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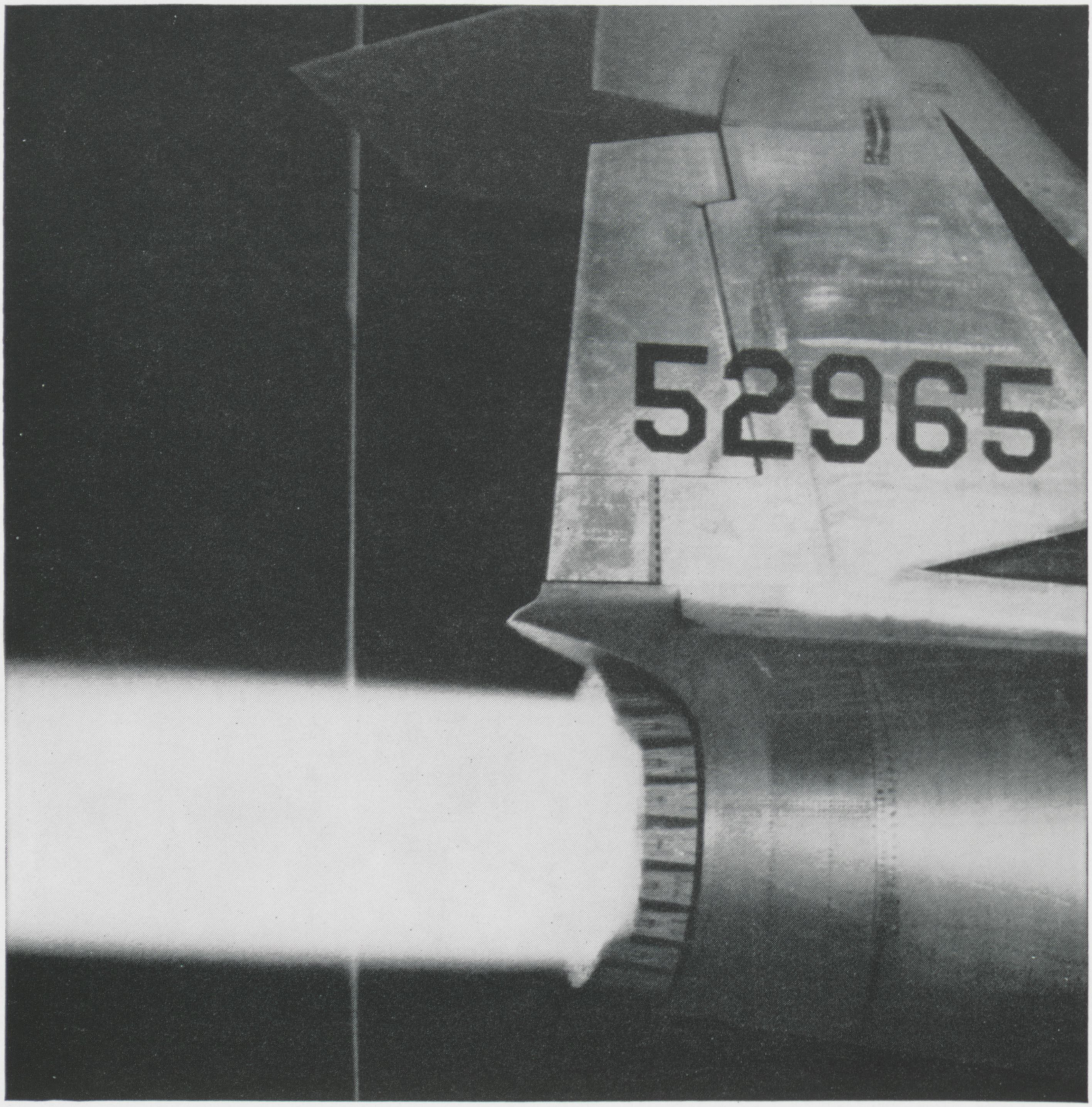
Rose Technic Staff
Rose-Hulman Institute of Technology

Rose Technic

November, 1959

In this Issue

SPUTNIK III
MAGNETIC AMPLIFIERS
ATOM SMASHERS



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New "exotic" metals, new methods for making them, present an exciting challenge. Men willing to accept this challenge—civil, industrial, mechanical, metallurgical, ceramic, electrical or chemical engineers have a future with United States Steel. Write to: United States Steel, Personnel Division, Room 2316, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

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Rose Technic

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Contents

Cover Note

"Modern construction is the product not only of Engineering and building skills, but of experienced procurement as well. A mountain of parts and equipment—including giant pyramids of bright red hopper bottoms—rises by the railroad siding. Painting by Stanley Meltzoff. Reproduced through the courtesy of United Engineers & Constructors Inc. of New York, Philadelphia and Chicago."

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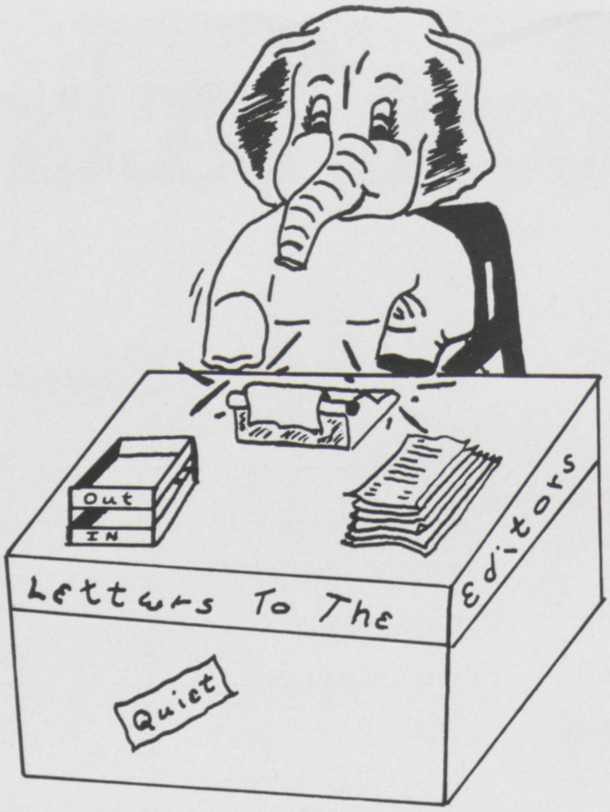
Entered in the Post-office at Terre Haute as second-class matter, as a monthly during the school year, under the act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized December 13, 1918. This magazine does not necessarily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



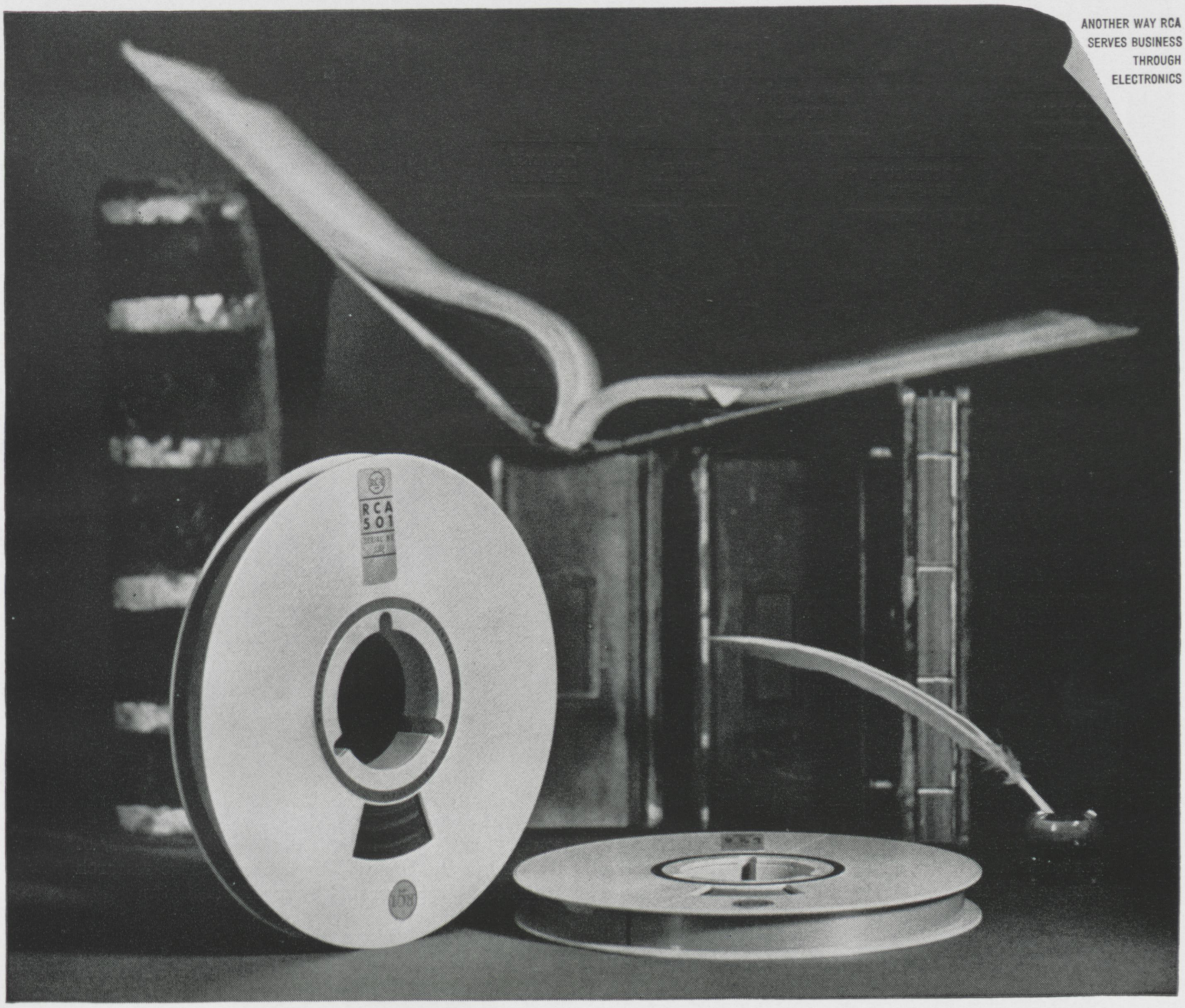
Congratulations to THE TECHNIC on its very interesting, informative article RELIGION AT ROSE. The editors are certainly to be commended for their interest in this important subject and for bringing the result of their survey to the attention of all of us on the campus.

Since is inception some five years ago, the chaplain's office has kept a record of church preferences as students indicated them at the time of their registration. Each year names have been sent to the churches of their choice and we have cooperated to the best of our ability with pastors in helping students maintain their church affiliations.

The high percentage of church membership indicated by your survey is both interesting and encouraging. I wonder, however, just what church membership means to many of those who have it. Church membership *per se* means relatively little. What led to that membership? What does it imply? To what, if anything, does it commit one, not for the moment but for all of one's life? These are the important questions, not merely if one's name happens to be somewhere on a church roll. If membership in a church really meant what it is designed to mean, there would be no let down of moral standards, no aimless drifting along through life, no self-seeking at the expense of others, none of the great social evils that today threaten the very existence of our boosted western civization.

As chaplain, here to serve Rose men in any way within my power, I would welcome the opportunity to talk with individuals or with groups about these great moral and religious problems that are inextricably bound up with a satisfying, useful life. My office door is open at designated times. My home telephone rings at any hour, day or night.

LeRoy Brown, Chaplain



RCA Electronics creates the "501" to streamline the paper work of business—it reads, writes, figures and remembers on tape

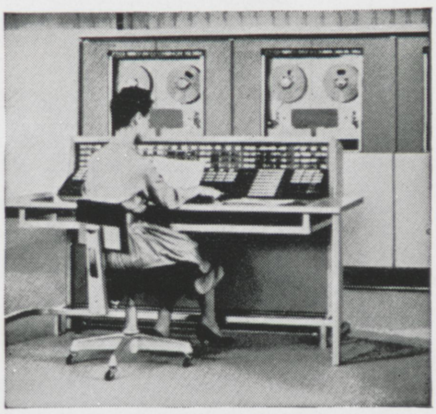
Much of today's traffic jam in paper work is being eliminated by electronic data processing. But to build a system that would be practical and economical for even medium-sized organizations was a job for electronic specialists.

To solve the problem, RCA drew on its broad experience in building computers for military applications and combed its many laboratories for the latest electronic advances that could help. The result was the RCA "501" high-speed electronic data processing system—the most compact, flexible, and economical ever built. It is a pioneer system with all-transistor construction for business use.

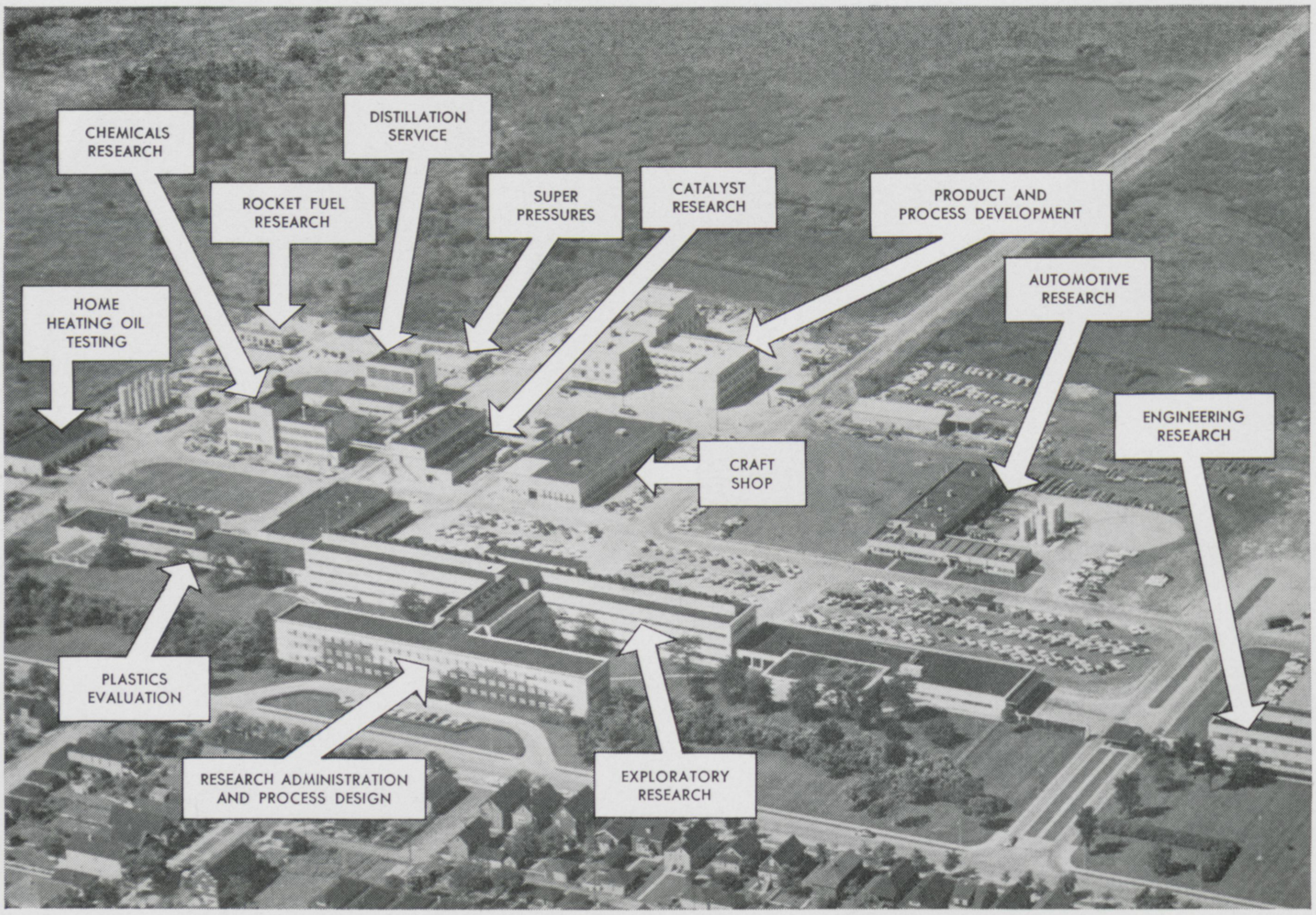
The "501" cuts out paper work bottlenecks for many government agencies and businesses, from stock brokerage firms to public utilities, banks, insurance companies, and steel mills.

It "remembers" millions of letters, numbers, and symbols that are "read" onto its magnetic tapes by such things as punch cards and paper tapes. In a fraction of a second, it can do thousands of calculating, sorting, and comparing operations—and checks each step. Finally, it writes such things as bills, reports, payrolls in plain English at 72,000 characters per minute.

This economical and practical answer to an acute business problem is another way RCA Electronics is helping to simplify the growing complexity of business.



RADIO CORPORATION OF AMERICA



This huge research center at Whiting, Indiana, is only part of Standard Oil's research facilities. A recently completed technical service and quality control laboratory, not shown here, is the largest laboratory of its kind in the country. In addition, large research laboratories are operated by several affiliates.

Where the fuels of the future are born!

From time to time, we are asked if gasoline and oil today really are better than they were five or ten years ago. People can't see the difference, smell it, or feel it.

The answer is an emphatic yes. And this aerial view of Standard Oil's research center at Whiting, Indiana, is graphic evidence of the extensive research work that goes on behind the scenes day in and day out.

Thousands of research experts—chemists, engineers, and technicians—work together in Standard's modern laboratories, improving present fuels and lubricants and developing new ones for cars that will not be a reality until about 1965! Rocket fuels, too, are being developed. Standard's development of clean-burning, highly-reliable solid fuels has been a real contribution to America's missile program.

Since our first research laboratory opened 69 years ago, research scientists of Standard Oil and its affiliated companies have been responsible for many major petroleum advances—from making a barrel of oil yield more gasoline to discovering a way to revive almost-dry wells. Each process had the effect of adding billions of barrels to America's oil reserves.

At Standard Oil, scientists have an opportunity to work on a wide variety of challenging projects. That is one reason why so many young men have chosen to build satisfying careers with Standard Oil.

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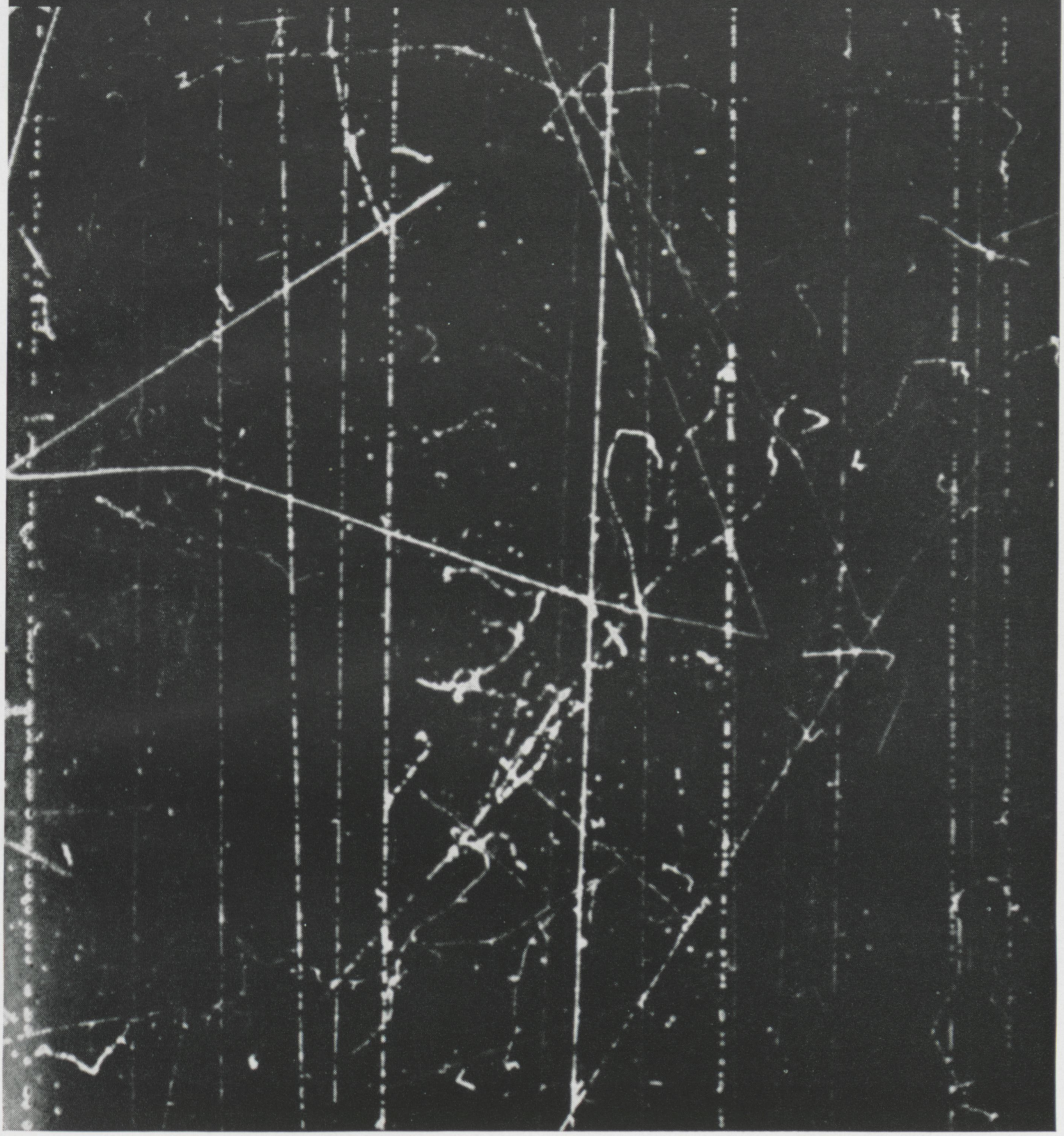
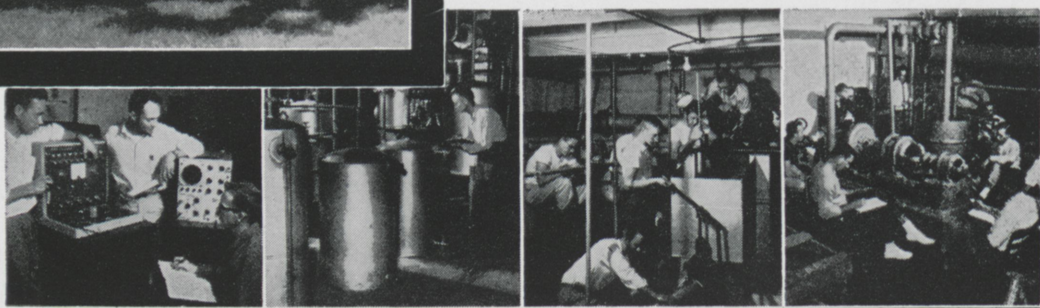
STANDARD

THE SIGN OF PROGRESS... THROUGH RESEARCH

Tracks of atomic particles in a bubble chamber developed by Prof. Donald A. Glaser of the University of Michigan



ROSE



ROSE POLYTECHNIC INSTITUTE

TERRE HAUTE, INDIANA

HIGH SCHOOL GRADUATES OF 1959

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

CHEMICAL ENGINEERING
ELECTRICAL ENGINEERING
MECHANICAL ENGINEERING
CIVIL ENGINEERING
MATHEMATICS
PHYSICS
CHEMISTRY

Office OF ADMISSIONS

ROSE POLYTECHNIC
INSTITUTE
TERRE HAUTE, INDIANA

For The Greeks

In the light of the recent adverse publicity throughout the country directed toward fraternities, it is felt that some of the advantages of fraternities should be pointed out.

Looking at fraternities from a strictly financial angle, there are several advantages. They can be seen in the financial burden that the fraternities remove from hard-pressed schools. At this time, colleges are in the midst of big expansion programs because of the great increase in young people entering college. Most of these institutions cannot expand fast enough because of their limited amount of funds available. To use Rose as an illustration, if it were not for the fraternity houses, the school would have to provide housing to take care of nearly 200 more men. This would necessitate building another dormitory the size of Bauer-Sames-Bogart Hall. This undoubtedly would prove out of the question considering the need of the school for new equipment and more classroom facilities under the new curriculum.

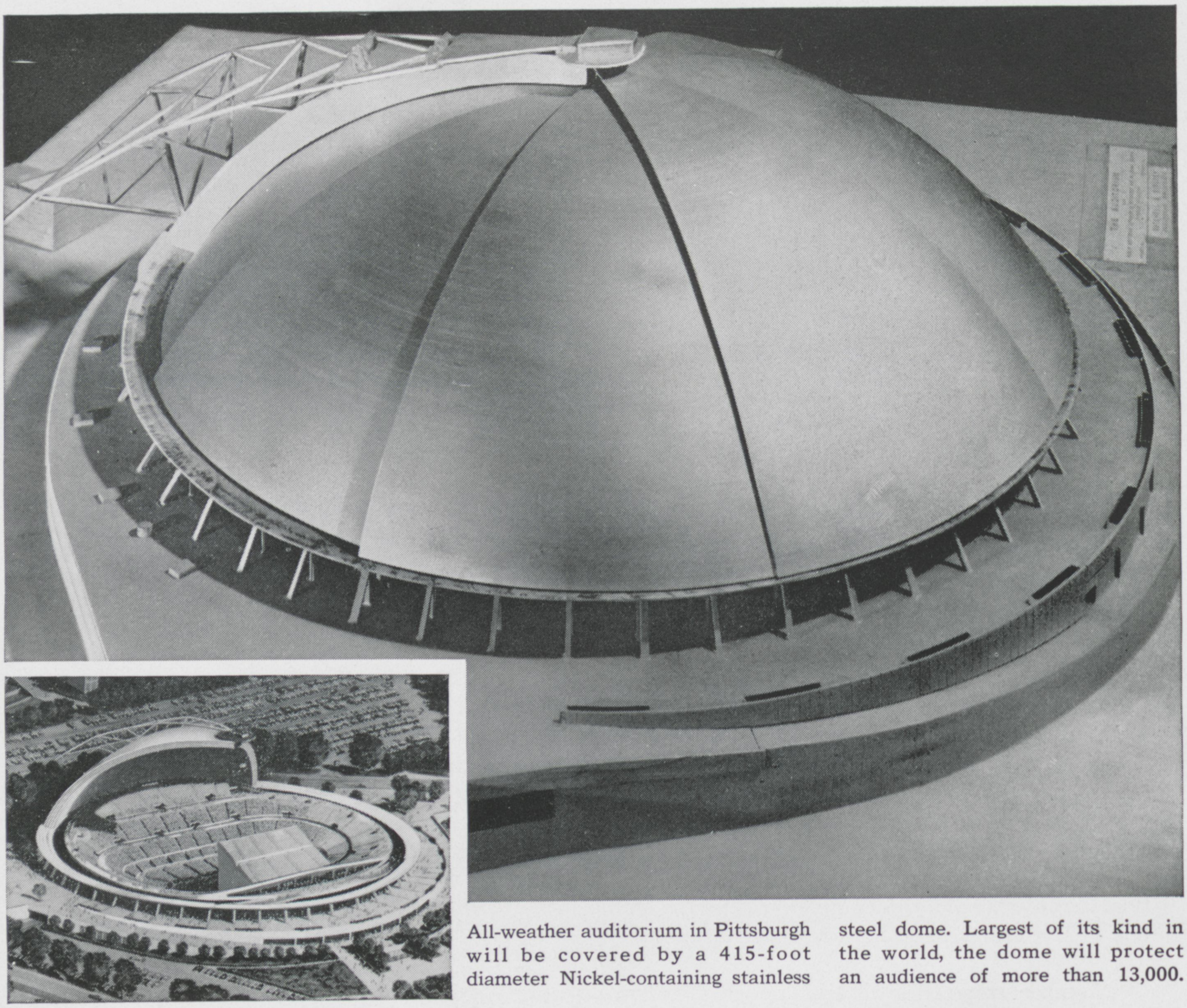
There are many other ways of showing the advantages of a fraternity system. Competition for a fraternity scholarship award on most campuses is another point in the fraternities favor. Again, using Rose as an example, the cumulative average of the four fraternities is a 2.52, which is well above all-man's average.

Another example of the training which fraternities provide is the leadership shown by fraternity men on campus. An example of this can be seen in our own Blue Key Chapter, a service organization, which at this time is composed entirely of organized men. Tau Beta Pi also boasts a group of men, 75% of whom are organized. A large percentage of the upper classmen participating in sports, publications, and other extra curricular activities are fraternity men.

Fraternities have advanced in giant strides during the past few years. Most fraternities have completely, or at least partially eliminated the old degrading and dangerous types of hazing. They have changed from dirty, dingy houses into clean modern homes. A fraternity now strives to be an accepted part of the community, aiding it by being a good citizen and helping in projects which will benefit the community as a whole.

Are fraternities an integral part of college life? If you have not yet reached a decision, perhaps some serious thought and reading this article again will help you to decide.

R. L. B.



All-weather auditorium in Pittsburgh will be covered by a 415-foot diameter Nickel-containing stainless steel dome. Largest of its kind in the world, the dome will protect an audience of more than 13,000.

For Pittsburgh's new auditorium...

A "push-button umbrella roof" of Nickel stainless steel ...the roof design of tomorrow

Here's the first of a revolutionary new type of roof design, destined to introduce a new concept in building.

A simple concept, but a daring one. The domed roof of a building is divided into eight sections which nest together when opened. Push a button, and six of these sections glide quietly together around an outside track.

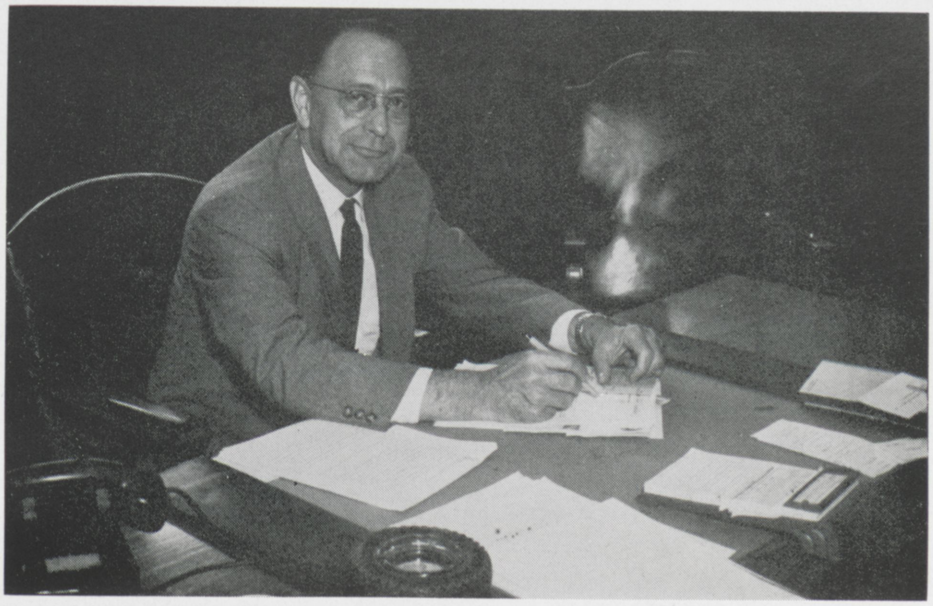
In Pittsburgh's new all-weather auditorium, the push-button umbrella roof can be closed at the first sign of bad weather without disturbing the show. In private homes, a roof design like this could bring the beauty of nature right into the home.

But what material is lasting enough for a dome like this? Architects and designers of the auditorium looked into all types of materials. They selected Nickel-containing stainless steel. They selected Nickel stainless because it has the best combination of properties for this purpose. For example it is one of the most weather-resisting, corrosion-resisting metals.

Naturally, this is just one example of how designers are taking advantage of the unique properties of Nickel-containing metals. In the future, however, you may be designing a machine—not a spectacular all-weather push-button roof. You might need a metal that resists corrosion, or wear, or high temperatures. Or one that meets some destructive combination of conditions. Here, too, a Nickel-containing metal could be the answer.

But, whatever your field of study, in the future you can count on Inco for all the help you need in metal selection. Right now, if you'd like to get better acquainted with Nickel Stainless Steel, why not write Inco for "Stainless Steel in Product Design." Write: Educational Services, The International Nickel Company, Inc., New York 5, N. Y.

INCO TRADE MARK **Inco Nickel** *makes metals perform better, longer*



From the

PRESIDENT'S DESK

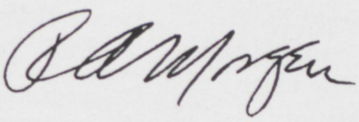
The 1959 Homecoming celebration demonstrated to me two very important things that are often overlooked by undergraduate students. The usual undergraduate student is so busy learning how to be an engineer that he seldom has a chance to reflect on what is the true meaning of engineering. However, once a year when the loyal alumni return for Homecoming he sees a living demonstration of the value of an engineering education.

Engineering is not just a collection of courses which taken in the proper sequence according to a catalog and after the passage of four years entitle the recipient to a piece of paper which says "Bachelor of Science in Engineering." Engineering is something much more important than that.

During the four-year period the prospective engineer is indoctrinated in the engineering way of life. It is like a cake which is composed of an introduction to the scientific way of thinking, larded with an appreciation of the economics involved and topped with an icing of good common sense. In addition to the technical subjects, the engineer must learn how to work with and get along with other people. Thus, his education includes a liberal sprinkling of the humanistic subjects and a strong dose of cummunications, including reading, writing and speaking. A man with an engineering education often branches out into other areas after graduation and usually becomes very successful in whatever he undertakes.

These facts become most evident at Homecoming. The returning alumni will be found to be engaged in many occupations, some of which would not be classified as engineering. Discussions with these people, however, indicate that the education which they received is still considered by them as valuable to the occupation in which they finally engage. The great majority say that they would take engineering again for their broad basic undergraduate training if they had their lives to live over again, regardless of the profession in which they finally engage.

However, even more important than the fact that the education was engineering is *where* that engineering education was received. There is a loyalty to Rose among the alumni which is far in excess of that which is evident at most college or university homecomings. There is friendship maintained among the Rose alumni which is heartwarming to perceive. This is the intangible something called "Rose spirit" which grows on the student during his undergraduate days and stays with him throughout his life. Let us hope that the faculty today can imbue the undergraduates of today with the modern engineering concepts and that the students of today will make the same kinds of friendships and develop the same kind of loyalty so that Homecoming at Rose will continue to be the outstanding event that it is today.



SPUTNIK III

By Jay Hirt, jr., math

Prior to 1957, the American public talked in hushed voices about the "Space Race," and just where the Free World stood in this race as compared to the countries behind the Iron Curtain. Since the end of World War II, the United States and Russia have been battling with words over many political issues. These issues slowly melted into broad fields, one of which was the conquest of space. Each faction claimed superiority in the race.

On October 4, 1957, Russia struck the first blow by launching Sputnik I. Many Americans thought our country was doomed to defeat in the race. Since that date, both America and Russia have launched satellite-carrying missiles with ever-growing success. It is not the purpose of this article to decide who is ahead in the race for the moon. It is the aim of this article, however, to enumerate some of the points which has led to Russia's success in satellites. The main topic of discussion will be Sputnik III, the latest endeavor of the U.S.S.R. All of the information obtained for this article was released by Russia. None of the information used herein is from American sources. It is true that we have monitored the Soviet Satellites and obtained much information from them, but this article is designed to tell the Russian side of the story, the story of the Sputniks.

The Flight of Sputnik III

The third Soviet Sputnik, Sputnik III, was launched by means of a powerful carrier-rocket on May 15, 1958. The satellite was released from the rocket when both reached a speed of 8,000 meters per second. Now traveling in an elliptical orbit around the earth, the third Sputnik is far superior to its two predecessors. Two and a half times heavier than Sputnik II and sixteen times heavier than Sputnik I, it has a hermetic, cone-shaped body 3.57 meters long and a diameter of 1.73 meters. Sputnik III contains a large number of systems for carrying out the most complex scientific experiments, designed principally for the study of phenomena taking place in the upper layers of the atmosphere. Many of its devices are devoted entirely to the study of the influence of cosmic factors on processes occurring in the upper atmosphere.

The radiometric apparatus contained in the satellite ensures an accurate measurement of its movement in orbit. The multichannel radiotelemetrical system of the satellite can transmit to the earth an extremely large amount of information on the scientific measurements carried out in the satellite, and can continually memorize the data of the scientific measurements as the Sputnik moves along through its orbit. When the satellite passes over ground measuring stations, the memorized information is transmitted.

All of the functioning of the scien-

(*Continued on page* 21)

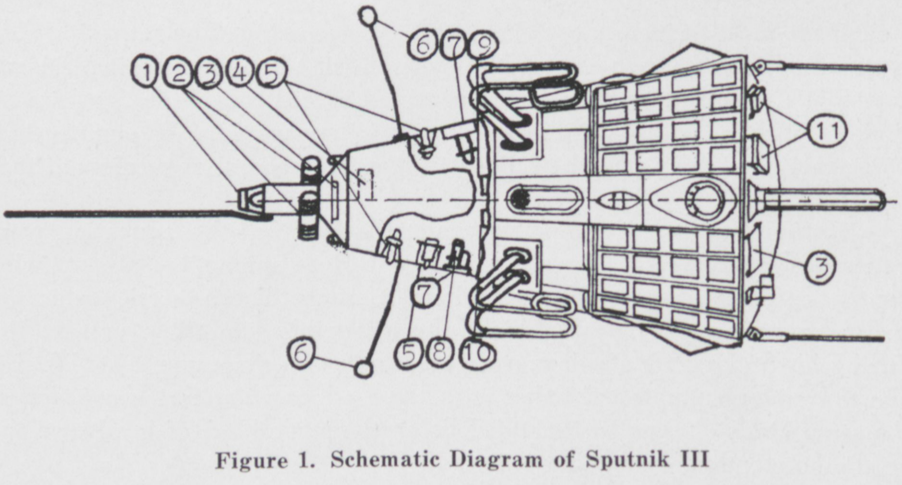


Figure 1. Schematic Diagram of Sputnik III

1—magnetometer
2—multiplier photo tubes
3—solar batteries
4—cosmic ray photon recorder
5—magnetic and ionization manometers
6—ion traps
7—electrostatic fluxmeters
8—mass spectrometric tube
9—cosmic ray heavy nuclei recorder
10—device for measuring intensity of primary cosmic radiation
11—data units for recording micrometeors.

Locker Rumors

By Bob Michael, jr., e.e.

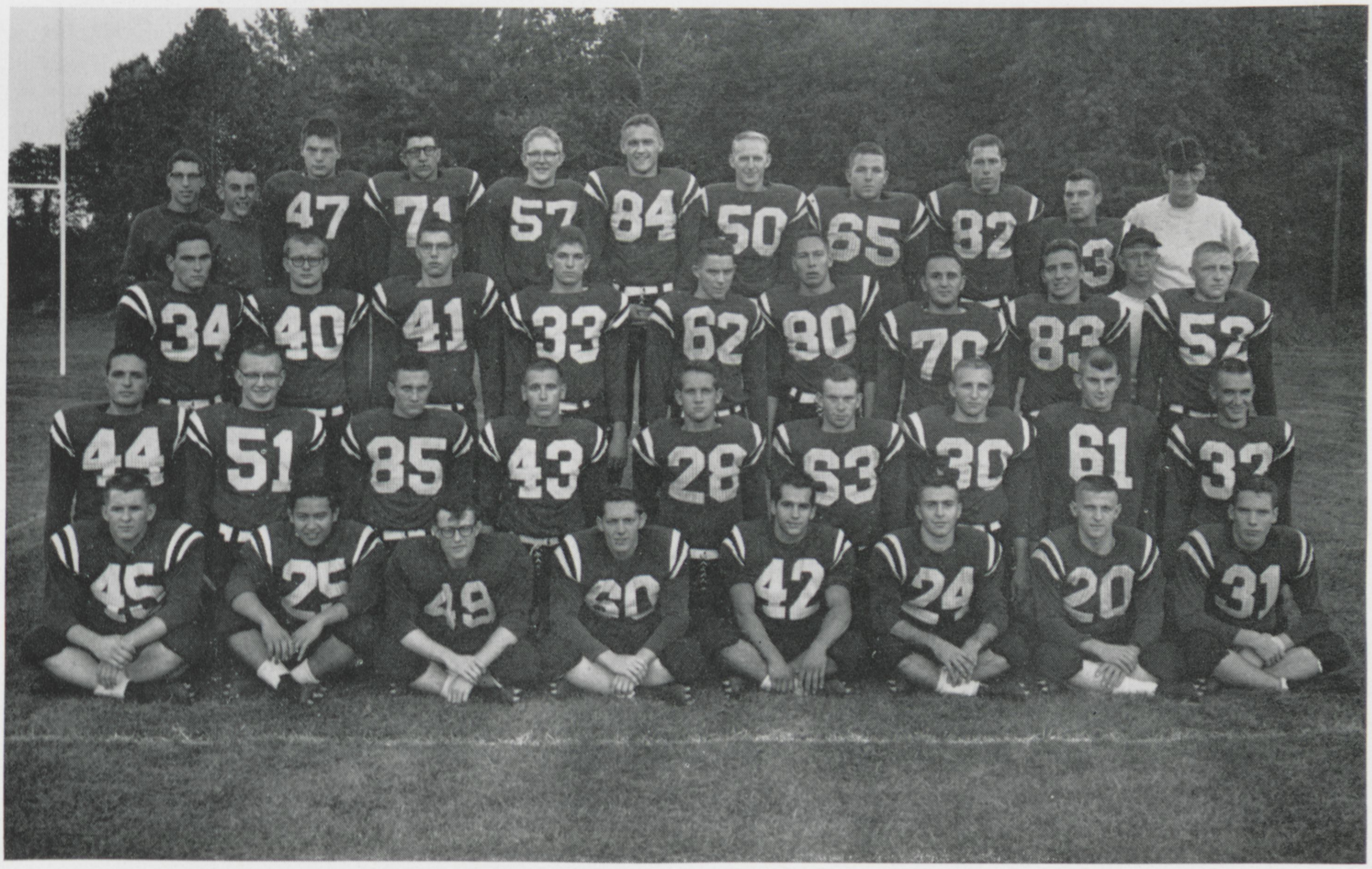
In the last two starts, the engineers have not been too successful. Their lack of success is by no means due to their lack of support. In this respect, the student body has done a wonderful job. At the first two ball games, the attendance was good and the crowd was cooperative. With this kind of support, the fighting engineers will undoubtedly improve.

On October 3 the Vikings of North Park invaded Lost Creek Stadium with a record of (1-1). Rose entered the game looking for their 17th straight victory. The North Park 11 proved to be rugged on defense while the engineers aerial defense seemed to miss the Viking missiles.

The first score came in the second quarter, when the North Park quarterback faded back and hit his right end for 7 yards and 6 points. The point attempt was wide of the goal post. Late in the same quarter, the Viking barrage again produced a score. The same combination again teamed up for another 6 points on a 12 yard pitch. Again the placement was wide. The half ended with the score North Park 12, Rose 0. About mid-way in the 3rd quarter, North Park scored again.

North Park then went for the 2 points by running the extra point and made it. The score then stood North Park 20, Rose 0. In the closing minutes of the 3rd quarter, Bill Yochum picked off a misguided Viking missile and raced (?) 92 yards

(*Continued on page* 36)



1959 Gridiron Engineers

Library

"The great consulting room of a wise man is the library."
G. Dawson

AN ENGINEER'S LIBRARY—SUPPLEMENT

Early in 1958 the Committee on Selection and Guidance of the Engineering College Administrative Council compiled a descriptive bibliography as a "Dean's List" of recommended reading for engineering students. This list was included in the February, 1958 "Library Notes". Recently another Committee, which included the Rose Poly librarian Carson W. Bennett, selected a Supplement to the "Dean's List." Following are the books, included in the Supplement, which are in the Rose Library.

Brown, Harrison. *The Next Hundred Years; a Discussion prepared for Leaders of American Industry.*

Attempts to forecast the future of our scientific-technological-industrial civilization and, in doing so, discusses the interrelationship between man and his resources.

Burlingame, Roger. *Backgrounds of Power; the Human Story of Mass Production.*

Develops the history of the machine and the production line in American industry from its beginnings.

Burlingame, Roger. *Machines That Built America.*

Informal history of the great events in machine production and brief sights of the great figures in this history.

Chalmers, Thomas W. *Historic Researches.*

Outstanding physical and chemical dicoveries, interestingly depicted in historical perspective.

Chapman, Seville. *How to Study Physics.*

Do you really know how to study effectively? This book may surprise you with its wealth of practical ideas on making notes, solving problems, performing experiments, taking examinations, etc.

Clarke, Arthur C. *Interplanetary Flight.*

A survey of the possibilities and problems of interplanetary flight by the Assistant Secretary of the British Interplanetary Society.

Compton, Arthur H. *Atomic Quest.*

How theoretical small-particle physics merged with practical large-scale engineering to produce the A-bomb.

DeForest, Lee. *Father of Radio: the Autobiography of Lee de Forest.*

De Forest's own story of the development of the three-electrode vacuum tube, feedback circuits, amplifiers, and other common circuits of modern radio.

Duke, Neville. *'Sound Barrier' the Story of High-Speed Flight.*

Presents the obstacles to supersonic flight already faced and overcome in the last decade, and the problems that lie ahead.

Einstein, Albert. *The Evolution of Physics.*

Reveals how scientific and philosophical theories may rise and fall in the "eternal struggle of the inventive human mind for a fuller understanding of the laws governing physical phenomena."

Giedion, Sigfried. *Mechanization Takes Command.*

The evolution of mechanization in the last century and a half, its effects on modern civilization, and its historical and philosophical implications.

Hart, Val. *The Story of American Roads.*

An account of the high spots about roads and road building in North America, from the first white man's use of Indian trails to the newest superhighway.

Heathcotte, Niels H. de V. *Nobel Prize Winners in Physics,* 1901-1950.

Here we may meet the Nobel laureates and listen as they acquaint presentation-ceremony audiences with their work. Brief biographies are followed by descriptive summaries, extracts from Nobel lectures, and evaluative comments.

Hildebrand, Joel Henry. *Science in the Making.*

A highly-interesting group of essays on what science is and how it develops.

Notes

By Anita Walden & Carson Bennett

Hill, Forest G. *Roads, Rails and Waterways; the Army Engineers and Early Transportation.*

History of the part played by Army engineers in the opening of the West, from 1812 to the Civil War.

Hunsaker, Jerome C. *Aeronautics at the Mid-Century.*

Taken from the author's Terry Lectures at Yale University, this consideration of the impact of the airplane upon civilization is divided into three parts: aircraft development through research; the present state of the art of aeronautics; and the effects of civil and military aeronautics on society.

Kirby. Richard Shelton. *Engineering in History.*

Traces the development of engineering in Western civilization from its origins into the twentieth century and relates this development to other human activities.

Norrie, Charles M. *Bridging the Years; a Short History of British Civil Engineering.*

A brief account of the British Civil Engineering profession from its beginning through World War II, written "mainly for young civil engineers who want to know something about the historical background of the occupation they have decided to follow."

O'Neill, John J. *Prodigal Genius; The Life of Nikola Tesla.*

A popular, but full, narrative of Tesla's work.

Parke, Nathan G. *Guide to the Literature of Mathematics and Physics.*

This guide presents helpful suggestions on using technical library materials effeciently, as well as advice on reading and study habits.

Pollack, Philip. *Your Career in Physics.*

What it takes to become a physicist, and the nature of his work. For those who qualify, opportunities abound in many areas, such as atomic energy, electronics, meteorology, etc.

Singer, Charles. *A History of Technology.*

A monumental five-volume work tracing the development of the technologies from pre-historic times to the beginning of the twentieth century.

Smith, Alpheus W. *Careers in Physics.*

Parallels Pollack on choosing a physics career from many types.

Struick, Dirk J. *Yankee Science in the Making*

A history of growth of the natural, physical, and engineering sciences in New England, from the time of the Pilgrim Fathers to the beginning of the Civil War.

Taylor, Frank Sherwood. *A History of Industrial Chemistry.*

A well-written short history of industrial chemistry from the earliest times to the present. Has numerous photographs.

Veblen, Thorstein. *Engineers and the Price System.*

A thoughtful and controversial interpretation of the engineer's role in society, by an eminent American economist.

Whitford, Robert H. *Physics Literature.*

Describes the many types and forms available, selects a representative working collection, and outlines efficient library methods.

Wilson, Mitchell. *American Science and Invention.*

A pictorial history of American science and invention from the time of the early settlers to electronics and chain reactions.

Wilson, Neill C. *The Earth Changers.*

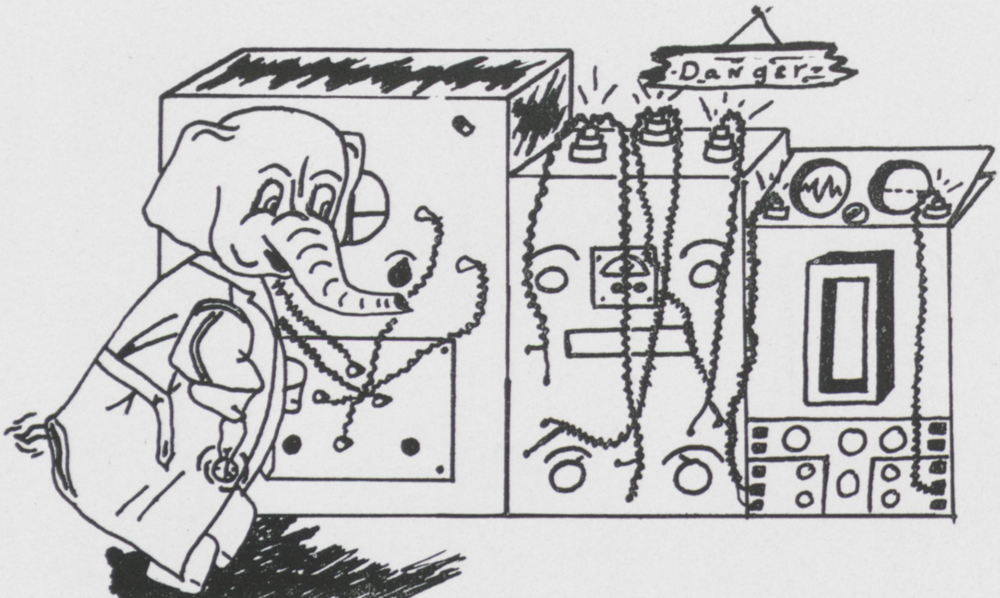
Story of the Hoover Dam, which opened a new era of heavy construction on all continents.

Wright, Wilbur. *The Papers of Wilbur and Orville Wright.*

These two volumes include all papers relevant to the evolution of the airplane and the principles of flight discovered by the Wrights.

Yost, Edna. *Frank and Lillian Gilbreth, Partners for Life.*

An interesting account of the successful careers of a husband-and-wife team who made important contributions in the fields of motion study, micromotion, and fatigue study.



Research

SCIENCE "SEES" WITH BUBBLES

Professor Donald A. Glaser from the University of Michigan has developed a new and accurate method to observe the behavior of subatomic particles. In 1951, he had decided that the best process would be somewhere between the Wilson Cloud chamber and the manner in which the tiny bubbles rise to the top of a stein of beer. Seven years later the Glaser "bubble chamber" made its scientific debut at Berkley, California as the target for high energy particles speeding from the University of California's bevatron. The result was a collection of 160,000 photographs showing how the particles behaved inside the chamber.

As the charged particle leaves the bevatron, it enters the liquid filled chamber and streaks through it at the speed of light, leaving a stream, or track of bubbles in it's wake. This liquid is held under precise conditions of temperature and pressure so that it remains superheated. Consequently, boiling will occur if a foreign particle enters the liquid. Instead of supersaturated air condensing around the particle as in the Wilson cloud chamber, the particle creates a small boiling process directly in its wake. These small bubbles then rise to the surface.

Physicists show 32 fundamental particles of matter and energy exist in the atom, as "neutrino", "K-plus meson", "anti sigma particles", to name but a few. With the bubble chamber as a new tool of exploration, he is able to photograph the behavior of several particles and examine them at his own leisure. In his examination, he looks for the total length of the track made by the bubbles. This tells him how many millionths of a second old the particle is before it dies. The number of bubbles per unit length of track is a key to its velocity. When the bubbles are close together it means high velocity; more loosely spaced bubbles indicates a lower velocity. The angle that a track makes when it suddenly changes directions, and the numbers and angles made when a track bursts into a multipronged track are all clues leading to a knowledge of the particles performing these maneuvers.

In Doctor Glaser's first experiments, particularly with diethyl ether, he discovered the particles would upset the equilibrium of a superheated liquid and cause it to boil. With this principle established, he began the slow process of finding the best liquid and the best temperature and pressure to give him the required results. However, the bubbles formed and dissipated so rapidly, the naked eye only observed a general foam rising to the surface. High speed movies could be used to solve this problem if the flash and camera could be timed to the instant the bubbles were being formed. In the end a common phonograph was used to pick up the boiling sound which was amplified and used to trigger camera and flash. The latest and best liquid to be used in the chamber is xenon, a colorless, odorless gas. When kept at 370 pounds per square inch, pressure and at -20 degrees Centigrade as in the experiment xenon becomes a liquid. Today there are about one hundred bubble chambers, ranging in size from a small glass tube to the two story apparatus at the University of California.

CONCRETE "HOT CELL"

"Get as conveniently close to the material as possible—but safely and economically." Stated simply, this is the principle problem facing men who work with radioactive substances. With those objectives in mind—proximity, safety, economy—architects and engineers set out to design the Picker X-Ray Company's first radio isotope handling facility, also the first installation of its kind to be built utilizing normal concrete.

Located at 1020 London Road, Cleveland, Ohio, the $500,000, 2-story building has been built principally to study the application and future use of x-rays and isotopes for medical and industrial applications.

The very heart of the Research Center is a high level radioisotope test cell designed and equipped to encapsulate one million curies of cobalt, the largest radioactive sources used for medical and indus-

and Development

By Jon Stiles, jr. m.e.

trial radiation and radiography processing.

A hot cell is a working or storage area so designed that its shielding walls and roof will reduce the radiation intensity of its contents so that that radiation count outside the cell is well within the maximum permissible dosage for its operating personnel.

The required properties sought in shielding walls and roof of a hot cell are: (1) sufficient weight to absorb gamma radiation; (2) stability under radiation; (3) structural strength; (4) ease of placement or fabrication of shielding materials; and (5) low cost in place.

The effectiveness of any biological shielding materal is relative only to its mass. The greater the density of a given material, the less thickness of it needed to make the required shield. Indeed, many materials can be used to shield radioactive material. Water, when present in sufficient quantity (weight) becomes the near perfect material for biological shields. Thin biological shields are composed of high density materials. Of the dense, heavy materials available for shielding, lead tops the list. Weighing 706 pounds per cubic foot, it does the best shielding job where thinness is a major concern .

In new structures, like Picker's hot cell, where the thickness of the shield is of less importance than if it were being built in a crowded, existing structure, concrete, which has low cost per pound, is a very economical material for shielding. The cost of concrete is about ⅓ cent per pound—while lead can cost up to 50 cents per pound in place. The cost of normal concrete in place will vary somewhat with individual jobs but is approximately one cent per pound.

Picker's hot cell is a six foot square on the inside, surrounded by 5½ foot thick concrete walls and four foot thick concrete floor and ceiling, thickness sufficient to contain the largest radiation sources available with complete safety. A total of 271 cubic yards of reinforced concrete surrounds the cell. This amounted to 1,140,000 pounds of concrete for shielding at a cost of $12,100 in place.

The decision to use normal concrete rather than lead came as a result of exhaustive evaluation which showed that the cost of lead would have been approximately 50 times greater than concrete. Almost the same weight of lead would have been required to obtain the same shielding effectiveness, and the cost of material alone would have exceeded $250,000. Also, as lead is not a structural material, the lead shielding would have had to be supported.

Poured Concrete Selected

Poured concrete was selected over concrete block on the basis of density (poured concrete runs better than 10% more dense than block); uniformity (mortar joints require that successive courses be stepped to offset joints); and flexibility (either 4-inch or 8-inch block are used or premium prices are paid for special sizes); and economy (solid block construction is 1.2 times more expensive than poured concrete.)

Once concrete had been selected as the shielding material for Picker's new hot cell, an economical and effective concrete mix design had to be created. A wide variety of concrete mixes utilizing many types of aggregates were evaluated.

Normal concrete using locally available aggregates and sand, can cost as little as $15 per cubic yard for material and cost one-eighth as much, in place, as the materials alone for other more specialized mixes. In designing the structure, engineers resolved economic questions on a "most per dollar" rather than "least expensive" basis, since commercial operations must consider value received as well as total expense.

After two efforts to achieve the perfect shield, another mix was prepared and site tested, this one containing 16 cc of Master Builders air detraining agent per sack of cement. The re-adjusted mix produced a slump of an easily placeable 4½ inches, met the density specs with less than 1% air.

The completely automatic 4-year-

(*Continued on page* 46)

MAGNETIC

Magnetic Amplifiers are steadily increasing their importance in maintaining controls. The theory of magnetic amplification has been known for many years and as early as World War II magnetic amplifiers were perfected by German scientists for use in controlling gun turrets on their battleships. Upon raising some of these sunken battleships, it was found that the turret magnetic amplifiers, even after ten years of under sea water conditions, were still in perfect working order. The durability and ruggedness of a "mag amp" therefore make it a desirable means of control.

Jet engine companies such as General Electric are presently using the magnetic amplifier as a means of controlling the turbine discharge temperature of the engine. This is done by comparing an incoming thermocouple voltage which is proportional to the turbine discharge temperature with an amplifier-generated reference voltage and amplifying the difference to provide a difference in the amplifiers two output currents. The two currents are applied to a torque motor which operates the hydromechanical system which varies the nozzle area which in turn controls the exhaust temperature. The thermocouples located near the jet exhaust provide the signal for changes in temperature over or under that desired. An opening of the nozzle would result in a loss of thrust if not corrected, but with a small enlargement of nozzle area, a decrease in nozzle temperature would result. The amplifier is warned of this change in temperature by a small increase in current, amplifies the small current difference and sends the amplified currents to the torque motor. A higher output current in output branch A will move the torque motor in one direction while a higher output current in branch B will move it in the opposite direction. When both output currents are equal, there is no temperature change, no incoming thermocouple signal change, no difference in currents being amplified, and therefore no movement of the torque motor controlling the nozzle area.

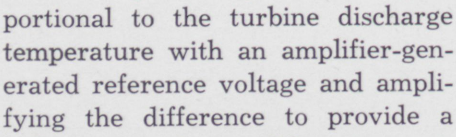


FIGURE 1. SATURABLE INDUCTOR

The magnetic amplifier uses as its basis a saturable reactor with a diode in the amplified current line. A small magnetizing current in Fig 1 goes through the reactor core until the core become saturated. When the core becomes saturated, it breaks down, giving very low impedance and a surge of high current. On the negative cycle the diode in branch 2 will not permit the surge current through, thus acting as a half wave rectifier.

Figure 2 will be referred to in the following explanation of a typical magnetic amplifier circuit.

Consider first the conditions when no input signal is present at XY. The four reactor windings on four separate cores X3, X4, X5, and X6 represents high impedances to the applied voltage across AB. Each reactor contains an equal number of turns and the pairs X3, X4, and X5, X6 represent full wave rectifier combinations. "S" and "E" indicate start and end of windings.

To understand the circuit operation, observe reactor pair X3, X4. With circled polarities at A and B, current will tend to flow through R1 X3, and back to B. The ratio of one half R1 to R3 allows most current through X4 toward C4 to flow through C4 and R3.

The amount of current which will flow in a winding at any particular time during an impressed alternating voltage cycle is determined by the magnetic condition of the core of a reactor. Conversely, the magnetic condition of a reactor core is determined by the amount of current which flows in its windings.

The amount of current which will flow through X4 at the beginning of the positive portion of the applied voltage cycle is very small. At this time the magnetic condition of the core X4 is normally unsaturated and the main winding (gate winding) gives a high impedance to current flow. That current which does flow increases core magnetization. The reactors used in the amplifier are designed so that saturation will occur at a magnetizing current magnitude reached during a normal cycle of applied voltage. The point in the

AMPLIFIERS

By Hal Booher, sr., e.e.

applied voltage cycle at which saturation occurs corresponds to a definite time in the magnetizing current cycle. The amount of energy necessary to saturate a core is the integral of a magnetizing current vs time plot from zero time to saturation point time.

At the time saturation occurs in a core, its magnetic condition is such that it no longer can present a high impedance in its main or gate winding. A high current is thus allowed to pass. This point occurs quite suddenly in this amplifier and the main winding is termed the "gate" winding because it behaves as if a gate were suddenly opened to current flow. The point or angle in the applied voltage cycle at which saturation occurs is termed the "firing" point or angle and the reactor is said to "fire". After the firing point the current wave form of the reactor will be similar to and in phase with the voltage impressed.

Going to reactor X3, it can be seen that any current flow through X4 will proportionally cause current flow through X3. Since the windings of X3 and X4 both are placed in the same direction with respect to their cores, a current which will increase magnetization in the core of X4 will at the same time produce a proportional current in X3 which will decrease magnetization. With the point at which saturation occurs in X4 (and the accompanying rapid rise in passed current) being defined as its "firing point", a current flows in the winding of X3 which changes its magnetization corresponding to the top part of the curve in Fig. 3. The waveform of this demagnetizing current in X3 corresponds to the waveform of the passed current in X4 and its peak magnitude "sets" the magnetization of core X3 at the point 1 of Fig. 3. This demagnetizing current in X3 is designated as

(*Continued on page* 32)

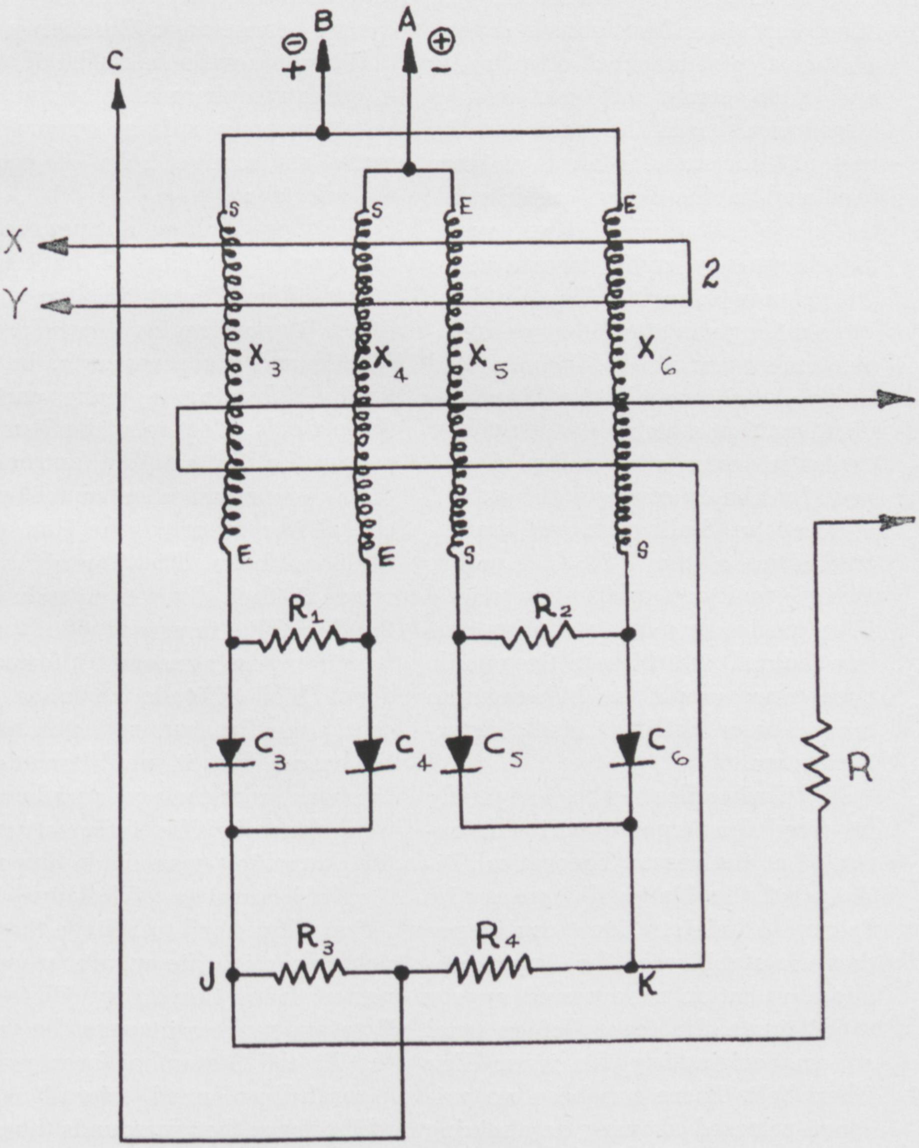


FIGURE 2. MAGNETIC AMPLIFIER

PROJECT ARGUS

By Fred Wernicke, sr., e.e.

Project Argus is being called the greatest scientific experiment ever conducted. It started in the early morning of August 27, 1958, over the South Atlantic, when an atomic bomb was exploded at a latitide of 45 degrees south and between 0 and 30 degrees west longitude with an altitude of over 300 miles. Again on August 30th and September 6, 1958, this performance was repeated as modified three stage Lockheed X-17 vehicles blasted off from the U.S. Navy experimental missle ship, the U.S.S. Norten Sound, carrying low yield atomic bombs.

The effects of these three high altitude explosions were monitored by aircrafts, around stations, the Explorer IV satellite (equipped with shielded intensity), and 21 ARGO E-5 solid rockets fired from Atlantic Ocean sites.

The data released so far indicates that these atomic blasts caused high-energy electrons to flash along magnetic lines of force out from the earth to distances of over 4,000 miles. Also these explosions produced an electron shell between the inner and outer Van Allen belts. This 100 mile thick electron belt had measured intensities 2 to 10 times that measured by Pioneer III.

Project Argus was designed to:

1.) Produce information needed for defense purposes.

2.) Give more information on the radiation that surrounds the earth.

Relevant military aspects of the Project Argus tests were described by Roy W. Johnsen, director of the Defense Department's Advanced Research Projects Agency, in testimony before a Senate Subcommittee on Governmental Organization for Space Activities. Mr. Johnsen revealed that a total blackout of all radar and radio communications over a large area could be achieved by high-altitude nucular blasts as were produced in the Argus experiment. Such a blackout would destroy all high-frequency radio transmissions which now form the basis of our present long-range-military communication systems. Mr. Johnsen sited as a possible example of such an application, that a high altitude nuclear explosion over the Indian Ocean would probably cause total blackout of Moscow, Stalingrad, and Leningrad areas of the U.S.S.R. Another possible military application would be in producing a thin radiation curtain behind which ballistic missile nose cones would be hidden from ground-based ballistic missile detection radar.

N. Christofilos, who originally proposed the Argus experiment, reported at the recent Theoretical Division of the National Aeronautics Space Administration conference that the stability of the Argus produced radiation zone would appear to eliminate the theory of external streams originating the inner Van Allen belt. There has been no evidence released showing any mixing or flow of particles from a radiation belt. The Argus electron belt was about 100 miles deep and it maintained this depth (within 10 or 20 miles) for several weeks.

The Argus test results have helped advance the theory that the inner radiation belt was formed by high-energy cosmic rays. Cosmicray particles collide with the nuclei of atoms in our atmosphere and the neutrons resulting may splash upward and cause radioactive belts of protons and electrons.

Many people have not yet realized the greatest significance that Project Argus offers. That is that the United States is not lagging far behind in missile and space research, but actually is leading in many parts of these fields. Certainly the Russians put up the first satellite, but none of their three massive instrument-packed spheres reported the Van Allen radiation belts. The Sputnik orbits were at their lowest altitude over the U.S.S.R., therefore the Russian scientists never received information about high altitude radiation. Recently the Russians reported hitting the moon, but it would seem that this was more for propaganda value than for scientific information; as the launching was made during a time of poorest possible launch conditions. It is hard to believe that any valuable scientific results were expected from this firing. While the Russians seek to impress the world, the United States has been making a carefully planned, scientific study of the space that surrounds the earth with precision-built, delicate missiles designed for our own needs.

SPUTNIK III

(*Continued from page* 12)

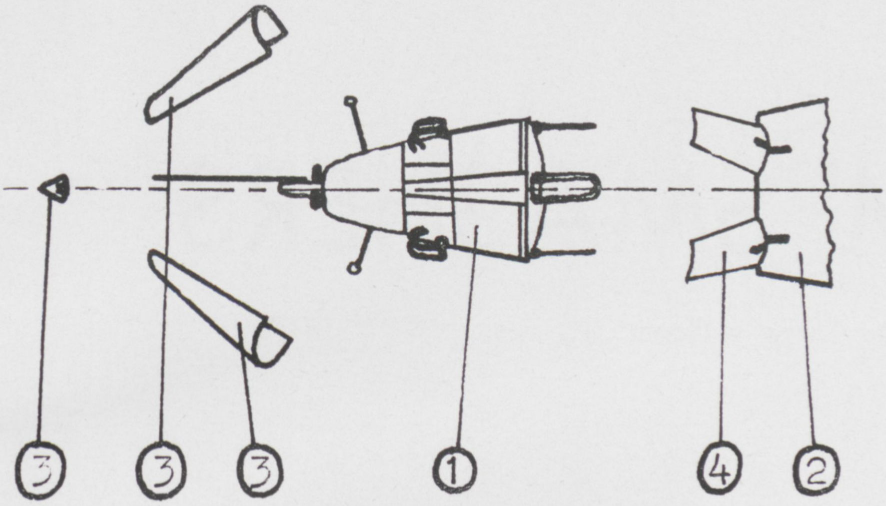


Diagram of Separation of Satellite from Carrier Rocket.

1—Satellite
2—Carrier Rocket
3—Detaching Protective Cone
4—Shields Detachable from Satellite

tific apparatus is guaranteed by a timer composed entirely of semiconductors. The power for the apparatus is supplied by electrochemical sources and semiconductor silicic batteries transform the solar rays into electric power. The Soviet scientists are now able to study the performance of the silicic batteries in detail under conditions of cosmic flight. The tension created by each separate silicon element in the battery equals about 0.5 volts, and the coefficient of transformation of solar energy reaches 9-11 per cent.

The great weight of the third Sputnik testifies for the rocket carrier which launched it into orbit. The Russian scientists believe that only satellites of great weight can promote the solution of space flight, and that small satellites have very limited possibilities for scientific research.

The continued increase in weight of Soviet satellites shows the possibilities of their rocket engineering. They now possess the power in a rocket to put a man into space. All they lack is the knowledge, which is being obtained from the satellites, concerning just exactly what will happen to this man when he is put into space, and just what he has to cope with.

Scientific Station in Outer Space

Sputnik III is an automatic scientific space station in the full sense of the word. All of the fallacies in Sputnik I and II have been liquidated in the latest satellite. Specific care was taken to insure that the sensitive instruments were placed in such localities in the body as to insure no interference between them.

The scientific apparatus will facilitate the extensive study of geophysical and physical problems that might be encountered by a human under the same conditions. The structure of the ionosphere will be investigated by observing the propagation of radio waves emitted from the satellite by a high-capacity radio transmitter. Other apparatus will enable the satellite to measure the density and pressure of the upper layers of the atmosphere, and gauge its own electrical charge and the electrostatical field in the layers of the atmosphere through which it passes. To study the magnetic field of the Earth at extremely high altitudes the Sputnik has a self-orientating magnetometer to measure the full intensity of the magnetic field.

A highly important experiment that will enable scientists to obtain data on short-wave electromagnetic radiation in outer space is being conducted in the satellite by registering the photons contained in the cosmic radiation. This is the first experiment which may possibly open up a new stage of astronomy—a study of phenomena in the universe through the short-wave radiation of stars.

Sputnik's Orbit and Observation On Its Movement

The third Sputnik will pass over all points of the globe between the Arctic and Antarctic Circles. The parameters of the orbit have been chosen in such a way as to allow the study of information gained at the most interesting range of altitudes. The orbit is elliptical in shape with an apogee of 1,880 kilometers. Just after its launching, the satellite circled the earth 14 times in 24 hours. Later in the flight, both the apogee of the orbit and the circling period will gradually diminish due to the deceleration of the Sputnik in the upper layers of the atmosphere.

The Sputnik is detected by radiotechnical and optical methods. The radar-obtained data on the coordinates of the satellite are automatically reduced to the one given astronomical time. Then through special lines of communication this data is transmitted to a common coordinating computing center and fed through computers which evaluate the information and calculate the orbits basic parameters.

Design of the Third Soviet Sputnik

The third Sputnik has an airtight conic body and is constructed of aluminum alloys. The highly polished surface of the body is specially processed to absorb radiation and solar rays. Prior to launching, the satellite is filled with gaseous nitrogen.

Inside the body on the rear instrument frame is located the radiotele-

(*Continued on page* 26)

ATOM SMASHERS

By Terry Hallcom, sr., m.e.

Can time run backwards?

How was our solar system formed?

Could an explosion in space destroy the universe?

These are some of the questions that the new giant nuclear particle accelerators, or atom smashers might help solve.

These giant atom smashers are actually machines that could be compared to a cannon—where electrical force or radio microwaves are used as power and particles of the atomic nucleus as their shells. These particles or shells are used to split atoms so scientists may study how nuclear particles move, interact and decay into other particles.

The new smashers now being built or planned will create upwards of 30 billion electron volts (BEV) of energy—forces which up till now have been found only in the cosmic events of outer space.

Why build them so large? Scientists need the ultra-powerful accelerator because with them they'll be able to explore ever-tinier dimensions of the atom. The higher the energy, the shorter the wavelength of the accelerated particle—and the finer its ability to probe the structure of matter.

The physicists hope their new machines will help them find answers to such questions as:

....What is the mysterious glue that holds atoms together?

....How was our solar system formed?

....Could a collision of matter and anti-matter in outer space destroy our universe?

....Can time run backwards in anti-matter regions in deep space?

These new machines that will help find the answer to those questions will be machines like the 30 BEV Alternating Gradient Synchrotron located at Brookhaven National Laboratories, Long Island, N.Y. which will be ready for use sometime next year.

Essentially, the Synchrotron will operate in much the same manner as conventional artillery (see fig. 1). Its shells will be protons—positively charged particles of the atomic nucleus—which will enter into the cannon's breech from a linear accelerator designed to boost the initial firing power to 50 million electron volts (MEV).

Originating as hydrogen gas, the protons will be squirted in bunches into a six-inch wide stainless steel vacuum tube 700 feet in diameter and 10 feet under ground.

Once inside the tube, the protons will be accelerated and focused into a narrow beam by 240 supermagnets placed around the tube in an 18-foot square concrete tunnel. The magnets will be energized by from 2700kw to a peak of 30,000kw of electricity surging through their coils at five second intervals.

The magnets will whirl the protons around the half mile long track, building up their speed to about 99.9999% that of light. They'll make the circular trip some 260,000 times—or a distance equal to more than half that from here to the moon—before they strike billions of target atoms inserted into the ring.

In the above-ground target building, special sections of the ring will serve a dual purpose as ring section and bubble chamber—maintained at a high vacuum by special diffusion pumps. When scientists want to insert the target atoms in the path of the speeding protons, they'll release—by remote control—enough liquid hydrogen to flood the chamber. When the protons rip through the hydrogen, they'll leave a visible and photographable trail, revealing how atomic particles from split nuclei behave.

(*Continued on page 35*)

FIG 1

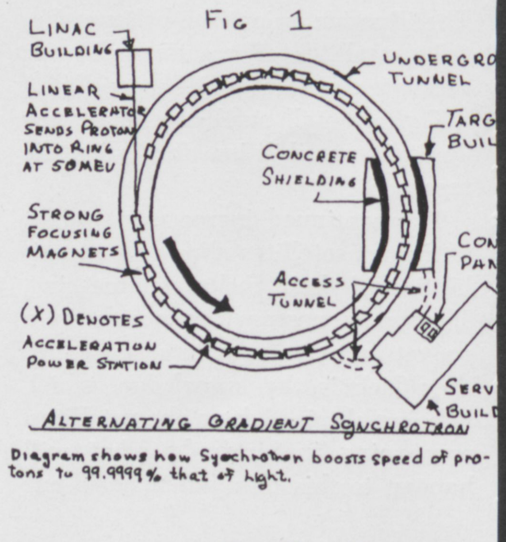
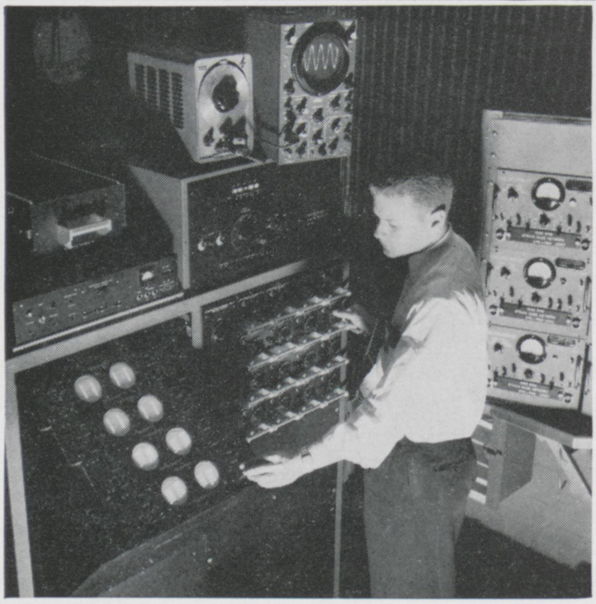
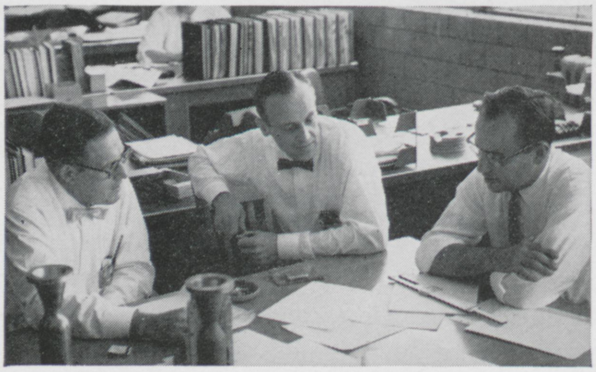


Diagram shows how Synchrotron boosts speed of protons to 99.9999% that of light.

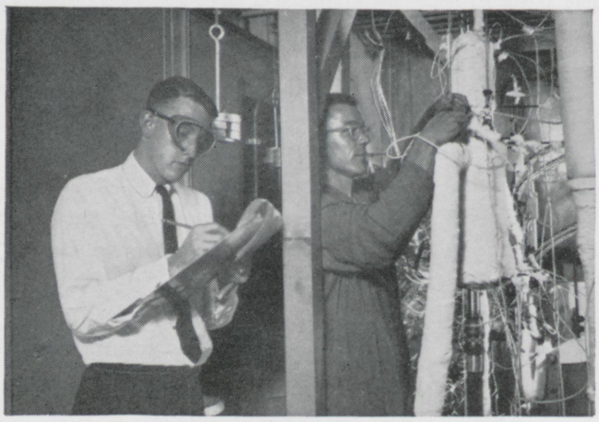
engineers



Automatic systems developed by instrumentation engineers allow rapid simultaneous recording of data from many information points.



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



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

and what they

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

Engineers at Pratt & Whitney Aircraft today are concer with the development of all forms of flight propuls systems—air breathing, rocket, nuclear and other advan types for propulsion in space. Many of these systems are entirely new in concept that their design and developm and allied research programs, require technical person not previously associated with the development of airc engines. Where the company was once primarily interes in graduates with degrees in mechanical and aeronaut engineering, it now also requires men with degrees electrical, chemical, and nuclear engineering, and in phys chemistry, and metallurgy.

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

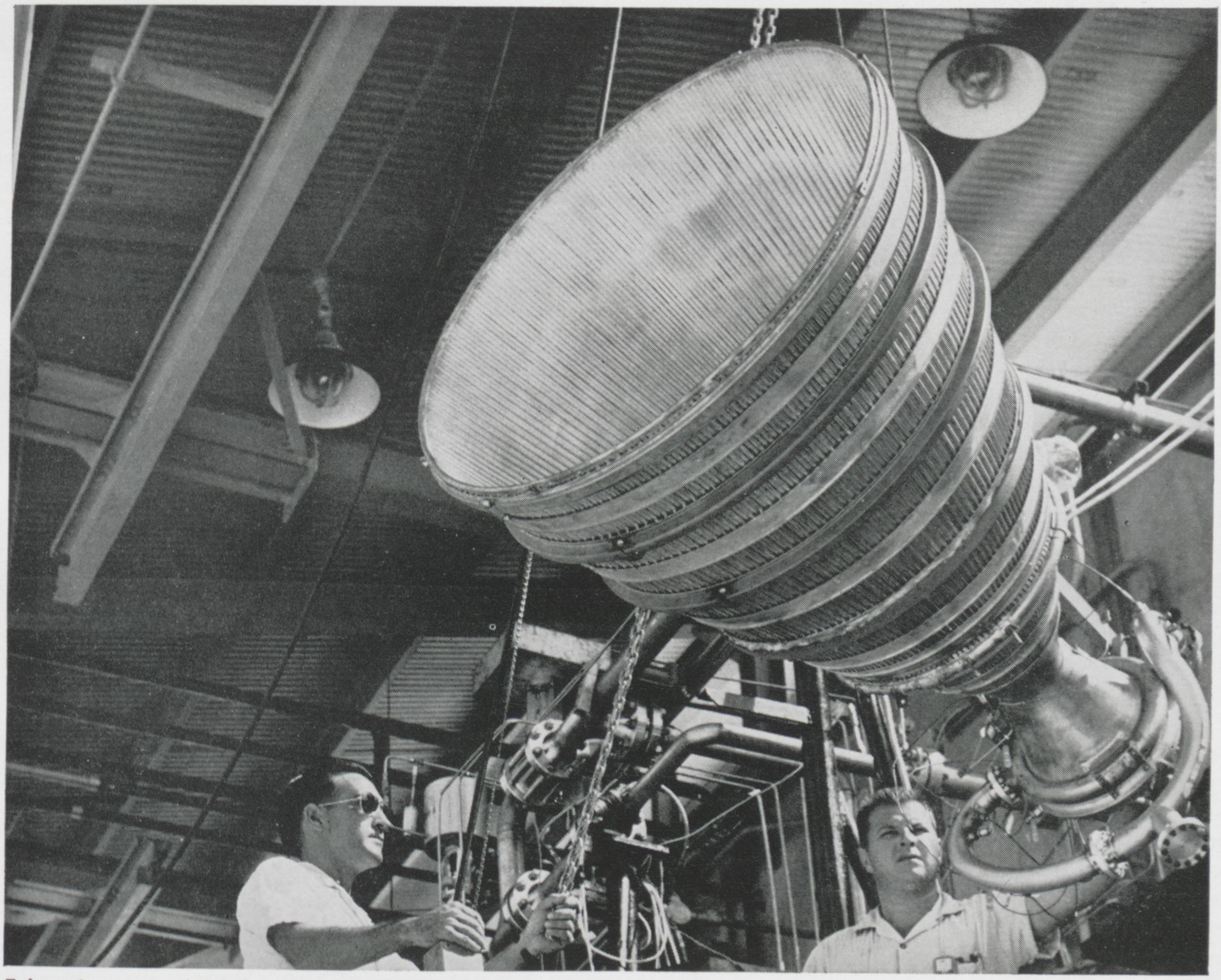
ANALYTICAL ENGINEERING Men engaged in activity are concerned with fundamental investigations the fields of science or engineering related to the concept of new products. They carry out detailed analyses of vanced flight and space systems and interpret results terms of practical design applications. They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

DESIGN ENGINEERING The prime requisite here is active interest in the application of aerodynamics, therr dynamics, stress analysis, and principles of machine des to the creation of new flight propulsion systems. Men gaged in this activity at P&WA establish the specific p formance and structural requirements of the new prod and design it as a complete working mechanism.

EXPERIMENTAL ENGINEERING Here men superv and coordinate fabrication, assembly and laboratory test of experimental apparatus, system components, and dev opment engines. They devise test rigs and laboratory setu specify instrumentation and direct execution of the act test programs. Responsibility in this phase of the devel ment program also includes analysis of test data, report of results and recommendations for future effort.

MATERIALS ENGINEERING Men active in this f at P&WA investigate metals, alloys and other mater under various environmental conditions to determine th usefulness as applied to advanced flight propulsion syste They devise material testing methods and design spe test equipment. They are also responsible for the determi tion of new fabrication techniques and causes of failures manufacturing difficulties.

at Pratt & Whitney Aircraft...



Exhaustive testing of full-scale rocket engine thrust chambers is carried on at the Florida Research and Development Center.

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

PRATT & WHITNEY AIRCRAFT

Division of United Aircraft Corporation

CONNECTICUT OPERATIONS — East Hartford

FLORIDA RESEARCH AND DEVELOPMENT CENTER — Palm Beach County, Florida

SPUTNIK III

(*Continued from page* 21)

metering equipment, the radio apparatus for measuring the satellite coordinates, the program-timing device, the instruments of the system of thermocontrol, the instruments for temperature measurements, and the devices which switch the instruments and chemical feed sources on and off. This rear instrument frame is constructed of magnesium alloy.

The major part of the scientific investigation instruments are located on the forward instrument frame. These instruments serve for measurement of pressure, ion composition of the atmosphere, concentrations of positive ions, the magnitude of electrical charge, the intensity of the electrostatic field, intensity of magnetic field, intensity of corpuscular radiation of the Sun, and the radio transmitter. For the most part, the location of these various instrumentations can be found in Figure I. Only the more important instruments are shown since the entire body is full of instruments and showing them is impossible in a two-dimensional drawing.

The front of the satellite is closed by a special protective cone which is jettisoned after the vehicle is launched into orbit. The jettisoning of the nose cone and the final stage in the launching are shown in Figure 2. The protective cone safeguards the satellite's front part from thermal and aerodynamic effects during the early stages of the launching. Apart from the protective nose cone, a large portion of the satellite's outer surface is covered with four special shields during the launching. These are also shown in Figure 2. When the final stage is completed, these shields remain on the rocket carrier.

The satellite's multichannel radio-telemetric system can transmit to Earth an exceptionally large volume of information. This system contains a number of devices which make a continuous memory record of the recorded information that is transmitted to Earth. This information is stored in the system until the satellite passes over one of the terrestrial measuring stations, at which point it is transmitted from the satellite at a tremendously high rate of speed.

The temperature measurement system on the satellite makes continuous recordings of the temperature at different points on the surface of the conic body and inside the shell. The entire movement of the satellite and all of its instrumentations is controlled by an electronic program-timing device, which periodically switches all of the instruments on and off.

Apart from the chemical sources of electrical current in the satellite, a set of solar batteries is installed in the fuselage. These batteries convert the energy of the Sun's radiation directly into electrical energy. The solar batteries consist of a series of elements, which are thin plates of pure monocrystallic silicon with a preset electron conductivity. Each cell in the battery creates about 0.5 volts, with a solar conversion factor of approximately 11 per cent.

Model Comparison

Figure 3 shows a scale drawing of the comparison between the Sputniks and the Explorers. It is evident that, as far as size is concerned, the Russians have put up a tremendous amount of tonnage as compared to the United States. As far as an energy-after-going-into-orbit comparison is concerned, we are led to these calculations. In order to put an artificial satellite into orbit, two conditions have to be met:

1) It is necessary to raise the satellite to a pre-set altitude.
2) It is then necessary to communicate to the satellite the velocity required for circling around the Earth.

Consequently, the mechanical energy which the satellite possesses in flight is equal to the sum of the work expended on its lift into space and the energy of its travel. For a more accurate calculation, the force of gravity must be considered since it declines as the elevation of the satellite increases.

Omitting the calculations themselves, we may make a comparison between the existing Soviet satellites and those of the United States. If we set the total energy of Sputnik I equal to 100 units, then the energy of Sputnik II is 633 units, and that of Sputnik III is 1,671 units. In comparison, using the same basis of measurement, namely 100 units for Sputnik I, Explorer I and III each had a total mechanical energy of 18.2 units, while Vanguard II had a mere 2.1 units of mechanical energy for a total.

After this last paragraph, we must realize that, although the United States is by no means the complete underdog in the Space Race, we have been challenged at the point where it hurts the most—our pride. We seem to have the feeling that Russia's first attempt at the launching of an Earth satellite was a success, and that ours was a failure. The thing that many of us forget is that, although some of their scientific data is released, we can never be sure as to how many times they attempted the launching before they were finally successful. The main worry the American public has now is just how the Soviet Union is going to use all of the knowledge they have gained from the orbiting vehicles over our heads. Will it be for peace or war?

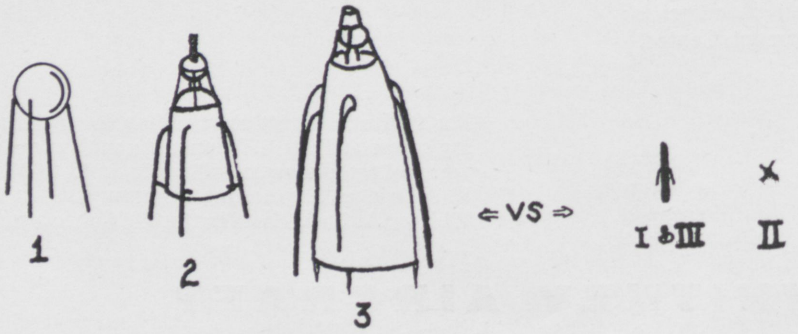


FIGURE 3

Sputnik's vs. Explorer I & III & II

Fraternity

Theta Xi

Now that Homecoming is over and the after effects have been drowned in black coffee, things are back to normal in the TX house. Congratulations to Alpha Tau Omega for their winning display. Ours is still scattered over various parts of south Terre Haute.

Brother Dan Pool recently gave his Badge of Membership to Miss Beverly Miller. Brother Pitt wants to give his away, also, but has yet to find anyone willing to take it.

It looks as if the TX Tigers will be fighting with Lambda Chi Alpha for second place in the IF football race. Coach "Pappy" Schreiner is in favor of proselyting a quarterback for next year's squad, since Brother Don Lanning refuses to play until his nose returns to normal size.

Fall pledges are Don Augenstein, Louisville, Ky., Bernie Landsbaum, Robinson, Ill., and Bill McGivern, East Gary. In the words of our Leader, "Welcome aboard!"

Theta Xi's who are holding down various school offices are: Ralph Wardle, Junior Class President and A.S.C.E. Vice-President; Jim Malone, Sophomore Class President; Dan LaGatta, A.S.C.E. President; Bill Rose, A.S.C.E. Secretary-Treasurer; Don Lanning, co-captain of the 1960 Engineer baseball team; Bob McCardle, Student Council Vice-President; and Bernie Landsbaum, Vice-President of the Camera Club.

The 1959-60 social season started with a mixer on October 16. Our guests were the Sigma Kappa's from State. A hayride is planned for the near future.

Overheard during the Homecoming week-end, as a group of celebrating Alums got into a car, "You drive, Herbie, you're too drunk to sing."

—Bob McCardle

Alpha Tau Omega

Sweeping, painting, nailing, studying! Should be the best homecoming ever with all this work going on at Indiana Gamma Gamma. The display is well on its way to completion, and the many hours of work it represents are being rewarded amply by its appearance.

We Taus took some time off from cleaning the house and studying for the Fall Honors Convocation, though, and it was well worth it. Brother Bob Schukai, as president of Blue Key, presided over the convocation which saw ten Taus cited for class honors. They were Brothers Bill Johnson, Bill Perkins, Louis Roehm, Bob Schukai, Woody Stroupe, Jon Stiles, Thomas (T. C.) Copeland, Dale Oexmann, Joe Snyder, Dave Starnes, and John Walden. At the same convocation tappings were held for Blue Key and Tau Beta Pi national honor fraternities. Brothers Hal Booher, Bill Carter, Marshall Garino, Bill Johnson, Jon Stiles, and Dave Trueb were honored with pledgeship in Blue Gey. They join other brothers who are members already, Brothers Larry Berger, Ted Jaenke, Bill Perkins, Louis Roehm, Bob Schukai, and Woody Stroupe. ATO was also represented at the Tau Beta Pi tapping ceremony with Brother Bill Johnson adding his name to those of Brothers Bill Perkins, Bob Schukai, and Woody Stroupe. In addition to the tappings Brother Stroupe was presented with a membership in The American Chemical Society for his fine performance in chemistry. Brother Joe Snyder was also honored when he was given the Freshman, Heminway Medal, the highest scholastic award to be given to a Freshman.

The visit of our national president, Brother Gerald E. Johnson, his wife, and Mr. and Mrs. Stewart Daniels was a fine success. The party toured the campus and administration building and was then quickly whisked to WTHI for a television interview. Returning to the house they were shown the many new improvements in the various sections as well as the new addition. Our Mother's Club came through in traditionally great style as they served a delicious meal for the visiting dignitaries and chapter. Gamma Gamma was proud to have had

Notes

the honor of entertaining the Johnsons and Daniels, and we look forward to having them with us again in the future.

Interfraternity football is leaving much to be desired this season, to say the least. After losing two extremely close games to Lambda Chi Alpha and Theta Xi, and another to Sigma Nu, the Taus are thirsting for a victory. One thing for sure, we'll be out there in the second round ready to capitalize on any break to bring some victories home.

The social activities of the chapter seem to have had some effect as five brothers have lost their pins since the last issue of the *Technic*. Newly pinned couples include Woody Stroupe and Miss Donna Schumpert, Jerry Waltz and Miss Vicki Broyles, Bob Schukai and Miss Nancy Turner, Ted Jaenke and Miss Nancy Grace, and Ron Staggs and Miss Carol Hutchinson. Needless to say, there has been quite a bit of shower activity. Congratulations to you all.

We are happy to announce that Allen Jannasch is now proudly wearing the pledge button of Alpha Tau Omega. Al is a sophomore in the E.E. department. Congratulations, Al. It's good to have you with us.

In the coming months will be the VMI Dance, the Children's Christmas Party, and finals week, and with everyone working hard as they have been so far this year they are all sure to be great successes.

—Bill Carter

Lambda Chi Alpha

After winning their opening I-F football game from ATO, the "flyboys" tied TX 0-0 and dropped two hard-fought games to league leading EN, 13-12 and 12-6. The team has improved considerably since last year, but does not seem to "click" at opportune moments.

Congratulations go to Gary Phipps and Jim Funk, who are coeditors of the new bi-monthly Rose newspaper, *The Explorer*. Other brothers, too numerous to mention, also serve on the staff.

At the October 15 Honors Assembly, brothers Jim Funk and Terry Hallcom were tapped for Blue Key. Jim was also tapped for Tau Beta Pi, along with "Rusty" Archer.

A mixer was held with St. Mary's of the Woods on October 2. It was so successful that *even* Jim Gates got a date.

We welcome Tom Bedwell and John Haley who recently pledged. Congratulations, men!

Bart Gronberg is again chairman of Engineer's Day. We know that Bart will make Engineer's Day a rousing success.

Contributing to the success of our Homecoming display were student nurses from St. Anthony's Hospital. Their assistance in decorating the backdrop was greatly appreciated. Thanks, girls!

—Tom Feutz

Sigma Nu

With Homecoming just around the corner, there's a lot to be done. Brother Charlie Smith has done a great deal of work in organizing the chapter to prevent our being caught in a last minute rush—so, here's hoping. With only a week left, there's no telling what can happen.

Charlie was recently tapped for Blue Key fraternity, also. Another recent event for the "old gang" was the addition of a new pledge, sophomore Don Hirst. Congratulations from the chapter.

For the first time in recent years, Sigma Nu is enjoying a three game winning streak in I-F football. Dick Landenberger has led the team with top-notch passing, but equal credit must be given Mike Smith, sports chairman, and John Kuasnica for catchin' the ol' football.

Last week we defeated ATO 24-0, and this coming Sunday we face the Terrible Tigers of Theta XI; so, watch out bruthuh!

Brother Ross Kuykendall has abruptly lost the services of his 1950 Mercury non-racing type auto. After a mere 635,000 miles (almost), of faithful service it passed on quietly. It's been a sad, sad day.

—Jim Onnen

Campus

Let us now take a few moments to get comfortable, light up a cigarette, relax and ponder over some of the activities and incidents that have occurred recently and are covered in this article.

The "Greencaps" this year followed the example set by some of last year's sophomores in proudly raising a Rose flag over the Indiana State campus. This banner was solemnly raised in the wee hours of the morning; the ceremony, as is customary for such ceremonies, was short and simple. On the contrary, the seven foot by three foot bedsheet banner was quite extraordinary. It must be said that the Rose freshmen this year have a certain uncanny knack for engineering ingenuity. Their ingenious method of securing the flag at the top of the pole required the efforts of all the campus attendants with the expense incurring assistance of the fire department to retrieve the banner. It seems an oddity that the administration hasn't received a letter of appreciation for our best wishes on their Homecoming. However, it isn't odd that the freshmen are planning to have extra large groups at each "watch shift" over our Homecoming bonfire.

Interest in the convocations this year has been stimulated by the new president's policies. The new rule that the bookstore, library, and student grill are to be closed during all convocations has increased the attendance considerably. This increase is due partly to the attendance of neighboring schools and townspeople. This year each convocation and its date and subject nature is going to be announced over the local radio station, WBOW.

Heat Convocation

The student chapter of the American Society of Mechanical Engineers sponsored an assembly Tuesday, September 29, and presented a film entitled "Heat" produced by the Johns Manville Company. This film gave the students a glimpse of many new industrial processes of great complexity that require a working knowledge of heat transfer. This company's main interest lies in the field of research and development of new heat insulators. Johns Manville Company recently produced an insulator for rockets with a new minimum K (thermal Conductivity). This new material will aid scientists in the problem of the overheating of a rocket while in flight in the atmosphere. With modern man's ingenuity and never dying desire for scientific progress, this company's engineers have a bright future.

Rocky Mountain Rambles

The administration sponsored a convocation Thursday, October 6 to allow the much traveled naturalist, Mr. Ralph Emerson Scott, to share his many experiences with the student body.

Mr. Scott's latest adventure was a rambling trek over the Rocky Mountains. The students followed his journey and enjoyed many of his sights on film. The personal narration of this film by Mr. Scott added variety and humor. Mr. Scott stressed the importance of nature's surroundings that usually go unnoticed.

Fordham Flash

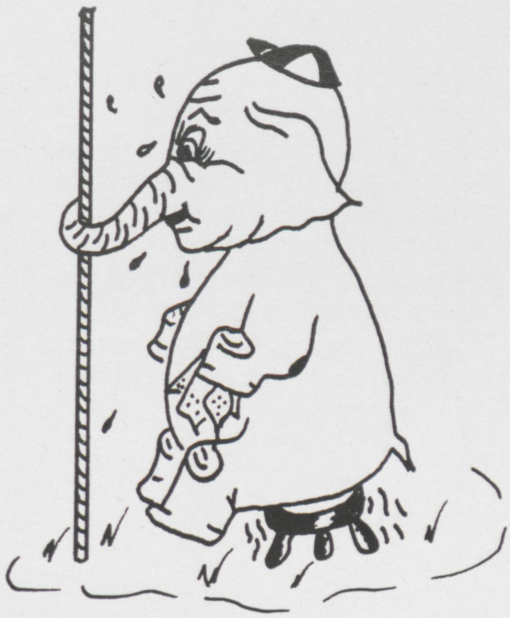
Tuesday, October 13, a convocation was scheduled to appeal to the sports consciousness of the student body. Mr. Frank Frisch acquired the nickname "Fordham Flash" by exhibiting his excelling sports ability while in attendance at Fordham University. After receiving his degree from this University, he went straight into national league baseball. His accomplishments in baseball are a good example of his ability. He played second base with success for the St. Louis Cards on what was then called the "Gashouse Gang" when Dizzy Dean was pitching. Later in his career, he managed the Chicago Cubs. His managing abilities proved to be a great asset to the team. Mr. Frisch elaborated on the differences in strategy when he played and the present mode of conduct. Mr. Frisch's jovial manner led to a very pleasant presentation.

Honors Assembly

The Blue Key National Honor Fraternity sponsored the annual honors assembly, Thursday, October 15. This convocation is scheduled to give personal recognition to

Survey

By Jim Gates, jr., math.



those students who, during the previous school year, excelled in scholastic achievement and campus leadership.

The number of students in each class receiving certificates for class honors last year were: 15 Freshmen, 13 sophomores, 12 juniors, with seniors not being able to be recognized.

Frankie Frisch, "The Fordham Flash."

A bronze medal, a copy of the Heminway gold medal, is also awarded annually to the student for the highest standing in his work for the freshman year. This year the honor went to Joe Wayne Snyder.

The inter-fraternity council has for several years awarded a trophy to the social fraternity having the highest average scholastic rating each semester. The Lambda Chi Alpha fraternity retains this trophy with a 2.73 cumulative rating.

Student Edward Kelly received a five dollar cash credit award for being the freshman that had the highest cumulative rating difference between first and second semester ratings.

Bob Schukai, president of Blue Key, presided over the ceremony of tapping new Blue Key pledges. The following men received this honor: Charles Smith, Dave Trueb, Dan LaGatta, Hal Booher, Terry Hallcom, Bill Johnson, Jim Funk, Jon Stiles, Bill Carter, and Marshall Garino.

Gary Phipps, president of Tau Beta Pi, acted as master of ceremonies for the tapping of new pledges into this organization. New pledges are Henry Bradley, Frank Fisher, Bill Johnson, Ray Clark, Jim Funk, and Russell Archer.

All of those students that received various honors deserve the respect of the student body and the faculty for their diligent efforts. These men are a definite asset to

(*Continued on page* 38)

MAGNETIC AMPLIFIERS

(*Continued from page* 19)

"bias" current. The magnitude of this bias current is determined by the ratio of one-half R1 to R3. If the bias current were made great enough, its peak value would "set" the core at saturation with opposite polarity from the time at which bias current started (point 3 to 4, Fig. 3) (The amount of bias current needed to "set" the core X3 magnetically is only a small proportion of the current passed by X4 in its saturated condition; thus the high ratio of R1 to R3) The point at which a core is magnetically "set" by the bias current determines the time necessary to bring it to saturation during the next half cycle of applied voltage. The magnetic condition of a reactor at the peak value of current passed in its winding is illustrated by point 3, Fig. 3. Point 2 corresponds to the point at which the core becomes fully saturated and "firing" occurs.

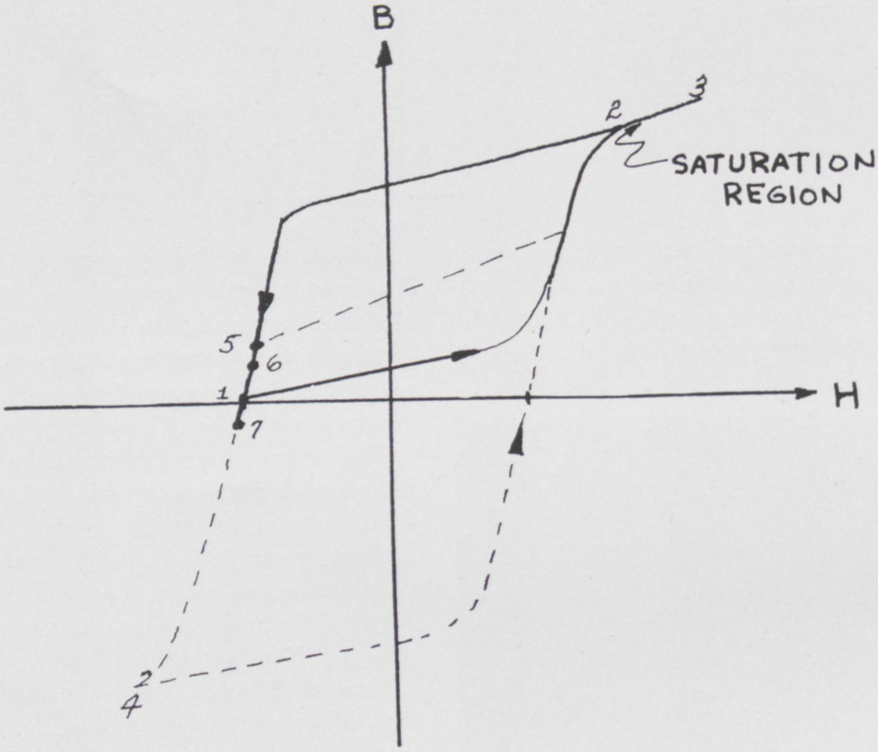


FIGURE 3

MAGNETIC CONDITION OF REACTOR CORE

The curve in Fig. 3 is a hysteresis loop. The loop for the actual core material of the reactors in this amplifier is much more square with sharper corners. Very little change in magnitude of magnetizing force is necessary to bring the core from saturated to unsaturated condition, or vice-versa.

Points 1, 4, and 5, Fig. 3, correspond to points 1, 4, and 5, Fig. 4, and illustrate how the firing angle may be varied by the ratio of R1 to R3 anywhere between 0° and almost 180° of the applied voltage cycle.

With uncircled polarity of Fig. 2 the above process would take place in opposite order. During the half-cycle of applied voltage when X4 fires, X3 is biased. Similar action occurs with X5 and X6. When X4 fires, X5 fires. When X3 fires, X6 fires. The current waveform of each reactor-diode pair is that of Fig. 4.

When a signal is impressed on winding 2 (Fig. 2), the current in the winding establishes a certain flux level tending toward the same flux polarity in all cores. Because the gate windings of cores X3 and X4 produce opposite magnetic effects (due to their winding directions) from those of cores X5 and X6, the effect of a signal in winding 2 is to cause the biasing current in the reactors to "set" cores X3 and X4 differently than X5 and X6. Points 6 and 7, Fig. 3, illustrate the difference. A given signal will result in the firing angles of pairs X3 - X4, and X5 - X6 being changed equal and opposite amounts from 90°.

Current outputs of each reactor pair X3 - X4 - X5 - X6 being thus made unequal by a signal voltage in winding 2, the resultant voltage drops across R3 and R4 will be unequal, and a net voltage will appear across JK. This is the output of the amplifier stage. Because of the large differential currents passed by the reactors (due to differences in the firing angles) brought about by relatively small signal input currents XY, the stage as a whole exhibits "amplification."

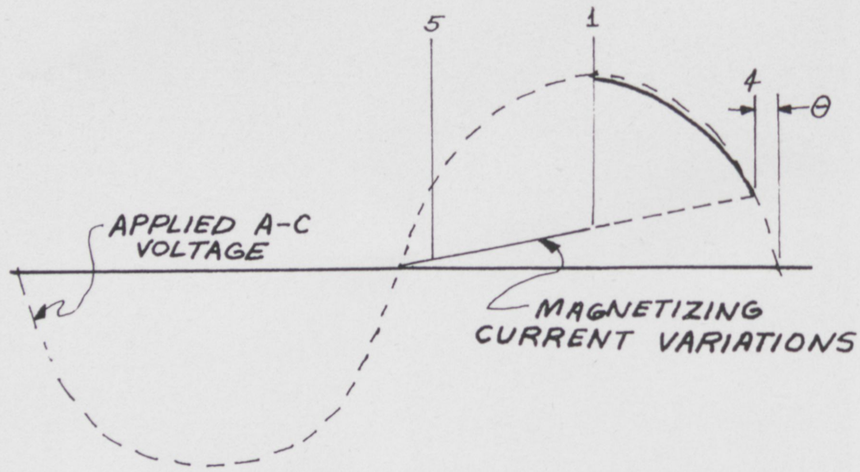


FIGURE 4

FIRING ANGLE AND CURRENT VARIATIONS

ATOM SMASHERS

(*Continued from page 22*)

Another giant machine that will be even more powerful than the Brookhaven Synchrotron will be a two-mile long linear accelerator at Stanford University, Stanford, Calif. This accelerator will operate on a different principle. It will produce its huge force in much the same manner that a surf board rider builds up velocity by riding the crest of successive ocean waves. In this case the rider will be electrons (atomic particles carrying a negative charge) which will be hurled down a straight, airless steel tube buried beneath 35 feet of earth. The Stanford atom smasher will consist of two parallel tunnels (See fig. 2.) One will be about 15 feet wide and contain a copper vacuum tube four inches in diameter. Inside the tube will be some 120,000 metal discs, an inch apart, and each with an inch hole in the center through which the electrons will speed.

The second tunnel will house klystron tubes to convert electrical current into radio microwaves. The microwaves will be fed into lateral pipes or waveguides, spaced along the tunnel at 10 foot intervals. The waveguides, in turn, will send synchronized streams of the microwaves into the four-inch tube to boost the speed of electrons as they travel past. Thus, the electrons will ride the crest of a radio wave through the accelerator's length until they smash into the target atoms.

At present, the largest accelerator is a circular 10-BEV machine in Subna, Russia. In contrast to Brookhaven's, the Russian accelerator is a weak focusing machine, 200 feet in diameter, with a magnet ring containing 36 tons of steel. This is nine times the weight of the magnets being installed in the Synchrotron.

Russian physicists have also announced plans to build a 50-BEV strong-focusing machine in Leningrade. A 25 to 30-BEV proton accelerator is under construction in Geneva, Switzerland, by the European Organization for Nuclear Research (CERN).

The largest accelerator in operation in the United States is the 6-BEV Bevatron at the Lawrence Radiation Laboratory, operated for the Atomic Energy Commission by the University of California. The AEC's Argonne National Laboratory, Lemont, Ill., has started construction on a 12½ BEV proton accelerator, 200 feet in diameter. This one, to be operated by the University of Chicago, will be a weak-focusing machine which will accelerate greater numbers of protons than the other machine, thus creating more particles. This means that experiments involving rarely-occurring particles will be more easily performed at Argonne than else where, while experiment needing higher energy will be performed at the large machines such as Brookhaven's.

What kind of experiments will be conducted with these giant machines?

One involves a mathematical game of chance known as *monte carlo*. A speeding proton in an accelerator hits a target atom and sets off a series of billiard ball collisions within the nucleus until finally a neutron or proton is knocked free.

By playing a sort of atomic roulette to predict the collisions within the nucleus, scientists are able to estimate the internal structure of the atoms.

By using high speed electronic computors, the scientists can predict when one of the collisions will occur, thus set their photographic equipment to record the event.

The "glue" believed to hold the atomic nucleus together is called a pi-meson or pion, a subparticle with a mass 273 times that of an electron. It, in turn, decays into other forms when hit. If, by predicting, photographing, and studying the results of collisions, scientists can determine what makes a pion do the things it does, they may learn the secret of its strength.

Another important field of study will be the creation of synthetic elements by intense nuclear bombardment of atoms. Limited experi-

(*Continued on page 44*)

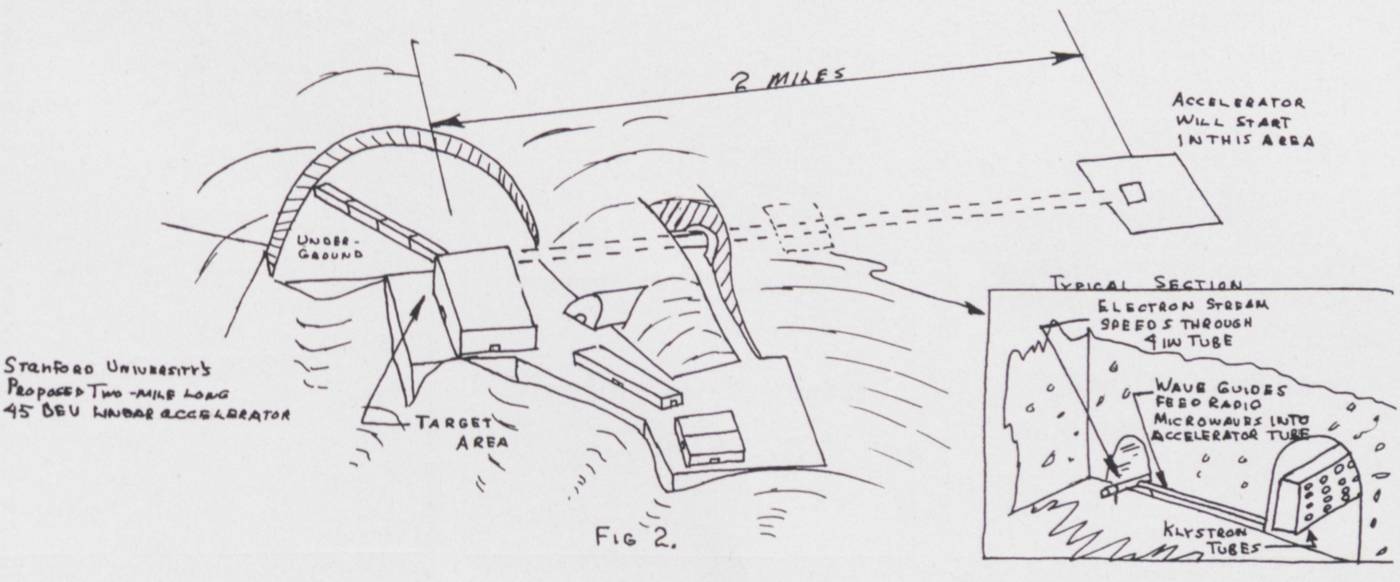


FIG 2.

LOCKER RUMORS

(*Continued from page* 13)

to score behind some fine downfield blocking. The running attempt for the extra point failed and that's the way the score of the game ended, North Park 20 Rose 6.

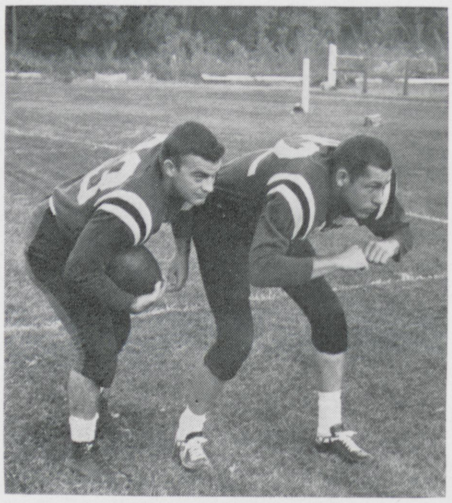
The following week, Rose travelled to Eureka, Illinois to take on Eureka College. The weather conditions for the game were far from being even halfway decent. Rain began to come down about an hour and a half before the game started and never ceased throughout the entire game.

Although there was no score, Rose gained over 200 yards which is very creditable for the conditions under which they played. Three times the engineers threw away scoring chances with fumbles on the 15, 20, and 22 yard line of Eureka. Rose's defense held Eureka to a gain of less than 100 yards. Needless to say, the game ended 0-0. After the game, you couldn't tell the players even *with* a scorecard.

Rose's next opponent is Illinois College of Jacksonville, Illinois. Then the following week is the Homecoming game against Franklin College.

Down in the fieldhouse the sound of swishing nets is once again being heard. Practice began October 15 for the freshmen with about 25 men turning out.

Intramural football this year is producing some fast and furious games. There is quite a bit of keen competition for the post position. All 3 top teams have the potential needed to produce a championship. As of now, the standings are as follows:



Co-Captains Anderson and Stroupe.

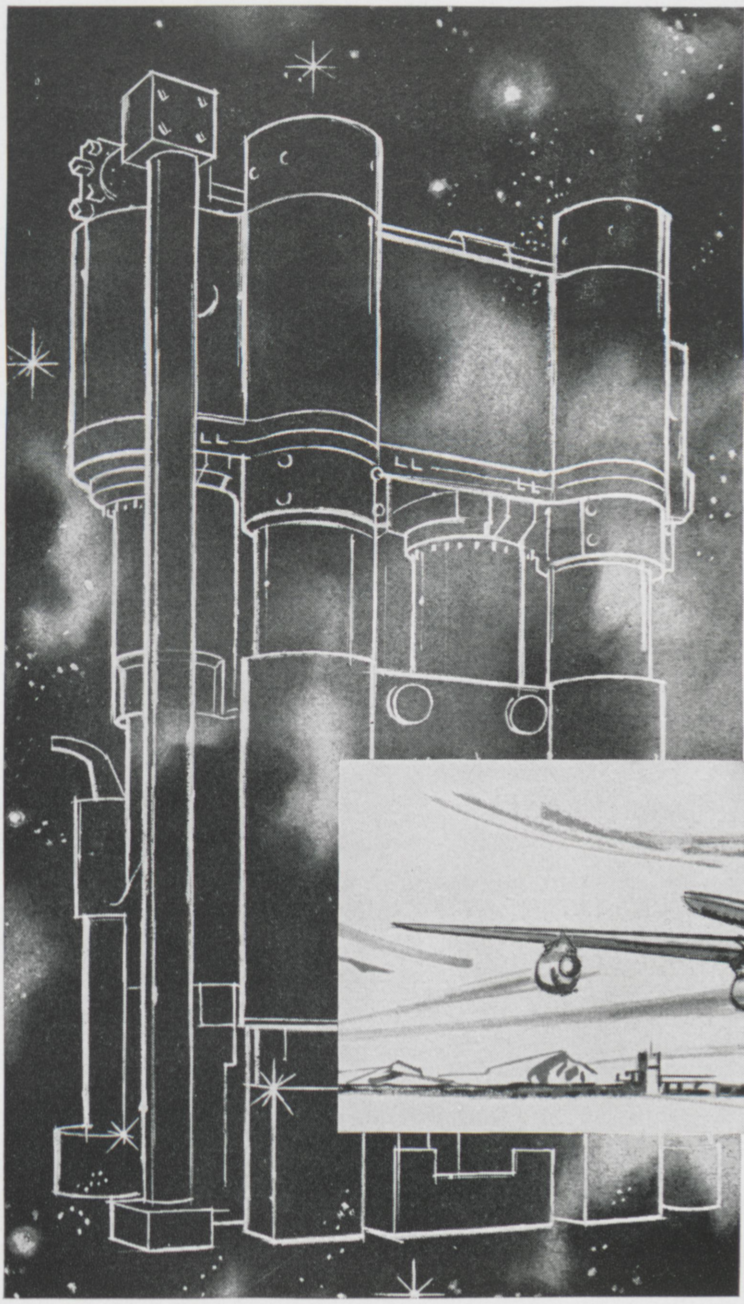
Team Standings

Jr. Jems	2-0
Soph. Colts	2-0
B II	2-0
Jr. Rams	1-1
Soph. Bears	1-1
Deming	1-2
B I	1-3
Ind. Fr.	0-3

In intrafraternity football, Sigma Nu leads the pack with a 3-0 mark. They are followed by Theta Xi and Lambda Chi Alpha who are all tied up with a 1-1-1 record having 0-0 the last time out. Following them is Alpha Tau Omega with a 0-3 record.

I. F. Standings

Sigma Nu	3-0
Theta Xi	1½-1½
Lambda Chi Alpha	1½-1½
Alpha Tau Omega	0-3



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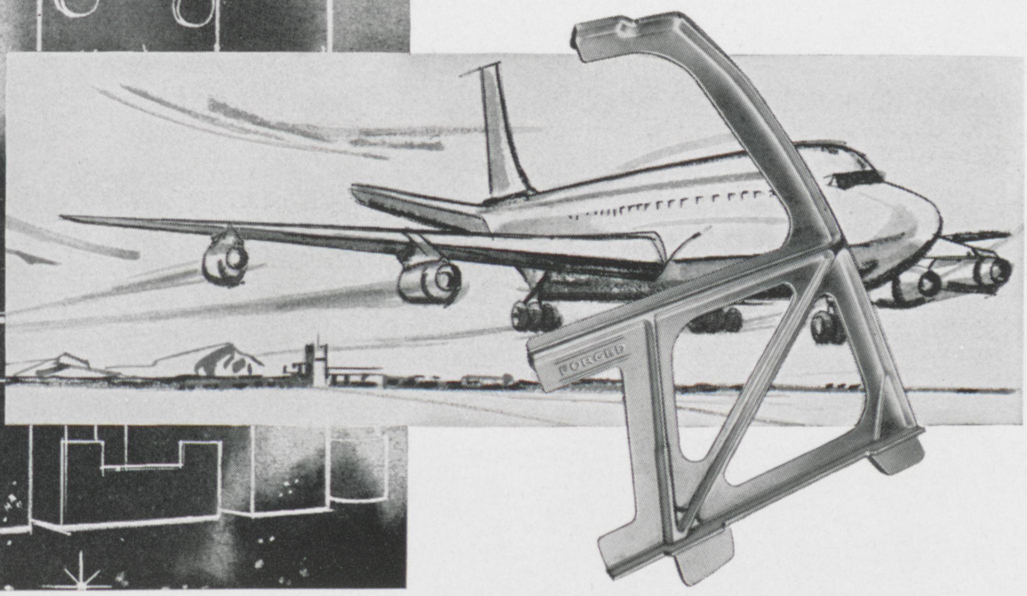

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(*Continued from page* 31)

the school.

Bell Labs Visited

On Tuesday, October 6, the sophomore, junior and senior E.E.'s, plus the sophomore M.E.'s spent the day in Indianapolis where they toured Western Electric, Indiana Bell Telephone Co., and Bell Telephone Laboratories. The group was also accompanied by Dr. Darrell Criss, Kenneth Carr, and Eugene Clehouse. The trip was planned by the Joint Student Branch of I.R.E.-A.I.E.E., with the Bell System paying the bill.

At 10:15 a.m. the three bus loads of Rose men arrived at the Western Electric plant where, upon signing in, everyone was treated to coffee and rolls, and the day's activities were outlined. The Rose men were then divided into groups of five which were shown through the plant and the Bell Laboratories by engineers working there.

In the Bell Laboratories the students got to see the design and testing of some of the latest Bell equipment such as the push button dial. The operation of an automatic dialing directory was also demonstrated. This is a device which stores telephone numbers and then, with the push of a button, automatically dials any particular number you may want. New telephone designs are put through very rigorous endurance tests in the labs so that when they reach the customer, they will withstand any abuse given them.

In the manufacturing division the students watched the birth of telephones and all the components that go into them. Telephones of all types and colors are made in this plant along with just about every part that goes into a telephone. The majority of the components are assembled by women working on an assembly line which travels through out the plant. This plant turns out approximately 30,000 telephones a day.

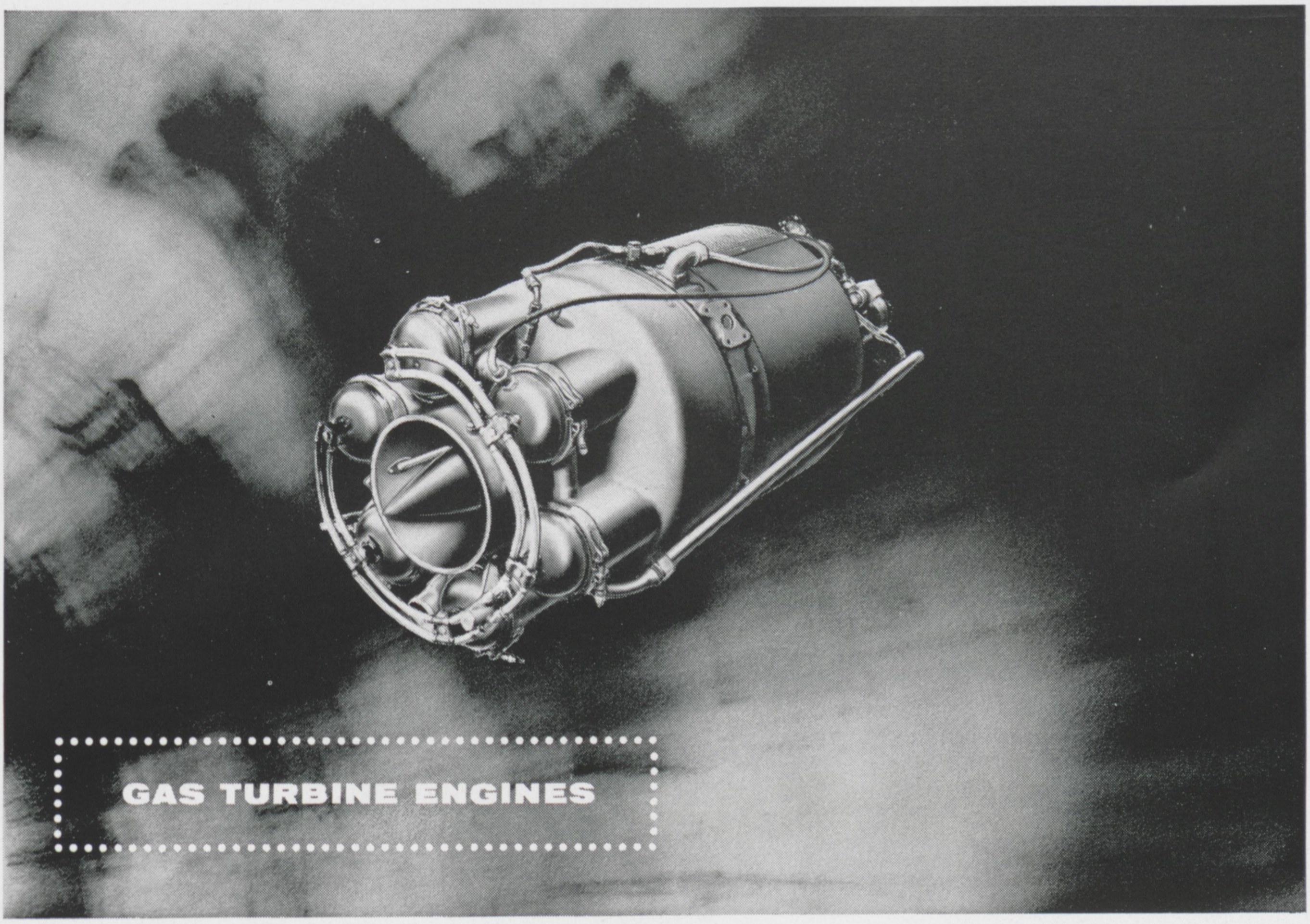
At 12:45, a buffet luncheon was served, after which cigars were passed out and a talk on the functions of the Bell Telephone Laboratories was given by Mr. Bill Tuff. He pointed out that the Laboratories are located in the manufacturing plant so that the design engineers of Bell may work with the manufacturing engineers of Western Electric, thus turning out designs which may be put into production with the greatest economy. The Rose men then boarded the buses and departed for the Indiana Telephone Building.

Upon arrival at the telephone building the group was first assembled in the auditorium where they were welcomed by Mr. Jess Overman. Demonstrations of the development of the first switch boards and of direct distance dialing were given. It was pointed out that in the near future all long distance calls will be dialed directly without the need of a telephone operator.

The Rose men were again divided into groups of five which were then given tours of the building. One of the more interesting highlights of the tour was a demonstration of the use of IBM and Bell's own machines to compute the customer's bill for a

(*Continued on page* 46)

Blue Key pledges, l. to r., are Jon Stiles, Chuck Smith, Jim Funk, Hal Booher, Dan La Gatta, Terry Hallcom, Dave Trueb, Marsh Garino, William Johnson, and Bill Carter.



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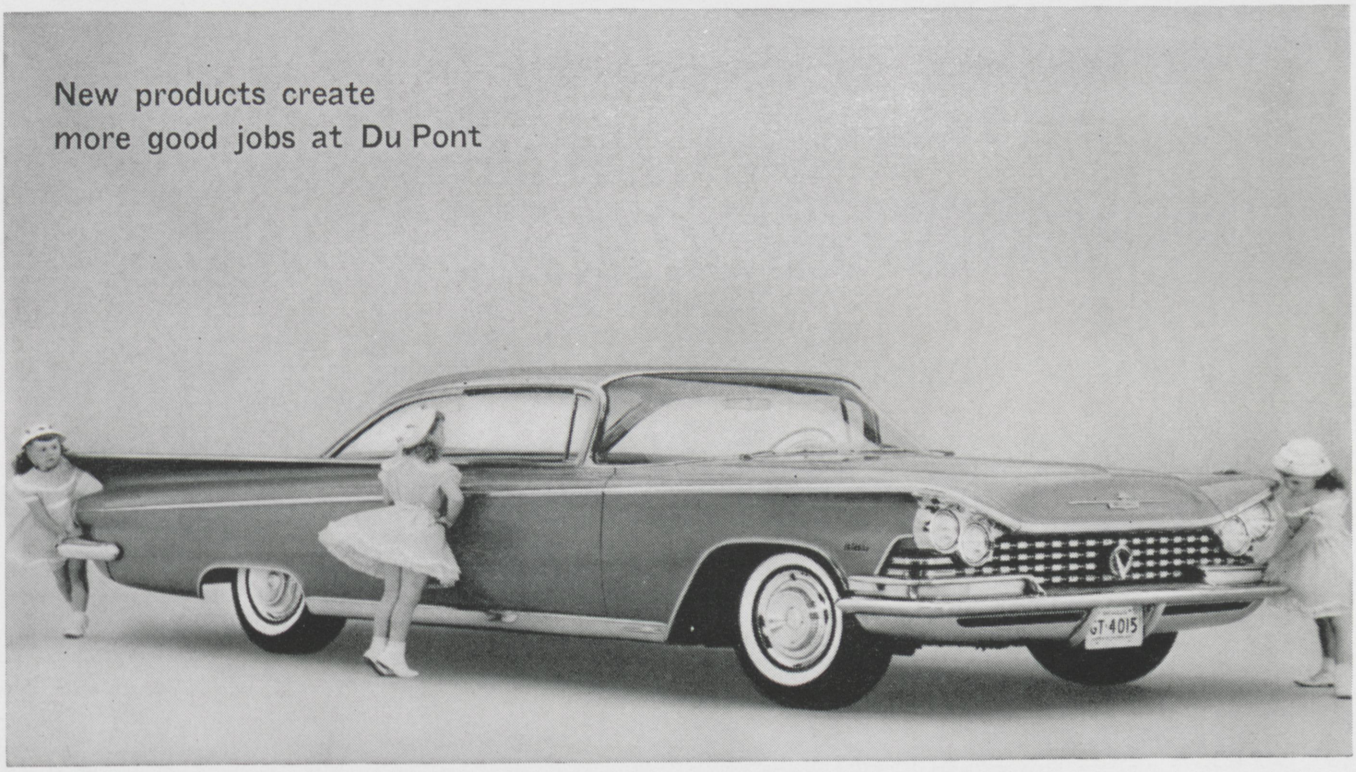

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BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Alumni News

By Louis Roehm, sr., c.e.

This months Alumni News article features a graduate who has made the military a career. On April 1, 1959 Colonel Earle B. Butler assumed the duties of District Engineer, Corps of Engineers, at Buffalo, New York. His duty in the Buffalo District follows a fourteen-month assignment in Korea.

Born in Terre Haute, Indiana, Colonel Butler attended Rose Polytechnic Institute where he received his Bachelor's Degree in Civil Engineering in 1935. It was during his college days that he entered the ROTC and was commissioned a second lieutenant in the Army Reserve. After graduation this native Hoosier started to work for the Tennessee Valley Authority at Knoxville and remained with this organization for the next six years. Between 1938-1940 he attended night sessions at the University of Tennessee where he received his Masters Degree.

In June 1941 he was called to active duty where he was assigned the duties of Area Engineer, Military Construction in the Mobile Engineer District and remained in military construction work until 1944. In this capacity he was responsible for literally changing the Palmetto Swamps into modern Air Force bases at Panama City and Apalachicola, Florida. At Opelika, Alabama he directed the construction of the prisoner of war camp in the unbelievably short time of 45 days. Following his Opelika tour, in December 1942, he directed the construction of the Memphis, Tennessee Air Force Depot and other military installations in that area. With the completion of the major portion on the military construction work, in May 1944, he was assigned as Engineer Supply Officer at Atlanta General Depot in Georgia. Colonel Butler's next assignment was at Camp Forrest, Tennessee where he developed production methods and facilities to use prisoner of war labor to weave camouflage nets. Early in 1945 he was transferred to the Baton Rouge Engineer Depot in Louisiana where his duties as Commanding Officer continued until after World War II.

In 1946 he returned to civilian life as Manager of Engineering and Construction for the Standard Oil Company, Illinois District. He received his Regular Army Commission in 1947 and returned to Army life. Colonel Butler was then assigned to Hanau, Germany, as Director of Engineer Supply and Procurement. As Director he was responsible for all engineer material procurement and distribution activities in Europe during the next three years which included the period of the sensitive Berlin Airlift in 1948-49.

In 1950 he returned stateside to assume the duties of Commanding Officer of the 83rd Engineer Construction Battalion at Fort Sill, Oklahoma. The following year, during the build-up of NATO forces, the battalion was transferred to France to begin construction work on the line-of-communications facilities across France to support U.S. Forces in Germany. Fourteen months later he returned to Fort Leavenworth, Kansas where he attended the Command and General Staff College for one year. Upon graduation he was assigned to Military Supply activities in the Chief of Engineers Office, Washington, D.C. His duties at this headquarters were intersperced with attendance in 1954 at the Graduate School of Administration, Carnegie Institute of Technology. From 1956-57 Colonel Butler attended the Industrial College of the Armed Forces at Fort McNair, Washington, D.C., after which he was assigned to

(*Continued on page* 46)

Colonel Butler.

ATOM SMASHERS

(Continued from page 35)

ments with small atom smashers have led to new theories on the creation of the supernovae, the huge stars that flare to brilliance in nuclear explosions millions of light years from our planet.

Scientists speculate that the exploding supernovae are actually giant atomic "furnaces". These "furnaces", with an intense nuclear flux, can produce heavy artificial elements such as Californium. The physicists base their "furnace" theory on the fact that synthetic Californium 254 produced in atom smashers has a half life of 55 days, which corresponds closely to the period of light reflected by exploding stars.

A special panel appointed by President Eisenhower's Science Advisory Committee recently pointed out the potential of the giant accelerator. In a 4000-word report, which recommended a buildup in smasher research, they said of the submicroscopic world:

"We are peeling an onion, layer by layer, each layer uncovering in a sense another universe, unexpected, complicated, and as we understand, more strangely beautiful."

They noted that 30 subatomic particles have been discovered so far. Their structures are largely unknown, their interactions only partly explored. But their combinations seem to be the basis of all matter.

At least 13 of the particles are thought to have anti-particle counterparts, that is, physical equivalents with opposite electrical charges. Scientists have found that when particles and their anti-particle counterpart collide, they destroy each other, instantaneously yielding more than a thousand times the energy, per pound, than the atomic bomb.

This anti-matter can be created in the collisions of an accelerator but anti-matter particles almost immediately collide with other particles, annihilating themselves and their new partners.

Although the anti-matter can't be stored on earth, physicists theorize that a few anti-atoms may exist in the vast clouds of thin gas between the stars of our galaxy or of other galaxies and could account for the mysterious radio waves that reach earth from space.

Indeed, anti-matter may have been formed at the same time and in the same quantities as other matter, in which case entire galaxies of anti-matter may exist in the far unseen reaches of the universe, held apart by a force like anti-gravity.

This speculation, which could be confirmed by further exploration of the heart of the atom, leads to the questions that will have enormous impact on proposed space travel.

For instance, if some galaxies in outer space are composed of anti-matter, will they be destroyed in a violent explosion when touched by matter such as a space ship? Would such a gigantic explosion upset the balance of the universe and demolish it?

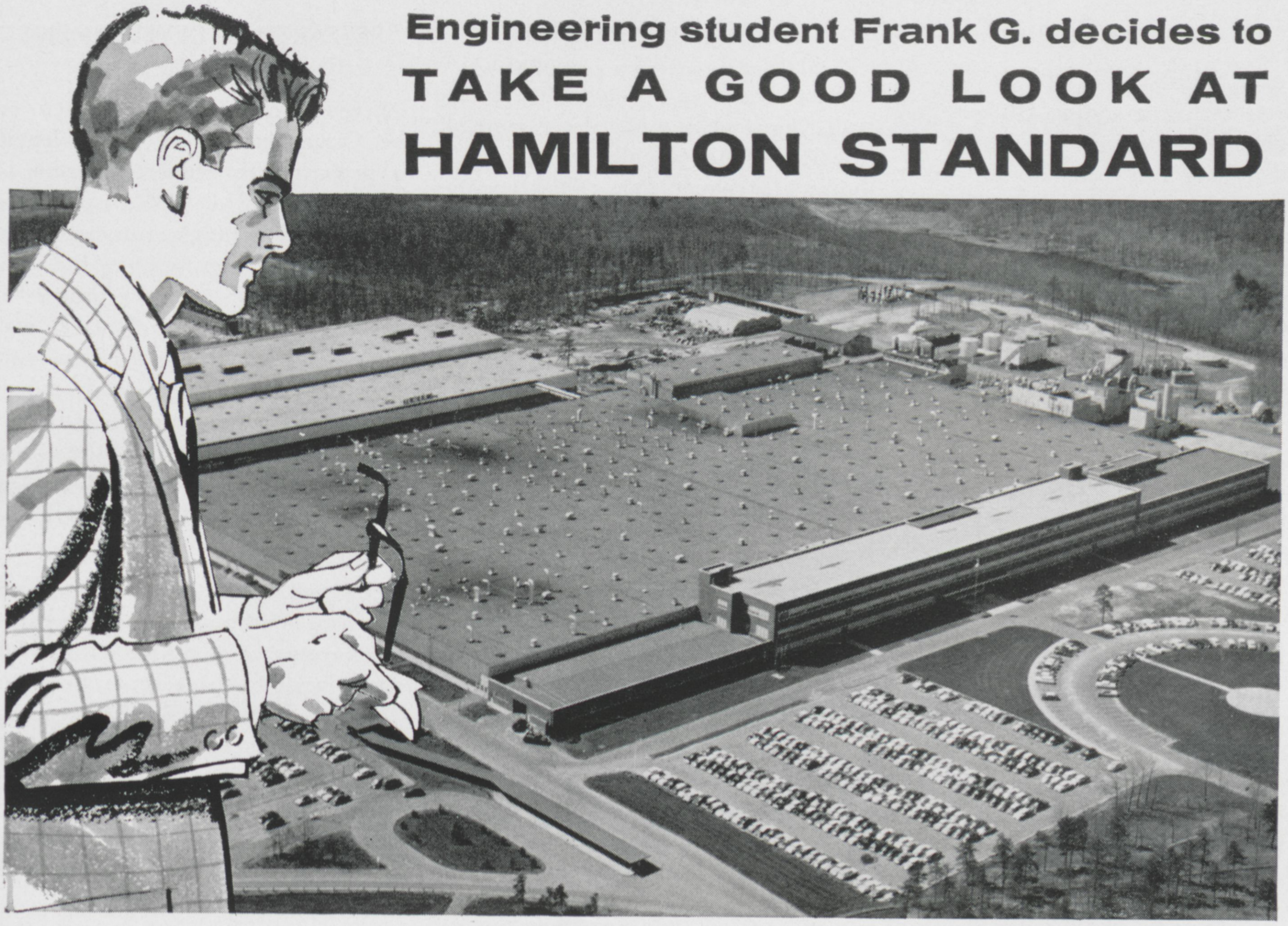
Would the laws of physics in such regions be identical to our own, and are our physical laws valid for subatomic particles?

This last question is especially crucial since Stanford physicists probing into nuclear particles have already found descrepancies which indicate that the present theory of quantum electrodynamics may not be valid for the hyper-short distances inside particles.

So far, the physicists, using the relatively low powered accelerator at their diposal now, have explored the anatomy of protons and neutrons to within a 30 millionth of a billionth of a centimeter of their core.

"We have a clear picture of the outer seven-tenths of the particles" says Stanford's Prof. Robert Hofstadter. "But no one can be sure what lies within the inner three-tenths." With higher energies we can look deeper. That is where we will find the answer.

Engineering student Frank G. decides to TAKE A GOOD LOOK AT HAMILTON STANDARD



WHO, WHAT, HOW? . . . Hamilton Standard, in its 40th year, is the founding division of the billion-dollar United Aircraft Corporation. Long famous for propellers, now more than half of its activity is devoted to environmental conditioning systems, engine controls, hydraulics, ground support equipment, and electronics.

HOW BIG, HOW SMALL? This engineering facility of 1,700,000 square feet includes laboratory, test, engineering facilities and production areas. The division employs over 700 professional engineers. Yet, Hamilton Standard is compact, integrated, flexible. Projects are conducted on a task-force basis with unique opportunity for individual recognition. There is free access to the United Aircraft corporate facilities, including the finest privately-owned research facilities in the world.

WHERE, WHAT ELSE? The complete Hamilton Standard story cannot be told on this page . . . the advantages of locating in lovely Connecticut with its wealth of cultural and recreational facilities . . . the tuition-paid post graduate study program . . . the dynamic product diversification activity that has created exceptional openings for incoming engineers. But in later issues, we plan to give Frank G. the whole picture . . . hope you'll be looking in.

For descriptive literature write to Mr. T. K. Bye
Administrator, College Relations

HAMILTON STANDARD A DIVISION OF **UNITED AIRCRAFT CORP.**
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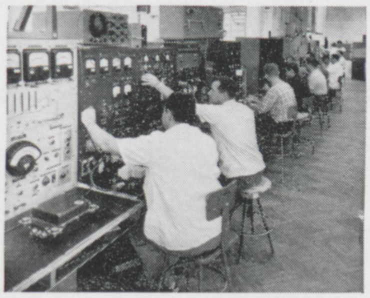
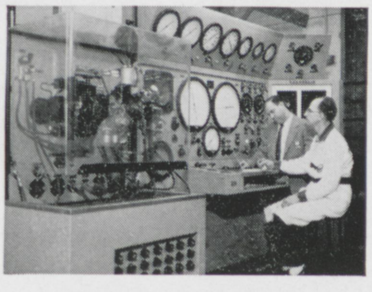


ELECTRONICS

RESEARCH



LABORATORIES

ALUMNI NEWS

(*Continued from page* 42)

Korea as Commanding Officer, 2nd Engineer Construction Group. It was during this tour of duty that units under his command completed over 200 projects, among which were the installation of electric power facilities, road and airfield paving, construction of housing and storage areas, and relocation of petroleum product lines. For meritorious service in this command, he received a citation from the Eighth Army Headquarters in Korea. He was also awarded the Korean Distinguished Service Medal by the Korean Government for this work.

Colonel Butler became a registered professional engineer in his native state of Indiana in 1946 and is currently registered in that state. He is married to the former Mary J. Cody of Terre Haute, Indiana and has two sons, Lee and John.

The editors hope that by giving the students a chance to read about these Alumni each month, the student will realize his goal in life.

CAMPUS SURVEY

(*Continued from page* 38)

Direct - Distance - Dialed telephone call. One machine keeps a record of the long distance calls by punching holes in a paper tape. This tape in turn is fed into another machine which eventually computes and types out the customer's bill. Other interesting items were the machines which take a dialed number and find an open line, make the connections, ring the telephone and then when the two parties are connected goes on to another number to repeat the whole process over completely automatically. The group reassembled in the auditorium for a short question and answer session which ended the day's program.

Recently, this writer has been questioned as to the continuance of this article after the creation of the new school paper. The Technic staff feels that this article is an integral part of the magazine. This article is the only chance that the alumni have to keep informed about campus events; its necessity and function are therefore shown.

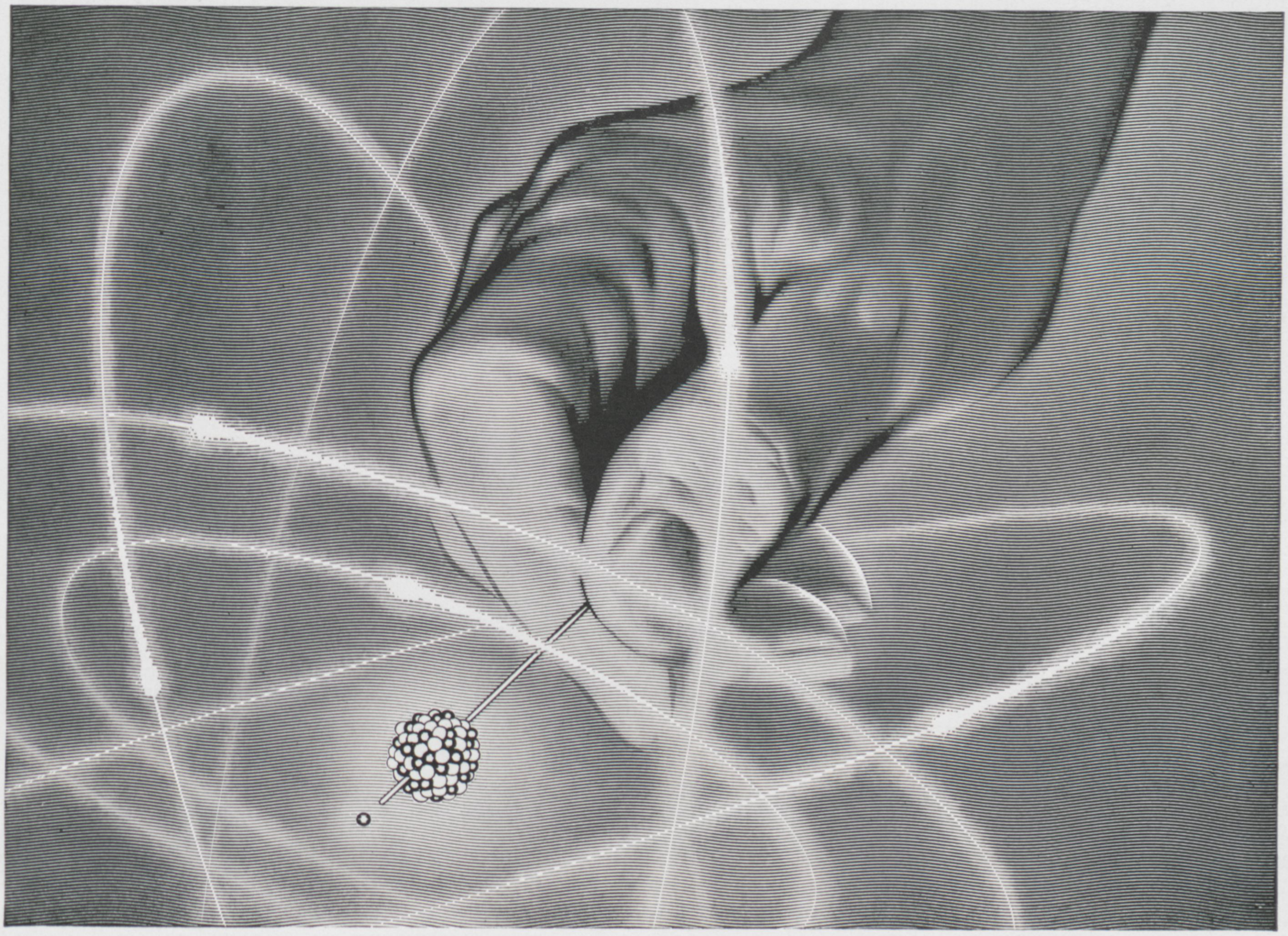
RESEARCH & DEVELOPMENT

(*Continued from page* 17)

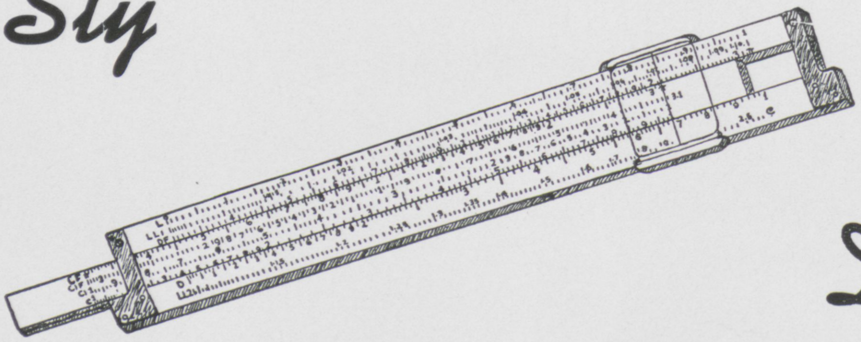
old ready-mixed plant, located on the Cuyahoga River, was selected to prepare the Picker concrete to take advantage of CBS's up-to-date electronic batching equipment and insure 100% accuracy in the mix design. At no point in the process of mixing the concrete at plant "J" was manual labor employed. Electronic controls turned out ready-mixed concrete precisely to formula as punch cards inserted in the operating mechanism regulated the carefully designed mix for the Picker job.

The cell itself is a three story structure containing 300 cubic yards of concrete, weighing more than 600 tons, placed in three separate pours of one story each. Each pour was accomplished in regular eight hour working days. With good shale underground, sufficient foundation was accomplished with five foot wide footers going 18 inches underground.

ADVERTISING INDEX



Sly



Droolings

Stolen by Jerry Waltz, sr., e.e.

"You've read that passage wrong Miss Adams—it's 'All men are created equal,' not 'All men are made the same way'."

* * *

E. E.: "I hear the administration is trying to stop drinking."

C. E.: "That so? First thing you know they will be trying to make the students stop too."

* * *

A divinity student named
Tweedle
Once wouldn't accept a degree.
It's tough enough being Tweedle,
Without being Tweedle, D.D.

* * *

Tired engineering teacher: "Many of my students are like processed coffee—98% of the active ingredients have been removed from the bean."

* * *

If all the students who sleep in class were laid end to end, they would be more comfortable.

* * *

Coed: "I'll stand on my head or bust."

P. E. Instructor: "Just stand on your head, we don't ask too much."

* * *

Ch.E.: "Is my face dirty, or is it my imagination?"

E. E.: "Your face is clean. I don't know about your imagination."

* * *

The M.E. instructor held the chisel against the rusted bolt. He looked at the M.E. student and said, "When I nod my head you hit it."

They're burying him at noon today.

* * *

First Little Boy: "I don't like the new little girl in our block. Her neck's dirty."

Second Little Boy: "Her does?"

* * *

A husband answering the phone: "How do I know? Why don't you call the weather bureau?"

"Who was that?" asked his wife.

"Some fool wanted to know if the coast was clear."

* * *

Two small boys in the Salvation Army diner put their grimy little hands side by side on the white tablecloth.

"Mine's dirtier than you'rn," exclaimed one triumphantly.

"Huh," snorted the other disdainfully, "you're two years older'n me."

* * *

A local barmaid was quite a flirt, and when the Senior went out to buy a paper she pursed her lips invitingly and leaned over the bar towards the shy Junior.

Putting her face against his she whispered: "Now's your chance, darling." The Junior looked around the empty room. "So it is," he remarked, and promptly drank the Senior's beer.

* * *

Overheard in a parked car:

"Slow down Columbus, you've discovered enough for tonight."

* * *

For years the bum slept under bridges and in ditches. Then one day he switched to culverts and became a man of distinction.

* * *

Her dainty foot brushed a potted flower, upsetting it. She looked at the spilled dirt gravely, then raised her childlike eyes to the sedate face of the minister and said, "That's a hell of a place to put a lily."

A tramp had been arrested and when taken to the police station was told to take off his clothes and take a bath.

"Me go in the water.." he asked astounded.

...."Yes, you need it," said the police sergeant. "How long has it ben since you had a bath?"

"Well," replied the tramp, "I ain't never been arrested before."

* * *

Let's eat, drink and be merry
today
For tomorrow we may die;
Let's fill the hours to the brim
Then we shall say goodbye.
The morrow's here — we're still
alive,
Last night was such delight!
And just in case we die tomorrow,
Let's celebrate tonight!

* * *

Senior Engineer: We're coming to a tunnel. Are you afraid?

Co-ed: Not if you take that cigar out of your mouth.