starting rate. Current salaries for outstanding engineers from this class are more than double the 1954 median starting rates and, in some cases, are three or four times as great.

Q What kinds of benefit programs does your company offer, Mr. Case?

A Since I must be brief, I shall merely outline the many General Electric employee benefit programs. These include a liberal pension plan, insurance plans, an emergency aid plan, employee discounts, and educational assistance programs.

The General Electric Insurance Plan has been widely hailed as a "pace setter" in American industry. In addition to helping employees and their families meet ordinary medical expenses, the Plan also affords protection against the expenses of "catastrophic" accidents and illnesses which can wipe out personal savings and put a family deeply in debt. Additional coverages include life insurance, accidental death insurance, and maternity benefits.

Our newest plan is the Savings and Security Program which permits employees to invest up to six percent of their earnings in U.S. Savings Bonds or in combinations of Bonds and General Electric stock. These savings are supplemented by a Company Proportionate Payment equal to *50 percent* of the employee's investment, subject to a prescribed holding period.

If you would like a reprint of an informative article entitled, "How to Evaluate Job Offers" by Dr. L. E. Saline, write to Section 959-14, General Electric Co., Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC