ILLINOIS

No. 6 –25c

TECHNOGRAPH

SCIENCE AND ENGINEERING WEEKEND MAY 10··11

AGRICULTURAL ENGINEERING-heat transfer-gas dynamics
aerospace and navigational electronics-ARCHITECTURE
PETROLEUM ENGINEERING-radiology-inorganic chemistry
PHYSICS-AERONAUTICAL AND ASTRONAUTICAL ENGINEERING-
rocket propulsion and rocketry-architectural design
COLLEGE OF VETERINARY MEDICINE-analytical mechanics
solid state physics-bacteriology and immunology
antennas and wave propagation-heat transfer
mechanics of soils and water conservation
GENERAL ENGINEERING-CERAMIC ENGINEERING
electric motor application and control
powder metallurgy-aerothermodynamics-
cadastral engineering-thermodynamics
CIVIL ENGINEERING-organic chemistry
nuclear physics-electrical ceramics
information theory
physical chemistry
aerothermodynamics
ceramic microscopy
ELECTRICAL ENGINEERING-gas dynamics
machine design-architectural design
JUNIOR ENGINEERING TECHNICAL SOCIETY
MECHANICAL AND INDUSTRIAL ENGINEERING
PHYSICS-rocket propulsion and rocketry
JUNIOR ACADEMY OF SCIENCE-heat transfer
physical chemistry-PETROLEUM ENGINEERING
elementary mechanics of deformable bodies,
man--electric motor application and control
human factors in engineering for space travel
aerospace and navigational electronics-ARCHITECTURE
COLLEGE OF VETERINARY MEDICINE--inorganic chemistry

BIOCHEMISTRY

aircraft shell structures
----CIVIL ENGINEERING----
automatic control systems
---power system stability
radio chemistry-pyrometry
-THE ILLINOIS TECHNOGRAPH
--veterinary parasitology
architectural design
analytical mechanics
sanitary engineering
prestressed concrete
CERAMIC ENGINEERING-
--MINING ENGINEERING
ENGINEERING PHYSICS-
-GENERAL ENGINEERING
quantum mechanics-
NAVY R.O.T.C.
CHEMISTRY-
PHYSICS
atomic
power
human
heat
man
no

PHYSICS
welding engineering
ARMY CORPS OF ENGINEERS
theory of structural design
GENERAL ENGINEERING-CHEMISTRY
microwave theory and techniques
THEORETICAL AND APPLIED MECHANICS
aircraft shell structures-pyrometry
automatic control systems-radiology
MECHANICAL AND INDUSTRIAL ENGINEERING
JUNIOR ACADEMY OF SCIENCE-JUNIOR ENGINEERING TECHNICAL SOCIETY
METALLURGY ENGINEERING-AIR FORCE ROTC
digital computer circuits-surveying
engineering law-x-ray metallography
CHEMICAL ENGINEERING-ARCHITECTURE
nuclear physics-radio chemistry
mechanical behavior of solids
industrial systems analysis
ELECTRICAL ENGINEERING
aircraft structures
NAVY ROTC

one
man
life
light
atomic
organic
aircraft
surveying-
heat transfer
engineering law--
solid state physics-
ILLINOIS TECHNOGRAPH

PHYSICS

Things We Know About Tomorrow

EYES MADE FOR DARKNESS Westinghouse scientists expect that airplane pilots are going to be able to see the ground clearly on a cloudy, moonless night. Astronomers will be able to see vastly beyond the present range of their telescopes, perhaps to the final boundary of the universe, if there is one. Policemen will peer into dark alleys and see through special binoculars. Scientists at Westinghouse are working on the proposition that no matter how dark it looks to us, there is plenty of "light" everywhere: on a black night, in a coal mine, in a sealed room. We just have the wrong kind of eyes to see it all. So they have developed a device that "sees" infrared light which we can sense only as heat...another device that "sees" ultraviolet light, which we can detect only when it gives us sunburn...still another that picks up a single "packet" of light, the smallest amount that can exist, and multiplies it into a visible flash. You can be sure...if it's Westinghouse

ENGINEERS: For full information on rewarding career opportunities at Westinghouse, an equal opportunity employer, write to L. H. Noggle, Westinghouse Educational Department, Ardmore & Brinton Roads, Pittsburgh 21, Pa.

THE ILLINOIS TECHNOGRAPH

Volume 78; Number 6 March, 1963

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Special Science and Engineering Weekend Edition

The Cover: by Bill Small

No Comment

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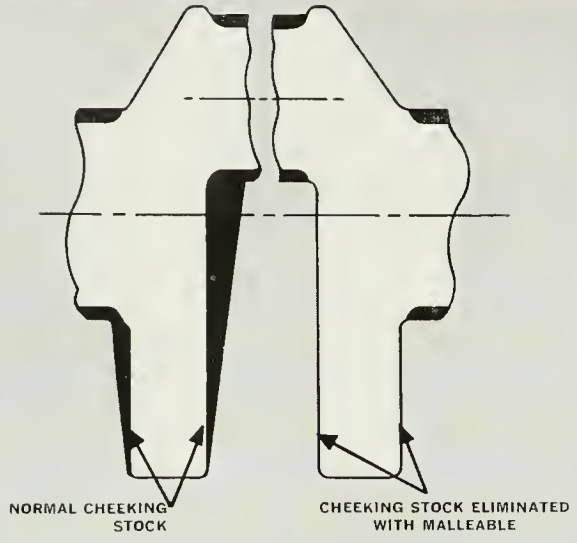
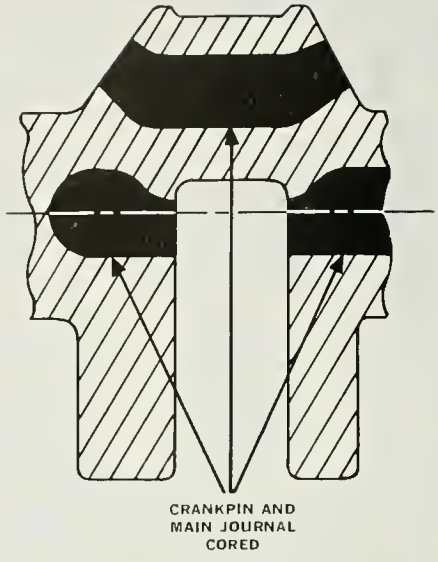


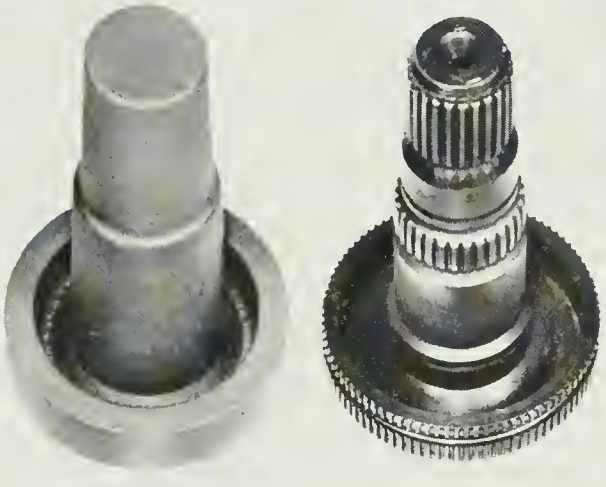
Eliminate Draft Allowance Metal

In designing surfaces perpendicular to a parting line, minimum draft angle requirements can be important to finished cost. By changing these automotive crankshafts to high strength pearlitic Malleable iron castings, the draft angle on sides of counterweights was reduced to one-half of one degree. This eliminated all excess stock formerly required in forming . . . and the machining operations to remove it.



Desired Size Without Excess Weight

These same crankshafts are excellent examples of how to eliminate metal that serves no function. Crankshaft main journals and crankpins are usually solid because of the method used to form them. Made of pearlitic Malleable iron, these areas can be cored out. This substantially reduces the weight of the crankshaft . . . with no loss in functional strength.



Put Metal Only Where It Is Needed

The deep recess at the base of this automotive transmission gear was formerly machined out. Now manufactured of pearlitic Malleable, the recess is created as the part is cast. This eliminates buying unnecessary metal . . . and reduces machining time and cost.

Start Closer To The Finished Part

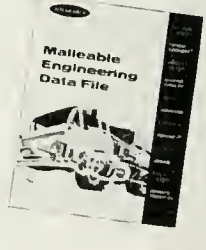
The versatility of design inherent in Malleable castings can save tremendous amounts of money. Final cost of this part was cut 50% by converting to a Malleable casting. A single core provides the sleeve hole, bolt hole, horizontal slot and vertical slot . . . before any machining is done.

Put High Strength Metal Only Where You Want It With Malleable Castings

Casting is the most direct method of forming metal parts. Of all castable metals, *Malleable iron provides the greatest strength per dollar.* Malleable also combines excellent machinability, ductility, fatigue resistance, design versatility, low start-up cost, and low production cost. Available in tensile strengths up to 120,000 p.s.i., Malleable castings offer the designer a wealth of opportunities to improve quality and trim costs.

Send for this 16 page Malleable Engineering Data File. You will find this informative brochure is an excellent reference piece.

MALLEABLE FOUNDERS SOCIETY



MALLEABLE FOUNDERS SOCIETY • UNION COMMERCE BUILDING • CLEVELAND 14, OHIO

ITT: AN AMERICAN CORPORATION WITH AN INTERNATIONAL VIEWPOINT

Facts bearing on professional careers at ITT answering questions frequently asked us by college seniors

A MAJOR CONTRIBUTOR TO U. S. DEFENSE

The largest American-owned international enterprise engaged in all aspects of electronic and telecommunication systems, International Telephone and Telegraph Corporation operates both domestic and foreign divisions and subsidiaries. Among its nine principal U.S. engineering/scientific organizations, four are engaged in advanced work for the Armed Forces and NASA. Programs include:
large scale computer-based command/control systems ☐ global communications systems (line of sight, tropo scatter, lunar bounce, digital, telecommunications) ☐ ICBM base communications and control systems ☐ satellite control & communication systems ☐ engineering support for large scale warning systems ☐ antisubmarine warfare systems ☐ electronic countermeasures ☐ tactical military air navigation systems ☐ ground support & environmental test systems ☐ infrared detection & guidance systems ☐ atomic clocks ☐ systems management: world-wide, local.

DEEP IN DIVERSIFIED U. S. COMMERCIAL ENTERPRISES

Prominent among ITT's domestic commercial products is a new, high-speed digital communication system for large industrial firms. ITT in the U. S. also develops and manufactures a vast variety of radio equipments and systems, automatic programmers, teleprinters, telephone equipment, infrared image converters, image storage and intensifier tubes, high resolution scanners, twt's, coaxial cables and other products.
Today, no less than 53 plants and facilities are operated by 16 ITT divisions or subsidiaries in the United States. Their combined income amounts to roughly 40% of the total figure for the world-wide operations of the parent corporation, whose resources stand solidly behind each operation, at home and abroad.

ITT IN RESEARCH & DEVELOPMENT ENGINEERING

Basic and applied investigations relate to both military and commercial programs. Extensive R & D facilities are provided. To cite one example, ITT's own "Space Communications Research Station," erected in Nutley, N. J., was selected by NASA as one of the ground terminals for the Project Relay experimental satellite communication system.

A PIONEER IN SYSTEMS ENGINEERING

ITT's long experience in the operation of world-wide communication systems has made it a logical choice for both systems development and systems management contracts awarded by the Armed Forces. Examples are:
Systems development, design and management of the vast SAC global command/control system 465-L ☐ Coordination and management of the 10 year program to expand and modernize AIR COM, global communications system of the U. S. Air Force.

GLOBAL PRACTITIONER OF FIELD ENGINEERING

In the Arctic, in the Tropics, on land, afloat, or undersea, ITT skills in on-site engineering for every kind of communication or large scale electronic system have been thoroughly tested. It is equipped to provide complete engineering support anywhere in the free world. This includes installation, operation, maintenance, evaluation and continuous modernization, as assignments may require. ITT's responsibilities in field and applications engineering include:
operation, maintenance and testing of Pacific Missile Range facilities for the U. S. Navy ☐ engineering support, installation and maintenance for a global digital command and control system for SAC ☐ tropo scatter communication systems spanning nations in Europe and Asia ☐ 6,000 miles of advanced radar and communications equipment on DEWLINE.

UNIQUE INTERNATIONAL RESOURCES FOR PROFESSIONAL ENRICHMENT

ITT foreign affiliates and subsidiaries operate public telephone systems in 19 countries. In addition, more than 12 overseas laboratories have made many significant advances in communications technology. Technical papers and progress reports steadily circulate among R & D people both at home and abroad, and leading ITT scientists and engineers participate in international seminars conducted annually by the company.

OPPORTUNITIES EXIST FOR RECENT GRADUATES AT THE BS, MS and PhD LEVELS WITH 9 U. S. MEMBERS OF THE ITT CORPORATE FAMILY

ITT Components Division, Clifton, N. J. ☐ ITT Communication Systems Inc., Paramus, N. J. ☐ ITT Federal Electric Corporation, Paramus, N. J. ☐ ITT Federal Laboratories, Nutley, N. J. ☐ ITT Federal Laboratories, Ft. Wayne, Ind. ☐ ITT Industrial Laboratories Division, Ft. Wayne, Ind. ☐ ITT Information Systems Division, Paramus, N. J. ☐ ITT International Electric Corporation, Paramus, N. J. ☐ ITT Kellogg Communications Systems Division, Chicago, Ill.

For detailed information about specific positions in your special field of interest, make an appointment through your College Placement Director for an On-Campus Interview or write directly to: Mr. W. A. Moorhead, Mgr., Recruitment and Placement, North America, International Telephone and Telegraph Corporation, 320 Park Avenue, New York 22, N. Y. An Equal Opportunity Employer

ITT

The U In Future

By George Pusey, Chairman of Engineering Open House

With your permission, I would like to divide you—the high school students who read this article—into three broad groups.

1) FUTURE UNDECIDED—Those of you who are still undecided as to your future career.

2) FUTURE ENGINEERS—Those of you who are definitely interested in becoming engineers.

3) FUTURE NON-ENGINEERS—Those of you who are not interested in becoming engineers.

If you have a very limited time to read this article, read the first part and then that portion which concerns your groups. All of you are about to embark upon a career which you are likely to follow for the *rest of your life*. Since that will be a long time, you should take a good look at yourself. It may sound odd, but we spend too much time looking at the different careers and not enough time looking at ourselves. Before you can possibly hope to choose a career wisely, you must take a good long look at yourself—your goals and abilities. What do you really want in life?—Really!

When you are sure of what you want out of life and what your abilities are, then, and only then, are you ready to examine different careers. Ask this of each career:

1) Does it help me find what I really want in life?

2) Do I have the ability required?

You should talk with your parents, high school counselor, teachers, and friends. They have a knowledge of your abilities and a general knowledge of many fields. From talking with them, you should be able to determine the general area in which your talents lie.

When you begin to think about specific careers, you should talk with as many people in these careers as possible. However, do not use their conclusions concerning the field *until you know the reasons behind their conclusions* because their wants and abilities are not yours. To ufse their information in your conclusions you must know the *WHY* behind their conclusions.

During Engineering Open House, May 10th and 11th, there will be information booths in each of the engineering departments, the Illini Union, and the Assembly Hall. Do not hesitate to come by and ask questions. Here is your chance to talk with many engineering students and faculty and to get their views on engineering.

Future Undecided

I consider those of you who are UNDECIDED to be the most important group. All of us were in your group at one time or another. Certainly I was on the fringe of this group when I first came to Engineering Open House during my junior year in high school. Engineering Open House is one of the many sources of information which I used in reaching my decision to become an engineer. Before you reach a decision as to what career is best for you, you should go through the reasoning process I outlined above. Know what you want, and what you are capable of doing; then look at the different careers.

Talking with the people in the career is one of the best ways to find out what the career supplies in terms of your wants, and what it requires of you. BUT DO NOT ASK THEM FOR JUST THE GOOD OR BAD POINTS, ask them for the reasons WHY they feel the way they do. It is not always easy to find the *true* reasons why people feel as they do. You must use some judgment of your own here, but it is essential that you know the reasons behind their conclusions if they are to be of any benefit to you. Also, do not make hasty conclusions. Be sure to talk with many people, and hopefully, a few of them will have goals similar to yours. These people will be of more help than someone with completely different goals.

I hope that you will come to Engineering Open House—for it is here that you will have a chance to talk with many students and faculty in the Colleges of Engineering, Veterinary Medicine, and Architecture. You will find many opinions among the student body, ranging from good to bad. So, again I emphasize the importance of knowing the reason *WHY* the person is saying good things or bad things about engineering, or any other field.

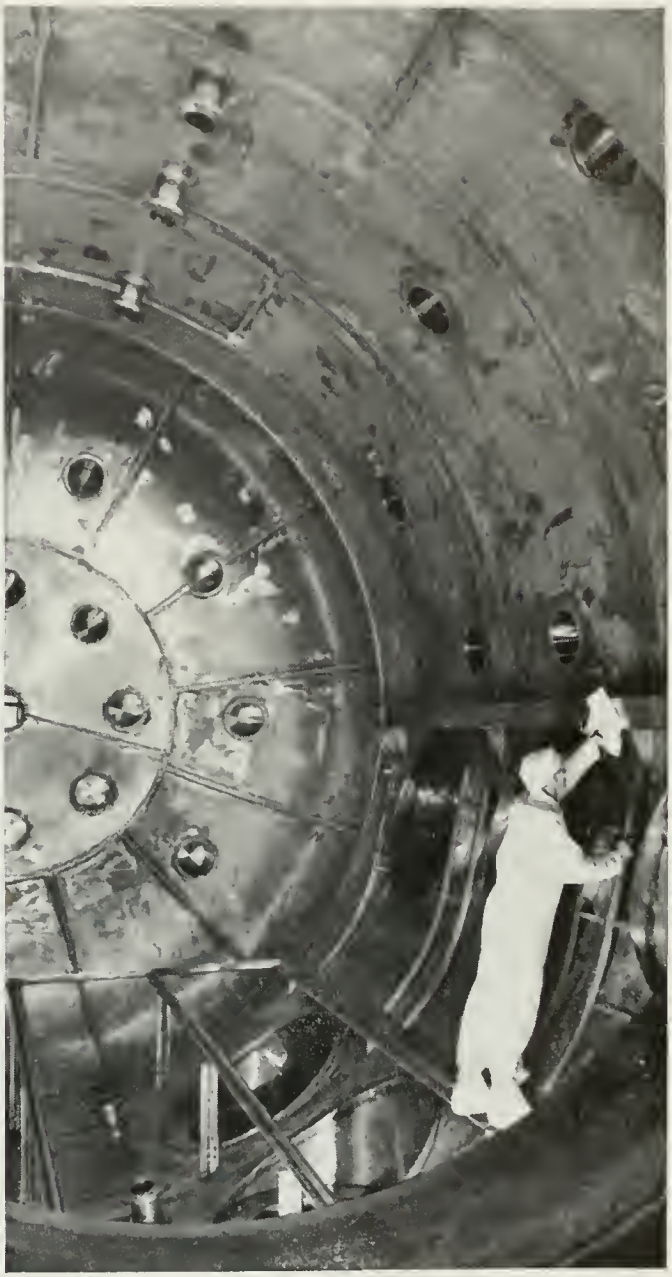
Future Engineers

Those of you who are DEFINITELY INTERESTED in becoming engineers have managed, wisely I hope, to narrow your choice of careers to one field—engineering. But, I hope you realize, and I am sure that most of you do, that engineering is subdivided into many areas. While it is not essential that you know the area in which you want to specialize when you enter engineering college, you should try to set up goals, or areas of study, based on the knowledge which you now have. As you progress with your education, you will need to modify these goals to coincide with a better understanding of yourself—your wants and abilities.

You are probably trying to decide what phase of engineering is best for you. The best way for you to do this is to talk to the students, faculty, and graduates in various fields of engineering. Do not just find out what they think is good or bad about a particular field, find out *WHY*. Only when you know the *why* can you apply their conclusions to the problem facing you.

One of the first opportunities for you to talk with

(*Continued on Page 53, Column 1*)



FROM THE OCEAN'S DEPTHS...TO OUTER SPACE

Striking examples of Bendix research facilities are the huge sonar tank in California and the space chamber in Michigan, among the most completely equipped in the free world. These facilities, designed and financed by Bendix, characterize our continuing advanced product research and development efforts.

College graduates will find a variety of technical challenges. Bendix participates in almost every phase of the space, missile, aviation, electronics, automotive, oceanics and automation fields. We employ top-notch engineers, physicists, and mathematicians at all degree levels.

Bendix operates 32 divisions and subsidiaries in the United States, and 12 subsidiaries and affiliates in Canada and overseas. Our 1950 sales volume was $210 million. Last year it was over $750 million.

Look over the materials we have in your school's placement office. Talk to our representative when he's on campus. Meanwhile, if you'd like to have your own copy of our booklet "Build Your Career to Suit Your Talents," write to Dr. A. C. Canfield, Director of University and Scientific Relations, The Bendix Corporation, Fisher Building, Detroit 2, Michigan. An equal opportunity employer.

THERE ARE BENDIX DIVISIONS IN: CALIFORNIA, MISSOURI, IOWA, OHIO, INDIANA, MICHIGAN, PENNSYLVANIA, NEW YORK, NEW JERSEY, MARYLAND.

WHERE IDEAS UNLOCK THE FUTURE

THE Bendix CORPORATION

FISHER BUILDING, DETROIT 2, MICH

Welcome . . .

to

Science and Engineering Weekend 1963

by Dean H. L. Wakeland

This year's student-sponsored "Engineering Open House" is uniquely different from those in the past. University of Illinois engineering students have combined this event with the Illinois Junior Academy of Science State Fair, the 11th Annual Junior Engineering Technical Society Exposition and Conference for the Central U. S. Division, and the Veterinary Medicine Open House to make the weekend of May 10 and 11 an enlightening one for high school students and visitors interested in science or engineering. In addition, the new circular Assembly Hall, a true engineering marvel, will be open for inspection.

For years, engineering students at the University of Illinois have set aside one weekend each spring to open the doors of the Engineering College to acquaint prospective students and friends with the facilities and educational programs of the college. At this event visitors can talk with faculty members and students and see some of the laboratory facilities in use. Exhibits and demonstrations are presented to acquaint the public and prospective students with engineering education and opportunities as well as with the types of work engineers perform.

The students and staff in the College of Engineering welcome YOU to YOUR university. The facilities, programs, and opportunities here are YOURS—the citizens of Illinois. The College of Engineering is truly one of the greatest in the nation—but only because the citizens of Illinois have been willing to generously support it.

As you walk through the various laboratories, you may be more impressed by the bigness of the facilities—the Mark II Triga Nuclear Reactor, the 3 million pound test machine, electron microscopes, IBM 1401 and 7090 computer facilities, the betatron and cyclotrons—yet the simpler, more readily understood exhibits probably give a better representation of the basic physical laws used in engineering. Exhibits of stream flow, basic electronic circuits, gears and mechanisms, roof frames, and models of atomic structures of materials depict more simply and clearly some of the physical and chemical principles upon which the larger or more mysterious exhibits are built. Try to look beyond the outward results of exhibits and ask why they function as they do. Do not let size or complexity distract you from the basic principles being displayed.

If you leave feeling that the field of engineering is too big and broad to easily visualize, then you will also realize the unlimited opportunities in engineering. Presently, there is a tremendous need for engineers in all fields, but, unfortunately, engineering freshman enrollments have been dropping during the past few years. Few fields have the opportunity, challenge, interest, and rewards that engineering offers. Nearly 200,000 unfilled engineering positions currently exist, and salaries are at an all-time high. The reason most engineers selected this vocation, however, is the continually changing challenge. Each day they must stretch themselves to solve new problems and continually ask, "How can I do this?", "What materials shall I use?", "Is there some other solution that may be more economical or efficient?", "How can I obtain this part quickly?", or "Will I be able to meet the time schedule?".

As you tour our campus, a few facts about the College of Engineering are not self-evident. For instance, last year the College of Engineering graduated the second largest number of engineering bachelors degrees of any school in the nation, the third largest number of masters degrees, and the second largest number of doctors degrees. No other single institution conferred more total degrees in engineering than Illinois last year. In addition, Illinois had the second largest research budget. This indicates that the program is well balanced, and during last year no other school was consistently in the top five in each of the categories, as was Illinois.

Each year approximately 700 students receive a bachelors degree in engineering and about 1,000 freshmen enter this field at Urbana each fall. A great majority of the classes in engineering are still taught with 24 students per section or less. Instruction in every major engineering field is offered, and most minor fields are also included.

Since there is a great need for capable young men and women to enter the engineering field, we are hopeful that many Engineering Open House visitors will have their interest sparked and become more aware of engineering and the engineer. Parents, high school teachers, and prospective students can obtain more information about the College of Engineering by coming to 106 or 103 Civil Engineering Hall. ◆◆◆

Variety: the spice of life at American Oil

by Jim Koller

"When I was first interviewed by American Oil representatives I was told I'd be given a free hand in guiding a wide variety of projects. This promise has certainly been kept!"

Jim Koller, 25 years old, came to American Oil right out of the University of Wisconsin where he earned his Bachelor of Science degree in Chemical Engineering. An Evans Scholar at Wisconsin, Jim describes his job at American Oil this way: "I work on basic chemical engineering problems, specializing in reactor design and process development problems. Before a process can go commercial, it must be tested in pilot plants. That's where I come in." Jim wants to stay in the technical research area, and plans to enroll in the Illinois Institute of Technology night school for courses in advanced mathematics.

The fact that many gifted and earnest young men like Jim Koller are finding challenging careers at American Oil could have special meaning for you. American Oil offers a wide range of new research opportunities for: Chemists—analytical, electrochemical, inorganic, physical, polymer, organic, and agricultural; Engineers—chemical, mechanical, metallurgical, and plastics; Masters in Business Administration with an engineering (preferably chemical) or science background; Mathematicians; Physicists.

For complete information about interesting careers in the Research and Development Department, write: D. G. Schroeter, American Oil Company, P.O. Box 431, Whiting, Indiana.

IN ADDITION TO FAR-REACHING PROGRAMS INVOLVING FUELS, LUBRICANTS AND PETROCHEMICALS, AMERICAN OIL AND ITS AFFILIATE, AMOCO CHEMICALS, ARE ENGAGED IN SUCH DIVERSIFIED RESEARCH AND DEVELOPMENT PROJECTS AS:

New and unusual polymers and plastics • Organic ions under electron impact • Radiation-induced reactions • Physiochemical nature of catalysts • Fuel cells • Novel separations by gas chromatography • Application of computers to complex technical problems • Synthesis and potential applications for aromatic acids • Combustion phenomena • Solid propellants for use with missiles • Design and economics: new uses for present products, new products, new processes • Corrosion mechanisms • Development of new types of surface coatings.

STANDARD

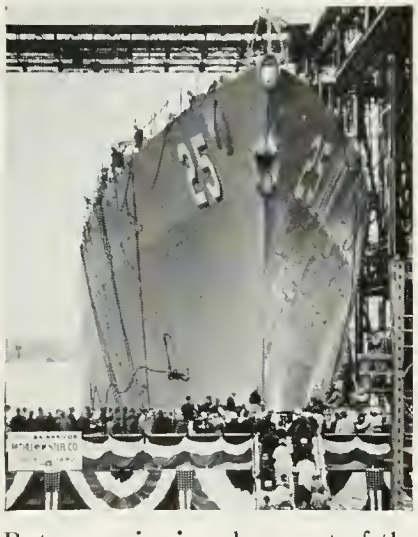
STANDARD OIL DIVISION
AMERICAN OIL COMPANY

Opportunities are better than ever at Bethlehem Steel!

What has Bethlehem Steel been doing lately?

. . . designing and building nuclear-powered naval vessels
. . . moved into new research laboratories unexcelled by those of any industry
. . . building new mills, the last word in steelmaking technology
. . . fabricating and erecting steelwork for the nation's great structures

Bethlehem Steel is one of the largest steel producers . . . one of the largest industrial corporations . . . one of the largest structural steel fabricating and erecting operations . . . and *the* largest privately owned shipbuilding and ship repair organization.



But mere size is only a part of the story. Throughout Bethlehem Steel the key word is *new*. New facilities, new products, new ways of doing things—exciting new developments providing rewarding careers for able and energetic young men who join this organization through the Loop Course.

What is the Loop Course?

The Loop Course is our program designed specifically to train men for management careers. New loopers report to our general headquarters in Bethlehem, Pa., early in July. They attend a basic course of five weeks, including talks and discussions by top Company officials, educational films, and daily plant visits (this circuit, or "loop" through a steel plant, is what gave the course its name). The Loop Course is *not* a probationary period. After completion of the basic course, every looper receives his first assignment, whereupon he goes through another, more specialized, training course before beginning actual on-the-job training.

Loopers are Career Men

We select qualified men for the Loop Course on the basis of their potential for careers in management. In most years we enroll over a hundred graduating seniors, most

of them engineers. There are about 2,000 loopers on the job today at Bethlehem, at all levels of management, in our General Offices, and in all of our diverse operations, which include steel and manufacturing plants, research, sales, mining, fabricated steel construction, and shipbuilding.

Read Our Booklet

The eligibility requirements for the Loop Course, as well as how it operates, are more fully covered in our booklet, "Careers with Bethlehem Steel and the Loop Course." Copies are available in most college placement offices, or may be obtained by writing to Manager of Personnel, Bethlehem Steel Company, Bethlehem, Pa.

An equal opportunity employer

Steel

BETHLEHEM STEEL

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Instant portable power... any time, any place

In this battery-sparked new world of portable convenience, hand tools are driven by their own rechargeable batteries . . . toys perform their tricks by remote control . . . a hearing aid with its button-size power cell can be slipped into the ear . . . cordless radios and television sets are lively companions in the home or outdoors . . . missiles and satellites are guided through the vastness of space. ▶ Developments like these have brought more than 350 types of EVEREADY batteries into use today, 73 years after Union Carbide produced the first commercial dry cell. Ever-longer service life and smaller size with power to spare are opening the way for batteries, such as the new alkaline cells, to serve hundreds of new uses. ▶ For the future, along with their research in batteries, the people of Union Carbide are working on new and unusual power systems, including fuel cells. And this is only one of the many fields in which they are active in meeting the growing needs of tomorrow's world.

A HAND IN THINGS TO COME

UNION CARBIDE

LOOK *for these other famous Union Carbide consumer products—*
LINDE *Stars,* PRESTONE *anti-freeze and car care products, "6-12" Insect Repellent,* DYNEL *textile fibers.*
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PROJECT MANAGEMENT
R. J. Hayes
Indiana Tech—BSME—1956

SALES ENGINEERING
R. J. Hummer
University of Toledo—BSEE—1961

DEVELOPMENT ENGINEERING
J. H. Trumble
University of Dayton—BSEE—1960

There's a challenging, rewarding future fo

C.W. Ludvigsen, Manager—Systems Sales, tells how creative graduates contribute to pioneering, automation developments.

Now, to meet the pressing challenge of industrial automation, Cutler-Hammer has formed a number of automation project teams.

These teams combine the technical and manufacturing talents of versatile, seasoned specialists and you, creative-minded engineering and business graduates.

Their primary job: to make sure that a customer's automation investment pays an adequate return.

How they work

How do they meet this challenge? By working with customer engineers and consultants to isolate cost problems in industrial process, manufacturing, and warehousing operations. Then, by applying their individual talents and creative ingenuity to develop, design, build, and install practical automation systems that will insure good return on investment.

Where they work

Automation teams work together in a Milwaukee-based, modern, 500,000 square foot plant specifically designed to house every activity involved in the evolution of a complex system . . . in a creative climate that is conducive to imaginative planning and pioneering development.

What they have done already

This approach has paid off! Th industry has barely scratched surface of the automation pote our credentials already are impressive.

Profit-making automation y tems such as . . . a bundle-han system for 30 major newspaper rooms . . . a package-handling y tem for a prominent publishe U.S. Post Office mail-hand systems in 14 major cities . . . p handling systems . . . more th score of major steel-mill finis lines . . . automatic warehouse trol systems . . . and auto body handling systems are just a examples of our creative plan and developmental skill at wo

What is your opportun y

What are the advantages to

OMATION PROBLEM SOLVERS

ANUFACTURING ENGINEERING
H. Menzel
ichigan Tech—BSME—1955

CONTROL ENGINEERING
L. Gall
University of Illinois—BSEE—1960

ANALYTICAL ACCOUNTING
A. E. Morgan
University of Wisconsin—BA—1960

u, too, on a Cutler-Hammer automation team

young, creative-minded grad- Short range, it's an exceptional tunity—if you spark to the nge of finding new solutions ugh manufacturing problems. nusual opportunity to get y involved in problem solving from the start!

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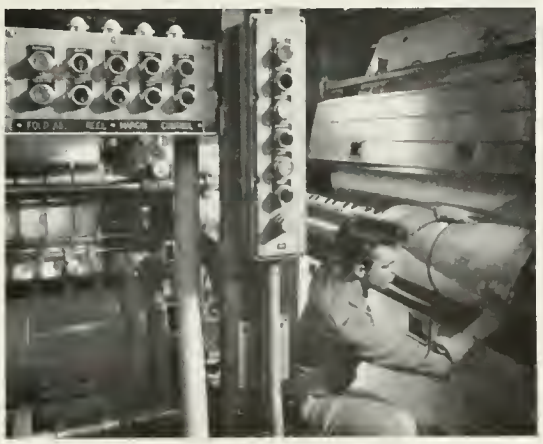
t to know more?

today to T.B. Jochem, Cutler- ner, Milwaukee, Wisconsin, mplete information. And, plan eet with our representative he visits your campus soon.



A CUTLER-HAMMER AUTOMATION TEAM helped the WALL STREET JOURNAL solve major production and distribution problems of a national newspaper by designing and building control systems for two new, highly automated printing plants. Controls permit the world's fastest presses to produce newspapers at the rate of 70,000 per hour.

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WHAT'S NEW? ASK...

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CONTROL

The Junior Engineering Technical Society

Freshman Student: I want to enroll in Engineering.

Dean of Engineering: What kind of Engineering?

Freshman Student: Just Engineering. Isn't Engineering all-inclusive? I never knew there were many kinds.

The above conversation is typical on college campuses during registration. There are nearly 100 definite fields of specialization within the engineering discipline. A recent article in the *Journal of Engineering Education* mentions, "The largest number of different degrees currently offered are found in engineering fields, with almost 350."

We could continue indefinitely listing the various questions constantly being asked about engineering. Two questions are sufficient, however: What is engineering, and who is qualified to become an engineer?

The above basic questions, among others, are those the Junior Engineering Technical Society, better known as JETS, is trying to help high school students answer.

JETS has been called the 4-H of engineering. It is international in scope, and its national headquarters are located in the United Engineering Center in New York City—the headquarters of most of the engineering societies. State and area coordinating offices are distributed geographically throughout the United States at leading engineering colleges. Local chapters are organized at high schools by students interested in learning more about engineering or applied science. Each JETS chapter is sponsored by a teacher and is provided with one or more engineering advisors who are practicing engineers in the community.

The chapters meet as frequently as they desire and organize themselves to suit their local situation. Chapters undertake projects, discussions, and activities that are connected with engineering and applied scinece. Their engineering advisors help them with information, materials, and general counsel in the different areas of individual or group interest.

This year JETS has started an aptitude search open to all students between the 7th and 12th grades. A 2½-hour battery of tests is given to the participants. The results of these tests are scientifically evaluated and returned to the students. Those participating in the search are followed until graduation with guidance material based on their aptitude. A fee of $2.00 per student is charged which covers the tests plus the follow-up guidance. Awards are given to those making notable scores on the tests.

Early in the fall leadership conferences are held at state or area levels. These usually take place on a weekend and may last from one to two days.

During the spring, state or area expositions are held throughout the country, followed by a national exposition. At the expositions both papers and projects are presented by the chapter members who have participated in the JETS program.

In Illinois during the summer, two-week orientation programs in engineering and applied science are offered under the sponsorship of JETS and the faculties and staff of the universities hosting the programs. These two-week programs bring the students to a college campus and familiarize them with the requirements of college life and the different aspects of engineering as seen at the college level.

JETS is a fully rounded guidance and orientation program for students who might be interested in engineering or applied science. The program does not force school authorities or teachers to spend undue extra time working with the chapter. The major portion of the work is carried on by the engineering advisors. They are able to bring to the members the professional experience of a practicing engineer.

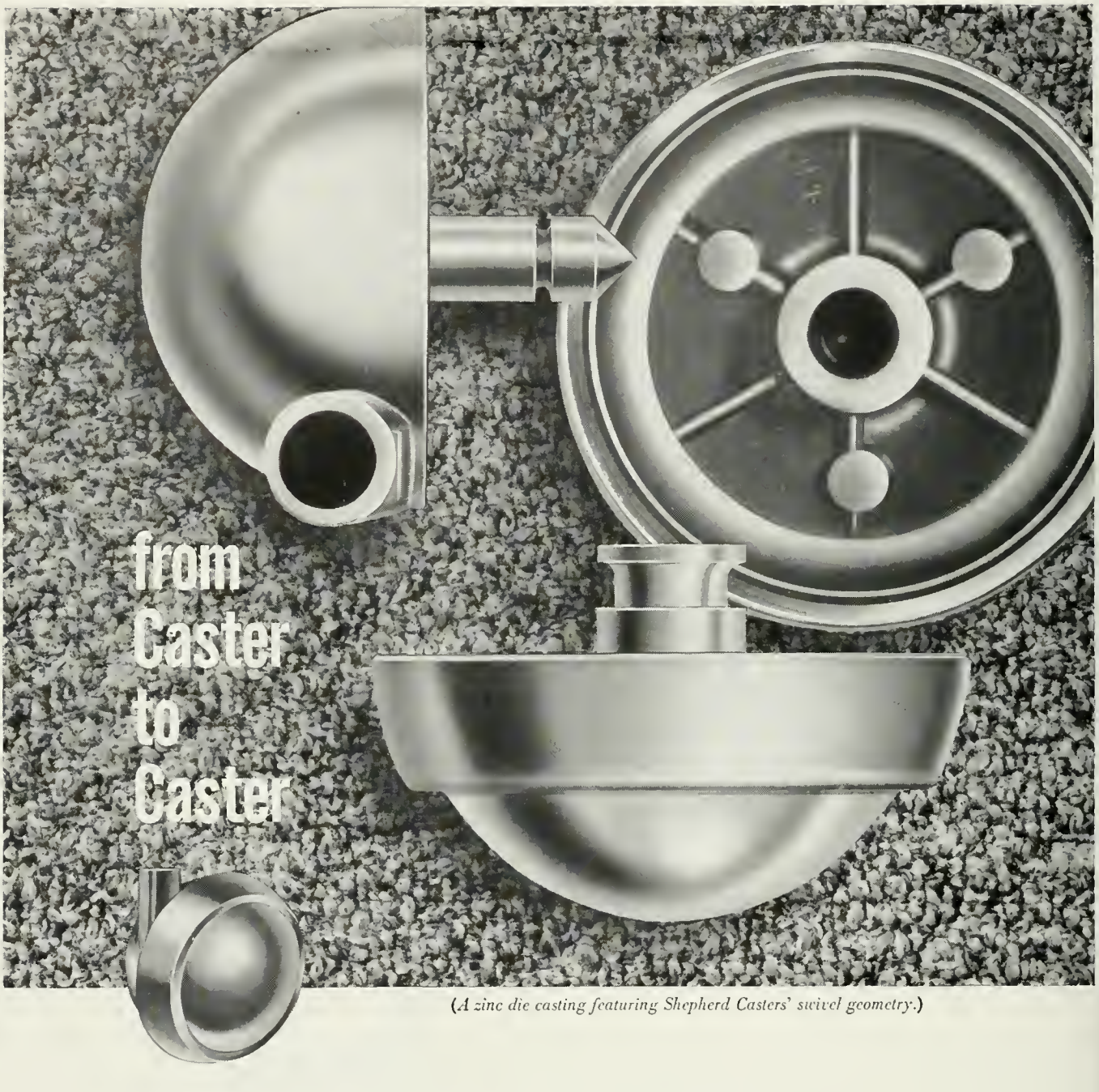
JETS is fully recognized in Illinois by the Illinois High School Association and at the national level by leading educational associations, and scientific and professional engineering societies.

JETS is entirely supported by contributions from industry and professionaly organizations. Each chapter pays an annual fee of $5.00 to enroll in the program. This fee entitles the chapter to all the services of the national, state, and area offices. There is no individual member fee. The $5.00 annual fee covers the entire membership of a chapter.

In our advancing technological and scientific world it is difficult for high school students, teachers, and parents to be aware of the work performed by engineers. A high school student who is considering professional study should have the opportunity, while in high school, to become acquainted with the different professions and the opportunities open to him after graduation. Only by close investigation of all careers can a student make a sensible choice of profession. JETS is a vehicle by which any high school student may evaluate his aptitudes, abilities, and interests for the engineering profession.

Our complicated educational structure makes it desirable that a student, early in his high school education, decide upon the profession he intends to pursue. College entrance requirements vary considerably and a student cannot wait until his last semester to properly prepare for admission into the curriculum of his choice. The decision must be made at least by the end of the junior year. JETS is a good way for high school students to determine whether or not they wish to enter engineering. *Students who are undecided should follow the high school courses necessary to gain admittance to a school of engineering.* This sequence will usually allow them to enter any college.

On May 10-11, JETS will hold the Central Division of the 11th Annual National JETS Engineering Exposition and Conference on the University of Illinois campus. The Second Annual State of Illinois JETS Exposition will also be held at this time as part of the National Exposition. The meeting will bring together participants from states in the central area of the country. The Illini Union Ballroom will be the exhibit area and the exhibits will be open to the public both on Friday, May 10, from 9:00 a.m. to 9:00 p.m. and Saturday, May 11, from 9:00 a.m. to 5:00 p.m. Saturday morning from 9:00 to 12:00 in Room 314, Altgeld Hall, JETS papers will be presented by chapter members. The public is cordially invited to attend both the paper sessions, as well as to visit the exhibits. On Saturday, May 11, at noon in the Illini Room of the Illini Union, and awards luncheon will be held. Complimentary tickets will be given to representatives of the different JETS chapters who are attending the exposition. ◆◆◆



(A zinc die casting featuring Shepherd Casters' swivel geometry.)

Mr. Engineer—How else would you make it?
Are you interested in the search for practical solutions to ever changing problems? The die casting process has infinite technical requirements, and the limitations are only those of the mind which accepts the challenge of further development.

NEW PRODUCTS CORPORATION
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Illinois Junior Academy of Science

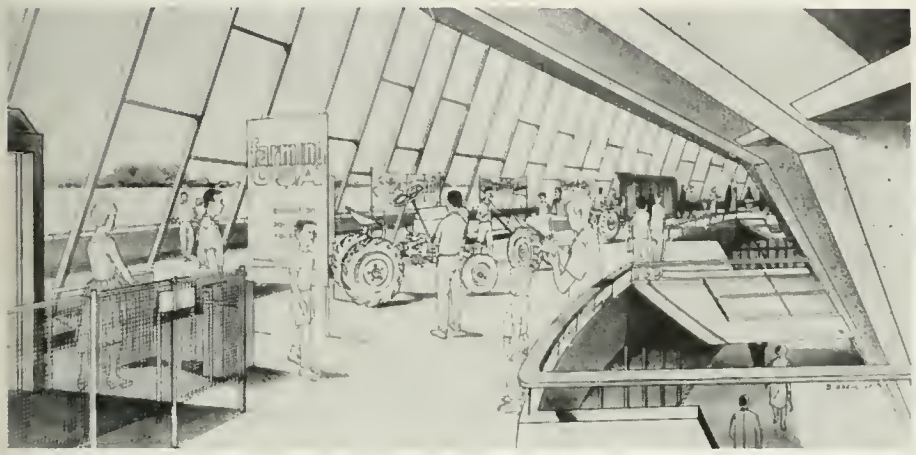

Figure 1. An artist's conception of the concourse of the Assembly Hall with an exhibition in progress. The Junior Academy will use this space for their exposition this year.

The Illinois Junior Academy of Science, largest and oldest Junior Academy in the United States, is an organization of junior and senior high school students interested in research in all areas of science and mathematics.

Since 1927 the Junior Academy, under the auspices of the Illinois State Academy of Science, has grown from one meagerly attended yearly meeting to eleven yearly meetings. The state is divided geographically into ten districts and the best student investigations from a school's individual science fair are sent to the district exposition in April. After a day of further judging the best projects are awarded first place and these students are eligible to enter the State Science Exposition. Last year over 1500 students vied for top honors in the state exposition. These top students were selected from over 40,000 students participating in the program in the state of Illinois.

The Illinois Junior Academy of Science State Exposition is a two day activity. The first day is devoted to the exposition of the projects while the second day is primarily for the presentation of student research papers.

On Friday, May 10th, beginning at seven in the morning and lasting until ten in the evening the some fifteen hundred students exhibiting projects, will be very busy setting up their projects, adjusting and explaining their masterpieces.

Approximately 500 judges, representing university scientists, industrial scientists, science teachers and various lay people begin carefully evaluating the student investigations and talking with the students. Each judging team of three people carefully judge from five to eight projects and spend from ten to thirty minutes with each student. Along with quizzing the student about his apparatus and his knowledge of the subject, the judges also carefully scrutinize the student's research paper, offering comments and assistance. Awards which the judges must decide upon for each project consist of First, Second and Third, and the top award, Outstanding. The rating of outstanding is a very special citation. Only 5% of all of the state entries receive this coveted award. The work for an outstanding exhibit represents definite genius and would be in the opinion of the judges comparable to the work of a Master's Thesis of a college student.

When the judges are finished talking with a student, the student still finds himself busy explaining his exhibit to other interested high school students, university students and the general public. During the rest of the afternoon, the students will have ample time to attend the Engineering Open House along with the other very worthwhile open houses and special campus activities.

Promptly at 4:30 the students must return to the Exposition Hall to receive their awards from the various judges and Junior Academy Officers. Between this time and 6:30 the students must remove their projects and get ready for the Annual Junior Academy of Science Banquet.

The banquet, planned by the student officers of the junior academy is held in the banquet hall of the Illini Union and lasts for two hours. Among special guests recognized are the state winners of the Westinghouse Science Talent Search, the Outstanding Project winners and the officers of the junior academy. Following the meal, a brief lecture will be given by one of the men of the university science faculty. Following the banquet the students are free to attend the various special campus activities planned for them.

The students who stay over until Saturday, usually the largest percentage, spend their morning attending the Paper Session Program of the Junior Academy of Science.

The paper session is separate from the project section. The student sends his particular research paper to the paper session chairman in mid-March. The chairman then sends the paper on to a head judge in the various sciences and mathematics. The paper is then carefully scrutinized by the head judge and his committee of scientists and teachers. The best five projects are invited to be read at the Saturday session. During the readings of these papers, judging is again made, with the best papers judged First Place. These winners are then honored at a special Honors Assembly at 11:30 Saturday morning. The winners receive token monetary awards and are invited to have their paper published in the *Transactions*, the official publication of the State Academy of Science. This program officially ends the Junior Academy of Science State Exposition. The students are free in the afternoon to attend the various open houses.

All readers of the *Technograph* are cordially invited to visit the State Science Exposition of the Illinois Junior Academy of Science, during the Engineering Open House. We feel sure you will be impressed with the fine science talent present in our junior and senior high school students. ♦♦♦

Electronic Engineers, Physicists, Mathematicians, BS-MS-Phd

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Virtually all of the advanced technical disciplines involved in large electronic system complexes are embraced in the R&D programs at the 17-laboratory organization at Sylvania Electronic Systems. Study the chart below to see if *your* chosen field of endeavor is listed.

	APPLIED RESEARCH LABORATORY Waltham, Massachusetts Central Research Facility for Entire Division	EASTERN OPERATION Laboratories at Waltham, Massachusetts and Needham, Massachusetts	CENTRAL OPERATION Williamsville, New York Advanced Communications Systems Laboratories	WESTERN OPERATION Mountain View, California Electronic Defense Lab; Reconnaissance Systems Lab
Advanced Systems Planning	●	●		
Advanced Phased Array Antenna Systems		●	●	
Aerospace Systems Research & Development	●	●	●	●
Airborne Instrumentation	●		●	●
Antenna Research & Development		●	●	●
Command & Control Systems	●	●		
Communication Techniques Research & Systems Development	●	●	●	
Data Processing & Display Systems R&D	●	●		●
ECM & ECCM Techniques	●		●	●
Electronic Tactical Warfare Systems				●
Information Handling Systems	●	●		
Intelligence & Reconnaissance Systems			●	●
IR Sensor Techniques	●	●		●
Microwave Research & Development	●	●		
Microelectronics Research		●	●	
Navigation Techniques	●		●	●
Operations Research	●	●		●
Optical Data Sensing Systems		●		●
Radio & Radar Research	●	●	●	
Reliability		●	●	●
Speech & Character Recognition Research	●			
Solid State Devices	●		●	
Simulator Systems	●	●	●	
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UHF-VHF Circuit & Component Design		●	●	●

Now consider the opportunity for personal growth offered by our parallel advancement plan. Here, you can pursue your career as an Engineering Specialist, choose Technical Management or go into Program/Project Management. In all cases, the rewards and advancement opportunities are *equal*.

Sylvania Electronic Systems is a major division of Sylvania Electric Products Inc., and provides over-all systems engineering and management on major government projects for the parent company, General Telephone & Electronics.

For further information, contact your College Placement Director or write to Mr. Robert T. Morton.

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AN EQUAL OPPORTUNITY EMPLOYER U. S. Citizenship required

Figure 1. Using the latest techniques in surgical equipment, U. of I. veterinarians perform abdominal surgery on an aging dog. Small animal surgery will be performed at Vetevue.

Vetevue

A Review of Vetinary Medicine in the Space Age

Vetevue, a revue of Veterinary Medicine in the Space Age, will be a special feature of the Science and Engineering Weekend at the University of Illinois, May 10 and 11. Live surgery, exhibits and demonstrations will highlight the revue.

Surgery will be performed on large and small animals. Goats will be used for rumenotomies—surgical operations often necessary in "Hardware Disease." This condition, most common in dairy cattle, results when animals swallow nails, wires and other objects present in their feed. No harm is done unless the objects penetrate the stomach wall. Rumenotomies are commonly performed on all ruminants—cattle, sheep and goats.

Horses will be used to demonstrate an anesthetic agent, sucostrin. When injected into the horse's vein, sucostrin causes the skeletal muscles to relax completely. Within seconds, the horse "goes to sleep," allowing approximately eight minutes of surgical anesthesia. This drug is used commonly in practice as an aid in performing castrations, minor operations and mouth examinations. After 10 to 15 minutes, the animal completely recovers from the anesthetic.

Small animal surgical operations will be performed on dog patients of the University of Illinois Small Animal Clinic. Possible small animal surgery includes the delivery of pups via Caesarian section, the routine "spay," tumor removal and the repair of bone tractures.

Chickens will be used to demonstrate use of radio-active isotopes in diagnosing disease. The isotope of calcium will be fed to hens, absorbed by their bodies and eventually incorporated into the egg shells. Vetevuers will be able to use geiger counters to find the "hot" eggs after they have been dispersed among normal eggs.

The electron microscope will also be shown. This machine is used to view viruses and study bacteria in much greater detail than that allowed by light microscopes. Magnifications of 50,000 to 100,000 times are possible with the electron microscope.

A sheep will serve as a subject for the polygraph or "lie detector." Changes in blood pressure, respirations, and the pattern of heartbeat are graphically recorded simultaneously.

Other demonstrations include the making of microscopic slides, giving medicine to dogs and cats, the mothering effect brought about by injecting a female hormone into a rooster and the role clinical laboratory procedures play in diagnosing disease. Each person present will have the opportunity of hearing his own heartbeat amplified over a loudspeaker.

Another highlight of Vetevue will be a film, *The Gentle Doctor*, which traces the co-existence of man and beast through the centuries and also the role of the veterinarian during the past 4,000 years in caring for and protecting domestic animals.

Care of the aged or geriatric dog will be featured in one of the small animal displays. Splints on parakeets will also be a feature.

X-rays of calves destined to be dwarfs will be shown and compared with X-rays of normal calves. A display of radiography equipment will also be exhibited.

Vetevuers will be able to observe tissue cells growing inside a test tube. This is known as tissue culture, a method for producing vaccines against virus diseases. The importance and care of germ free animals will be another feature of the exhibits.

Displays on cancer, tuberculosis, and other diseases as prevalent in animals as in people will be presented. Other displays involve the detection of poisons in animal tissues, the prominence of parasitic conditions in animals, the care of laboratory animals, and the zoonoses—diseases transmitted between people and animals. Other presentations will emphasize anatomy and physiology. ♦♦♦

Figure 2. Dr. H. J. Hardenbrook, U. of I. veterinorian, displays nails, wires and other hardware surgically removed from the goat held by Ray Smith, senior in veterinary medicine. Hardware disease results when animals swallow metal objects which accidentally get into their feed. The surgery necessary to remove hardware will be performed at Vetevue.

Action: Now under Army test, a Ford-designed glass filament torsion bar that's lighter, stronger, more flexible than steel

"Looks like you've got something there," the Army Tank Command said in effect to Ford Motor Company engineers. "Let's do a feasibility study on tracklaying military vehicles."

The story begins in 1957 when Ford engineers conceived the idea of a plastic-bonded glass filament torsion bar for vehicle suspension systems. It was a revolutionary departure from the use of solid steel. It promised dramatic weight savings in battle tanks, in personnel carriers and other military vehicles. For example, as much as 1,000 pounds in medium tanks.

Compared to steel, the tubular-shaped glass filament composition has greater energy storage potential—is stronger and more flexible under heavy load. It may well prove to be the automobile suspension material of tomorrow . . . cars suspended on glass!

Another example of engineering leadership at Ford and new ideas for the American Road.

Ford

MOTOR COMPANY
The American Road, Dearborn, Michigan

WHERE ENGINEERING LEADERSHIP BRINGS YOU BETTER-BUILT CARS

Aeronautical and Astronautical Engineering

The Department of Aeronautical and Astronautical Engineering studies many technical areas which are important to the fields of aeronautical engineering and astronautics. In addition, teaching and research in the areas of missiles and space flight have long been an important element. Aeronautical engineering has greatly broadened its scope during the last century, and it is expected to expand even faster in the future. In its programs in education and research, the department plans to be as progressive as its name suggests. Although the scope and course emphases change periodically, investigations are normally undertaken in each of the major subdivisions of aerodynamics—propulsion, structures and vehicle dynamics. Current efforts are concerned with supersonic and hypersonic aerodynamics, rarefied gasdynamics, plasma generation, magnetogasdynamics, aeroelasticity, structural behavior at elevated temperatures, and vehicle dynamics and propulsion. Plans are underway to expand the study of low-speed aerodynamics and ground effect vehicles. Engineering Open House will show visitors some of the principles of these space age engineering projects and their applications.

As part of its contribution to advances in the aerospace field, the department offers many courses and engages in high-speed flight research. When a vehicle exceeds the speed of sound it forms shock waves in the air that drastically hinder its performance. The department's shock tubes which will be on exhibition are used for instruction and research on fundamental problems associated with the shock wave phenomena. One of these tubes can propel shock waves through a gas at velocities greater than 20 times the speed of sound, thus making it a valuable instrument in the area of supersonic flight, missiles and space exploration. Supersonic wind tunnels are also used for high-speed aerodynamics investigations.

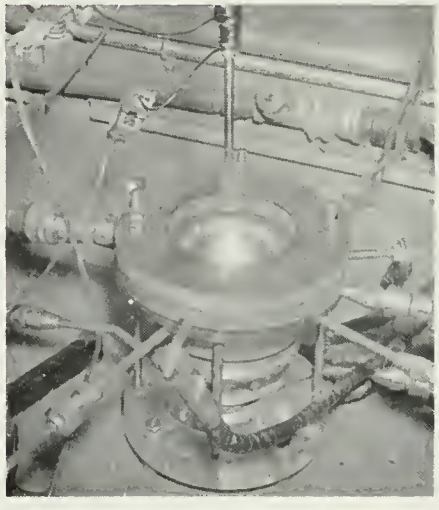


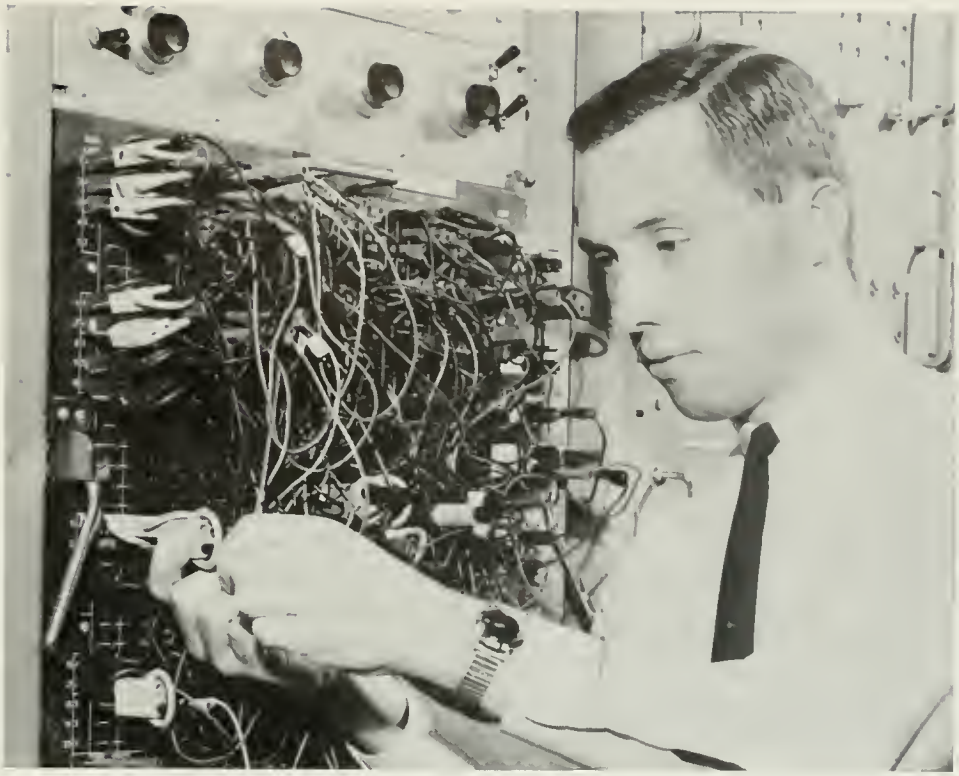
Figure 1. The thermal electric rocket motor produces a plasma consisting of an electrically neutral conglomeration of ions, electrons and neutral atoms with temperatures up to 30,000 degrees F.

Manned aircraft studies are by no means left out of the instructional and research programs. Consideration is being given to a wide range of aircraft varying from vertical take-off and landing airplanes to high-altitude hypersonic-speed craft. A small wind tunnel will be used to show how an airplane derives its lift from a pressure difference between the upper and lower wing surfaces.

Advances in propulsion systems have enabled engineers to design vehicles capable of exceeding the speed required to escape from the earth. All modern propulsion systems are included in the educational programs. At the low end of the speed spectrum the department investigates ground effect vehicles—machines that move close to the ground on "cushions of air." (See Feb. TECH). The vehicle performance spectrum illustrated by these examples indicates the breadth of interests of the Aeronautical and Astronautical Engineering Department, and also shows that higher and faster is not the only direction aerospace technology is moving.

When the biplane was the champion of the air the primary problem of aircraft structural engineers was to design structures with sufficient strength to withstand relatively small flight and landing loads. Loss of material strength due to high temperatures, for example, was not a problem. Today, however, engineers must design light weight structures which will be subjected to high temperature and dynamic loadings which greatly complicate their problems. Examples of aero-structures testing will be exhibited showing how engineers tackle certain types of practical problems. Also, the basic design principles of a filament wound solid fuel rocket motor case will be explained.

Space flight will be well represented at Engineering Open House. A working model of a thermal electric (plasma) rocket motor will be on display. The plasma produced is an electrically neutral aglomeration of ions, electrons and neutral atoms with temperatures up to 30,000°F. The electrical energy input per unit of propellant is much higher than the available thermal energy per unit weight of propellant in chemical rockets. As a result, the electrical rockets have much higher exit velocities, and are of interest for space propulsion where a small thrust operating for a long period of time is needed to accelerate a space vehicle. The Open House exhibits will also include a working model of a student built rocket. Orbits and trajectories of vehicles will be explained with the aid of a three-dimensional display portraying a typical space flight. ◆◆◆



Richard E. Covert, Iowa State BSME '62, utilizes an analog computer to study heat transfer transients and their effect on the control mechanism of a mobile military compact reactor being developed by the Allison Division of General Motors under contract to the Atomic Energy Commission. Covert is one of several young engineers now engaged in various studies connected with nuclear powerplant engineering programs at Allison.

● **NUCLEAR ENERGY CONVERSION**—For the last 5 years, Allison, the energy conversion Division of General Motors, has participated in the design of various nuclear powerplants requiring compactness and low weight. Work on these projects has resulted in the compilation of a formidable background in nuclear systems engineering for space and terrestrial powerplants.

Announcement by the Atomic Energy Commission of the selection of Allison as prime contractor for development of MCR (Military Compact Reactor) now creates opportunities for well-qualified Engineers and Scientists in a long-range program in the nuclear field.

The MCR is a lightweight, completely self-contained nuclear reactor power system—easily transportable by truck, aircraft or rail—designed to provide packaged power for a wide variety of applications. It will have a high temperature, liquid metal cooled reactor coupled to a power conversion system. Incorporating long plant life characteristics compatible with military field equipment, the powerplant is expected to reduce the burden which shipment and storage of petroleum imposes on combat forces.

Along with its nuclear, missile and space activity, Allison is maintaining its enviable position as designer and producer of air-breathing engines. Recent developments include advanced types of turboprop engines for greater power with maximum fuel economy and without increase in engine size; a compact lightweight turboprop selected as the powerplant for the Army's next generation of Light Observation helicopters, and thermally regenerative gas turbine engines for a wide range of vehicular and industrial use.

Perhaps there's a challenging opportunity for you in one of the diversified areas at Allison. Talk to our representative when he visits your campus. Let him tell you first-hand what it's like at Allison where "Energy Conversion Is Our Business."

An equal opportunity employer

Allison

THE ENERGY CONVERSION DIVISION OF GENERAL MOTORS, INDIANAPOLIS, INDIANA

General

ENGINEERING

Figure 1. A Mikrokator and a set of "Joe Blocks" used in precision measuring. The blocks are guaranteed accurate to within two millionths of an inch.

The General Engineer is a versatile man. His training combines an education in engineering principles with substantial work in a secondary field such as administration, geology or sales.

The graduate who has a broad engineering education plus a background in a less technical field is in constant demand by both industry and government. For example the salesman must know the technical product which he sells. The technical writer should understand the technical aspects of his subject as well as possess journalistic ability. The engineer of highways or structures who is competent in geology will be better able to choose the best geographic locations. The secondary non-technical options featured in the General Engineering program include engineering administration, engineering sales, engineering geology, technical writing, engineering law and meteorology.

All General Engineering exhibits will be located in the Transportation Building where many of the General Engineering courses meet. In the Hospitality Room, an exhibit illustrates the types of positions General Engineers occupy in industry. Geographical locations of the General Engineering graduates are depicted on a map of the United States. Students and staff members will be delighted to visit with you and discuss any phase of General Engineering.

Featured exhibits are described briefly below.

Engineering Design: Design is one of the most rewarding and demanding functions of an engineer. Engineering designs from major corporations will be displayed in their creative forms.

Engineering Drawing: Engineering students will demonstrate the fundamental geometry and procedures of graphic representation and engineering design.

"Design for Production": This is the title of a film which was jointly produced, in 1961, by the University of Illinois Department of General Engineering and a manufacturer of numerically controlled milling machines. This film shows how the engineering drawing, which presents shapes, dimensions and specifications, is correlated with the various machining operations to produce a precision product as a single item or in mass production. A second film, "Move the Mountains," which is concerned with material handling and earth moving equipment will be shown intermittently with the above film. The film depicts the changes in material moving methods from the ancient Egyptians to those of a present-day equipment manufacturer.

Gauging: It is impossible to make anything to exact specified dimensions; therefore, an important aspect of engineering is the determination of acceptable deviation from desired dimensions. A set of super-precision Johansson Gauge Blocks, which are basic measuring units in industry, will be on display. These "Joe-blocks" have a guaranteed accuracy of $\pm .000002''$ (two millionths of an inch). For example, a precision dial indicator, the Mikrokator, is set to a desired dimension for a machine part by using assembled Joe-blocks. The machine part is then manufactured within permissible limits by utilizing the preset Mikrokator.

Air Brush: The air brush is an instrument used in the shading of drawings. This will be an audience-participation display where visitors can try to produce art work with an air brush.

Nuclear Reactor Model: A model of a nuclear reactor will be on display. The model, used for orientations, illustrates the basic principles of our present-day high-powered nuclear reactors.

Universal Drawing System: This new system invented at the University of Illinois has been introduced in several schools and corporations. Drawings made with the system will be displayed showing how orthographic and isometric views are integrated in direct projection with each other.

Law: An engineer should know the legal aspects of his field. Of interest to engineers and other creative persons will be the display furnished by the U. S. Patent Office which explains the legal processes of protecting a new item.

The students and staff of the Department of General Engineering extend a cordial welcome to all. ♦♦♦

Physics

This year the Physics Department will show the visitor intriguing displays on classical physics and current fields of research. Undergraduate students will present twenty minute lectures featuring demonstration experiments designed to show dramatically the wave properties of light, spectra of various elements, interference patterns, and other interesting optical phenomena. These lectures will be held in Room 100 Physics Laboratory, beginning on the hour and half hour; after each lecture, there will be time for visitors to ask questions and examine the apparatus.

For those interested in learning more about current research, there will be several displays in Room 112 Physics Laboratory. The popular low temperature physics display will be given again this year; this demonstration shows the many remarkable changes that matter undergoes when cooled. For example, a lead bell which responds with a dull thud when struck at room temperature rings clearly when struck after being cooled by liquid nitrogen. Normally flexible materials such as rubber and plastic shatter like fragile china when hit after cooling in liquid nitrogen.

This year, one of the newest research tools, the spark chamber, will be explained and demonstrated in Room 112 Physics Laboratory. The spark chamber makes use of the fact that a high energy charged particle passing through a gas such as neon leaves behind a trail of ions capable of conducting an electric current. The spark chamber, in its simplest form, consists of two thin metal plates, one of which is connected to ground and the other to a bank of charged capacitors. When a charged particle passes through the system, a sensing device causes the capacitors to discharge between the plates along the ionized trail left by the particle, producing a spark. Several sets of plates produce a series of sparks indicating the path of the particle. The ability of the spark chamber to select the particles that it observes makes it extremely useful in the study of elementary particles. By allowing the capacitors to discharge only when an interesting particle has passed through the system, a photograph showing only the desired track can be obtained. Photographs made from older devices such as the cloud chamber and the bubble chamber contain many extraneous tracks in addition to the one of interest. A cloud chamber and the well-known Geiger-Muller counter will also be displayed in Room 112 Physics Laboratory.

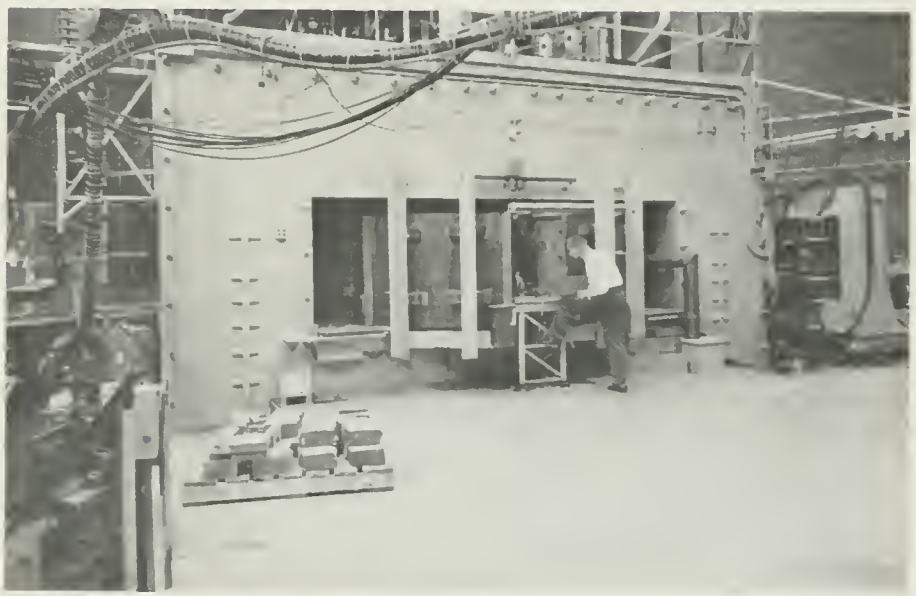


Figure 1. A closeup of the 340 MEV Betatron used for basic research. The Betatron is one of the open house attractions.

One of the new features of this year's Open House will be an information booth located in the main corridor of the Physics Laboratory. Student and faculty advisers will be available at this booth to answer questions that prospective students may have about high school preparation or the program of study leading to a degree in physics at the University of Illinois. The Physics Department will also show several movies especially prepared to illustrate some principle of physics in a way that is both interesting and easy to understand. These movies will be shown continuously in Room 119 Physics Laboratory.

The betatron will be open to the public again this year and because of improved bus service it will be more accessible than in the past. Busses will leave the Engineering Campus for the Assembly Hall and the betatron every five minutes. The betatron was invented here at the University of Illinois by Professor Donald Kerst in 1940. It differs from most other large particle accelerators in that it produces high energy electrons rather than high energy protons. Since 1940, the University has constructed several betatrons, the largest of which is capable of producing 340 million electron volt electrons. The electron beam produced by the betatron may be made to strike a metal target, thus producing high energy x-rays which are useful in many experiments. ◆◆◆

Army ROTC

Figure 1. Unmanned aircraft send back aerial views of distant sites, using light TV equipment developed at the Army's Signal Corps Engineering Laboratories at Fort Manmouth. The camera in the L-17 drone (shown in telescopic view) can point downward or farward through the plane's belly.

This year the Engineer, Ordnance, and Signal Army ROTC branches will jointly participate in Engineering and Science Weekend. The latest equipment and activities characteristic of these branches will be exhibited and explained in the display.

The Corps of Engineers, the world's largest engineering organization, will exhibit equipment used in support of its combat, technical service, military construction, and civil works mission. A lighted transparency depicting major construction projects in Illinois will accentuate the role of the Corps of Engineers as manager of our nation's flood control and waterway development programs. A variety of bridge models will show one phase of the Engineers' combat mission of keeping your Army moving forward. For those with a little more time and interest, a half-hour color film dramatically depicting past, present and future world-wide engineer missions will be shown near the display.

The Ordnance branch will display several of the Army's newest weapons. The first of these weapons is the 7.62 mm, M14 rifle—the new shoulder weapon for the individual soldier. Secondly, the display shows the 7.62 mm, M60 machine gun, which provides the accurate, sustained fire power that the infantryman needs. Also, to be displayed is the 40 mm, M79 grenade launcher, which is used for projecting high explosive grenades between the maximum range of hand grenades and the minimum range of mortars. These are just a few of the items that will be present at the United States Army Ordnance display. Ordnance has a four-level function concerning the United States Army's material. They are responsible for the research and development of all of the Army's materiel as well as the industrial manufacturing of the items. After the material is ready for the using unit, Ordnance supplies the proper training to get the most effective use from its operation. At the last Ordnance functional level, we have the field service which supplies needed repair parts, ammunition, and any other logistical need of the using unit.

The Signal Corps will display tactical Signal Corps field equipment such as field switchboards, light radios and telephones, teletypewriters and multichannel carrier equipment. Four static display cases will also show developments in miniaturization, transistors, communications, satellites, battlefield surveillance drones and ADPS applications. A twelve-minute film explaining recent developments will be shown hourly. ♦♦♦

Figure 2. The M-14 rifle has been adopted by the armies of the North Atlantic Treaty Organization and fires the standard NATO 7.62 mm cartridge. It replaces the Browning Automatic Rifle, M1 Garand Rifle, carbine, and Caliber .45 sub machine gun. It is a semi-automatic weapon and can easily be converted by the soldier to fully automatic.

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Why? Consider this. Every American voice from space — from the X-15 to Schirra's 6-orbit flight — has been carried back to earth by Collins communication systems. The men who designed and engineered the equipment and put these systems together are topnotch experts in their fields. These are the men you'll have an opportunity to work with and learn from on a variety of space communication project assignments. ☐ Our company is currently engaged in another phase of the U. S. space effort, communication systems for NASA's Apollo manned lunar spacecraft. Again Collins can provide young engineers with an opportunity to advance and grow through actual experience on projects such as this and through close working contact with the experts. ☐ Future Collins commitments call for further exploration in the field of space communication and the equipment and systems necessary for contact between spacecraft and earth. It's a field full of challenge and opportunity for the young engineer wishing to carve out a satisfying career in space electronics.

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A skit for relaxation

Evidence of effort

Medea, one of the finest Independent Men's houses on campus, offers small group living with the advantages of a larger house. Living at either Medea or Medea Lodge assures you of an excellent location, fine food (T-bones once a week), coffee an' served every morning, good study conditions, linens—all for $800.00 a year.

Technocutie . . .

Miss Lois Backer

. . . What? An Engineer?

Increased rumors of several unidentified creatures — creatures resembling "girls" — have been circulating on the Engineering campus for some time. With the help of the Society of Women Engineers it didn't take TECH long (there were more than anticipated) ta lacate one, and here she is . . . lavely Miss Lois Backer—one of 23 charming women engineering students who are adding a touch of grace to our previously homogeneous enginering campus.

Lois was valedictorian of her Roanoke High School class,and she is now a 4.5 plus General Engineering freshman whose domestic talents acquired during five years af 4-H, should appeal to every engineer. Her beauty is self-radiating, but just for the records, she has been a Dolphin Queen semi-finalist as well as a Miss Woodford County contestant in the Miss America preliminaries.

Only one problem remains—where can TECH find another photographer? . . . Ours has found a new hobby—"Creature Watching"! As a matter af fact, where is the rest of the staff? . . . Hey fellows . . . wait for me!

UT YOUR FEET MUST BE ON THE GROUND

The glamour and excitement of space age programs often obscure a fundamental fact. It is simply that farsightedness must be coupled with sound, practical, down-to-earth engineering if goals are to be attained. This is the philosophy upon which Pratt & Whitney Aircraft's position as a world leader in flight propulsion systems has been built.

Almost four decades of solid engineering achievement at Pratt & Whitney Aircraft can be credited to management's conviction that basic and applied research is essential to healthy progress. In addition to concentrated research and development efforts on advanced gas turbine and rocket engines, new and exciting effects are being explored in every field of aerospace, marine and industrial power application.

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If you have interests in common with us, if you look to the future but desire to take a down-to-earth approach to get there, investigate career opportunities at Pratt & Whitney Aircraft.

To help move tomorrow closer to today, we continually seek ambitious young engineers and scientists. Your degree? It can be a B.S., M.S. or Ph.D. in: **MECHANICAL • AERONAUTICAL • ELECTRICAL • CHEMICAL and NUCLEAR ENGINEERING • PHYSICS • CHEMISTRY • METALLURGY • CERAMICS • MATHEMATICS • ENGINEERING SCIENCE or APPLIED MECHANICS.** The field still broadens. The challenge grows greater. And a future of recognition and advancement may be here for you.

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Women in Engineering

by Pat Martin

In small but increasing numbers, American women are distinguishing themselves as engineers. The persisting idea that engineering is a hard and rough occupation unsuitable for women has been refuted by the women who have pioneered and succeeded in this field. Today the tremendous number of women in all Russian technical fields shows us an excellent example of how this untapped resource can be utilized. Surprisingly, this utilization of women has not slackened their pace, but rather helped them in the space race and certain other areas.

In America, as prejudices are slowly decreasing, the number of women in engineering has increased. In 1950 there were some 6,500 women engineers, in contrast to less than 750 in 1940. All evidence indicates this rising trend will continue.

Women who choose—for one reason or another—to enter engineering have before them a varied, interesting, and exciting college career. Even now, with many successful women in engineering, college girls are often advised not to enter engineering. As a result many potential women engineers never experience the challenge, excitement, and pride of an engineering profession.

The first challenge comes when someone asks what you are majoring in. A woman engineering student soon learns to tolerate criticism and those who come up with the universal questions such as, "Did you go into engineering just because that is where all the man are?" The challenge comes in proving to the world that all women engineers are not two-headed, sexless creatures who wear shapeless dresses and horn-rimmed glasses. The challenge comes in wearing skirts and being feminine in a traditionally man's world, and still proving that you can do a good job. And the challenge comes most of all in making a success . . . in getting through college and earning that treasured degree . . . in going into industry and being an asset to your country and your employer.

The excitement comes in many ways. It comes while standing in lines those first few days and returning wondering stares of the men about you. It comes during the first classroom days when you notice the ratio of men to women, and when your instructors persistently call the roll it is always Smith, Brown, White, and then, Miss Jones. It comes from figuring out a difficult problem or from receiving a good exam grade. It comes from winning the respect of the people around you, men and women. It also comes in a very special way when you attend a dance with your special beau and meet the people from your classes who stare in wonder and obvious admiration to see you at a dance with a boy and really looking quite feminine and pretty. It comes in dating men and being able to talk to them intelligently; in being able to listen and understand. It comes most of all when you discover that you are finally being treated as an equal; the men around you have accepted you and are ready to help you and to be helped, are ready to accept the astonishing fact that you are a woman engineer and most of all a Woman. It has often been said that college life is the most exciting time of a woman's life. It is sometimes hard to realize that this is doubly true of a woman engineering student. She has all of the normal excitement, and so much more if she can only meet the challenge.

And then there is Pride . . . that funny little word that creates an inner glow that can grow into a fire . . . that funny little word that drives people onward to bigger and better goals . . . that makes them try harder when it seems almost impossible . . . that word that makes a person want to be different and special . . . that drives someone to the point of exhaustion and leaves them happy merely because they are proud of their accomplishment, and they can see pride reflecting in the faces of the people around them. Pride . . . an undefinable word that means the world. It is a sparkle of happiness that you are doing what you are doing, a fascinating aura of joy that you are what you are and nothing else. This is what it takes to become a good woman engineer. This is the spirit, combined with dedication and hard work, which caused our pioneering women to become engineers and to succeed in spite of what society and near-sighted people said and did to make it hard for them.

Today the problem is supplying adequate high school counseling to women whose aptitudes in math and science point to an engineering career. The Society of Women Engineers is trying to help in this respect by counseling high school seniors. In the coming years it is possible to envisage more and more women making a success in engineering. At the present moment there are 23 women enrolled in engineering at the University of Illinois. These women are scattered throughout all branches of engineering.

The rumors of hard work and no fun are partly correct. True, engineering isn't easy; but in actuality few free things are worthwhile. A woman should not be forced into engineering. It must be something she freely elects with her eyes open and her chin firmly set, since there are times when things seem almost impossible to bear; times then the easy thing to do would be to simply give up and try something else. A young woman entering engineering must be fully aware of what she is doing. She must be proud of her work and stand up for it; she must be ready to give up some of the small things she wants now and keep sight of the further more important goals; she must be ready to meet the challenges that will inevitably come. But the thing to remember is that when it is all done, and the hardships and worries are over, you will have something, something special, precious, and worth much more than it cost. ♦♦♦

THE BELL TELEPHONE COMPANIES SALUTE: CAL CRIMP

Michigan Bell makes few moves in Southfield without consulting Engineer Cal Crimp (B.S.E.E., 1957). Cal makes studies on where to put new central offices, how to expand old ones, what switching equipment to order.

To make these decisions, Cal must interpret forecasts of customer growth. He must also know his equipment and operating costs closely. Such responsibility is not new to him. On an earlier assignment, for instance, he skillfully directed a drafting section of 32 people.

Cal Crimp of Michigan Bell Telephone Company and the other young engineers like him in Bell Telephone Companies throughout the country help bring the finest communications service in the world to the homes and businesses of a growing America.

BELL TELEPHONE COMPANIES

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Take Consolidated Edison's Indian Point nuclear power station near New York City. Several giant companies contributed to her success. But her most significant feature—the reactor—was designed and built by Babcock & Wilcox.

B&W is large enough to win contracts for big projects. 1962 sales, for example, were more than $320 million. And every year, B&W invests many millions of dollars in research and development. B&W offers many other advantages of the large company: formal training program, paid tuitions, wide variety of job openings (17 plants in 9 states), plus the security and benefits of a large, established organization.

B&W is small enough to give you a chance to work on big projects early in your career. There are 149 larger industrial companies in the U. S. Growth opportunities are enormous. Yet only 47 bachelor-level students will be hired in 1963.

B&W has interesting job openings for graduate and undergraduate engineers and scientists, including M.E., E.E., Ch.E., Met.E., Cer.E., Nuc.E., and physicists. For more information, talk to the B&W interviewer when he is on your campus or write to J. W. Andeen for "Your Career Opportunity at Babcock & Wilcox." The Babcock & Wilcox Company, 161 E. 42nd St., New York 17, New York.

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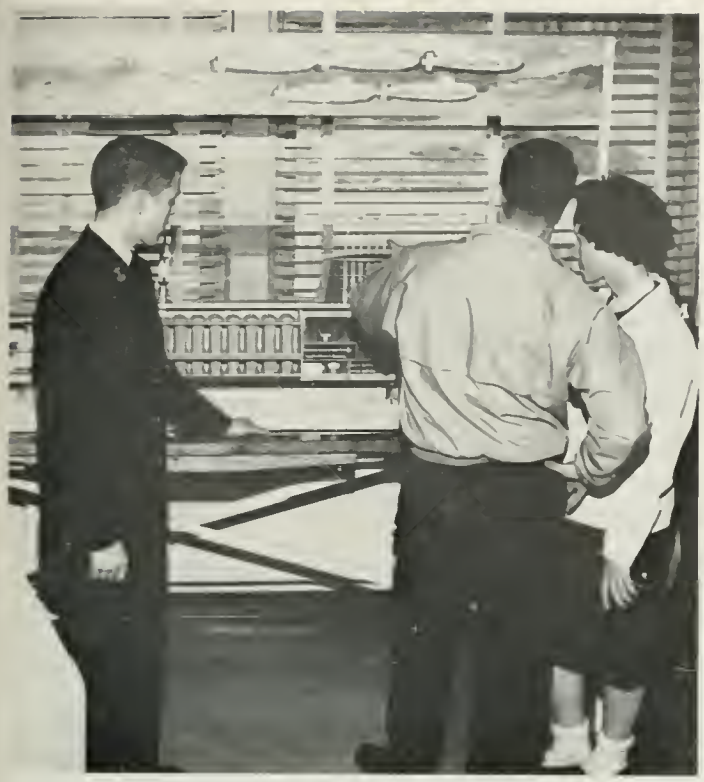

Figure 1. Several students are shown taking in the Navy's Polaris Model display at last year's Open House.

NAVAL ROTC

This year many Midshipmen are displaying the latest in operational weapons and space technology. The Naval Ordnance Plant at Forest Park, Illinois, will display an eight-foot model of the Sidewinder, an operational air to air missile. Somewhat more important is the exhibit on the Navy's formidable Polaris missile firing submarine. This exhibit will include a large model displaying the inside of the sub and selected photographs of the Polaris in action.

This year's most spectacular exhibit, however, will be the large plastic model of the new Gemini Space Capsule. This capsule is much larger than the Mercury Capsule and is designed for two astronautis. Smaller models will be displayed of the Gemini on a Titan rocket and the Gemini on para glide. There will be pictures of the launch sequence and an exciting 22-minute color film showing Geminin's launch to landing squence—a must for Open House visitors who are interested in our "man in space" programs.

There will be displays concerned with the Naval research program; a dynamic display explaining the Navy's research in gas lubricated bearings; and a display of the Navy's giant radiotelescopes. One of these radiotelescopes is located nearby at Danville, Illinois, where it will pick up radio signals from outside our galaxy. These exhibits will be explained by Naval ROTC students.

Graduating high school seniors can still enter the Naval ROTC program this fall. A student desiring to become a Contract Midshipman must present himself in person at the Administration Office of the NROTC unit. This can be done as early as the last half of the senior year in high school or in the summer before entering the University—it should not be later than the first part of Freshman Week. Those applicants who are found acceptable will receive a written exam and be notified of the results in time for registration. These Midshipmen take one naval science course each semester and receive a commission upon graduation. They are supplied with uniforms and Naval Science textbooks and about $27 per month during their junior and senior years. They also participate in one summer training cruise between their junior and senior years.

In addition to service orientation, history of sea power, psychology of leadership, navigation and operations each Midshipman studies ballistics, computers, directors, guided missile propulsion, guidance and control in his naval science courses. He will receive additional training in naval engineering and the functions of the engineering department aboard ship, including ship stability, fundamentals of heat engines, boilers, steam turbines and the necessary components, and a basic study of the fundamentals of nuclear propulsion.

Upon graduation and commissioning the Navy offers qualified officers postgraduate training in most fields of engineering. A good example is the Navy's excellent nuclear power school which trains officers for work with nuclear reactors. ♦♦♦

Figure 2. Pictured above is the Alexander Hamilton SSB(N) 617 being launched in August 1962. The Hamilton is a polaris submarine about which further information can be obtained at Open House.

Civil Engineering

One of the most common complaints among engineering students is that they are barricaded scholastically by required courses. Civil Engineering at the university has recognized this restriction and a new program will begin next fall. This program will allow the student to overcome the required specialization to whatever degree he desires.

One combination which comes to mind is that of the aeronautical structural engineer. A civil engineer's background in structures plus proper selection of courses in aeronautical engineering could qualify an engineer for structrural work in the rapidly expanding missile field.

In addition to allowing a student who is certain of his desired field to obtain his goals, the new curriculum gives the student who is not certain an insight into possible fields of interests. Complete information pertaining to the new curriculum will be available at a special exhibit. The exhibit will have both staff and students available for questions or additional information on the curriculum changes.

Civil Engineering, being one of the most diversified fields of engineering, requires training in many areas. The field of *Highways* is at this time one of the most rapidly expanding in civil engineering.

Closely related to the development of highway facilities is the problem of traffic control. The *Traffic Engineer* is responsible for the safety and efficiency of a highway design. With the ever increasing volume of traffic on our highways, the need for adequate traffic control becomes more evident. The Traffic Engineering Laboratory located in 408 Civil Engineering Hall has on display some of the equipment needed to evaluate traffic conditions and to control this traffic once the conditions are determined. Also potential speeders may get a closer look at that "little black box" used in radar speed detection. Traffic signal controls for several Urbana intersections will be operating from the lab during Open House. The complexity of a coordinated traffic system will be demonstrated in the lab.

One of the newer fields in civil engineering is that of *Soil Mechanics and Foundations.*

A soil and foundation display located in room 202 Talbot Lab will demonstrate factors affecting soils when used as foundation materials and the different types of soils as they are classified in foundation work. A series of pictures will demonstrate the many facets of soils engineering and some of the problems encountered in applying those facets. The behavior of a soil under an applied load is demonstrated by the settlement and consolidation exhibit. The quicksand exhibit will offer no threat to visitors although its potentials are amply demonstrated.

The civil engineer entering *Surveying* will find very modern and highly complex equipment applied to this very old art. Equipment is available which will measure distances of twenty miles or more extremely accurately. Some of the newest equipment in the field will be on display in the Surveying exhibit. Within the field of surveying, *Photogrammetry* is becoming more popular. Through the use of aerial photographs accurate elevations and distances may be obtained for engineering work by photogrammetry. This procedure is finding increased usage in the preparation of maps, soil surveys and highway design. The basic fundamental of photogrammetry—that of 3-D viewing of two photographs—is demonstrated in the surveying display.

Skyscrapers, bridges, flagpoles, television towers and airplane wings are just a few examples of the *Structures* with which the civil engineer is concerned. The complexities of structure loads vary from snow loads to that of a nuclear blast.

The field of *Construction* is becoming increasingly complex with new technology and equipment and with the ever increasing degree of competition in the industry. No longer are the previous construction methods being relied upon to obtain competitive bids or to make money once a contract is won. The present day construction engineer must investigate cost analyses and estimates, time study and productivity, and job planning. Statistical analyses and computers are being applied to construction. Throughout his career, the construction engineer is called upon to apply principals of every field in civil engineering from soils to traffic.

An example of a typical construction project is that provided by Chi Epsilon, civil engineering honorary fraternity, of a model of Glen Canyon Dam in its finished state plus data used in design and construction.

The *Hydraulics* engineer is concerned with the design, development and use of water resources and facilities. The increasing needs for water are forcing the hydraulic engineer to develop new sources and to provide means of preserving present supplies. Flood control, culvert design, dam design and irrigation are all part of the hydraulic engineer's work.

One example of a hydraulic design at Open House is that of an energy dissipator. This display will demonstrate the work that is being conducted at the University of Illinois on hydraulic energy dissipators for culverts. With water actually flowing, the exhibit will compare the performance of two box culverts, one with dissipator and the other without. The relation of energy dissipation to soil erosion will be shown by this exhibit.

Of special note about this exhibit is that it was prepared as part of an actual laboratory study that is being conducted

(Continued on Page 54, Col. 1)

Agricultural Engineering

Agricultural engineering is a growing and expanding profession which is meeting the engineering problems of an advancing agriculture. As new machinery, processes, structures and soil conservation practices are developed, agricultural crops can be harvested more rapidly, more efficiently and with greater quality. At the same time new structures with environmental control give healthier, more productive animals, and conservation studies insure the necessary natural resources to meet future requirements. Supplying the technical engineering know-how required to handle crops, produce animals, and manipulate soils is the challenge of the agricultural engineer.

The academic staff of the Department of Agricultural Engineering is composed of professionally trained engineers who, in addition to teaching, apply their knowledge toward solving agricultural problems. Students likewise are encouraged to think and do agricultural research.

A student not only receives sound classroom instruction, but also sincere advice and counsel from an interested faculty. His advisor is a qualified staff member who has many years' experience in engineering and a thorough understanding of the student's program and problems. The progress of the student from his entrance in college until his university career is terminated, hopefully through graduation, is followed by the advisor. The advisor is extremely important in helping the new student plan his course of study as related to his high school record and his personal and professional goals following graduation.

The entrance requirements for agricultural engineering students are identical to those in the other departments of the College of Engineering: high school training in mathematics, science, rhetoric, social studies, and a foreign language. If a person is deficient in one of these, he may make up the deficiencies at the university. A farm background is, of course, helpful in gaining practical insight into agricultural problems.

A supplementary student activity—encouraged by the department—is participation in the Illinois Student Branch of the American Society of Agricultural Engineers. This group attempts to develop leadership and cooperation by planning and executing various projects during the year. One such project is the *Agrineer*, the agricultural engineering student annual, and another is the work done for Engineering Open House. The students plan and build the Open House displays to publicly demonstrate the agricultural engineering accomplishments. Such experience—in addition to formal classroom and laboratory training in structures, soil and water mechanics, electric power and processing, and field power and machinery—is highly valuable to the graduated engineer.

A few areas where an agricultural engineer may work are: machine design, processing of farm products, farm structures and environmental control, project managing in an agriculturally realted industry or in other production areas requiring engineering know-how.

♦♦♦

Figure 1. Aerial view showing the Agricultural Engineering display building and contrasting machinery display.

Figure 2. Jerry Weibel demonstrating the pneumatic feed distributian system at last year's open house.

Chemical Engineering

Chemical engineers are concerned mainly with "scaling up" processes discovered by the chemist in the laboratory. That is, the chemical engineer first decides whether or not a process is economically feasible and, if it is, designs the equipment which will be used in the process. Chemical engineering, however, is not limited to production alone; many chemical engineers also work on basic research.

In the Division of Chemical Engineering at the University of Illinois, research is being carried on in many fields: mass transfer, heat transfer, fluid flow, reactor design, process dynamics, and high pressure technology. This variety shows that a degree in chemical engineering from the University of Illinois is often not the end, but a springboard for further study in one of many fields not commonly related to chemical engineering.

During the Engineering Open House, chemical engineering students will present two sides of their field—theoretical research and practical engineering applications.

Practical Applications

Most of the Open House exhibits will be shown in the "Unit Ops Lab." This laboratory occupies three floors of the East Chemistry Building and will have many industrial scale operations displayed in it. Equipment for evaporation, gas absorption, distillation, and filtration will also be shown. In the "Unit Ops Lab" the undergraduate student experiences his first contact with practical applications of classroom theories.

The first display visitors will view in the lab is the Chem Pop exhibit. This exhibit will provide a cool, carbonated drink while demonstrating the operation of gas absorption. Of primary importance in this exhibit is a fifteen-foot, glass-packed column through which visitors can see the action of gas bubbling through the liquid.

A new addition to the lab is an all-glass distillation tower through which visitors can see the operation of the bubble cap trays. The unit was installed early this year and replaces a bronze, six-plate column which had been used in the past to show how the various components are separated.

Several other displays will also be displayed in the "Unit Ops Lab." Among these will be a filtration exhibit showing two types of industrial filters—a stirred tank reactor used for both reaction kinetics and process dynamics studies and a drop evaporation experiment where the rate of evaporation of a drop is measured and used to compute a diffusion rate for water vapor through air.

A series of displays in another room will introduce visitors to a vital segment of chemical production—measurement and control. The displays shown here are the instruments and controls necessary for the operation of a chemical plant. These instruments are basic to the growing field of automation. Devices such as the optical pyrometer, thermocouples, potentiometers, and recorder-controllers will be shown and explained to the visitor.

Theoretical Research

Up to this point all of the displays mentioned have been directly related to industrial operation. Two other displays will show research projects which could ultimately be used by industry, although they were not designed specifically for industrial application. Both experiments were designed by senior students working with a faculty advisor. One experiment deals with reactor design; the student is attempting to vary the time during which reactants in a stirred tank are in contact, by varying the location where the products are taken off. The other experiment deals with the transition of flow patterns in a water jet falling vertically from a nozzle. The study is being made by measuring the diameter of the jet as it falls and then correlating this data with analytical equations.

Finally, the visitor can view several movies dealing with chemical engineering and also attend the highly entertaining "Chem Magic Show."

In conclusion, University of Illinois chemical engineering students realize they can show only a small portion of their vast field to visitors, but it is hoped that this representative portion will demonstrate the activities and challenges facing the modern chemical engineer.♦♦♦

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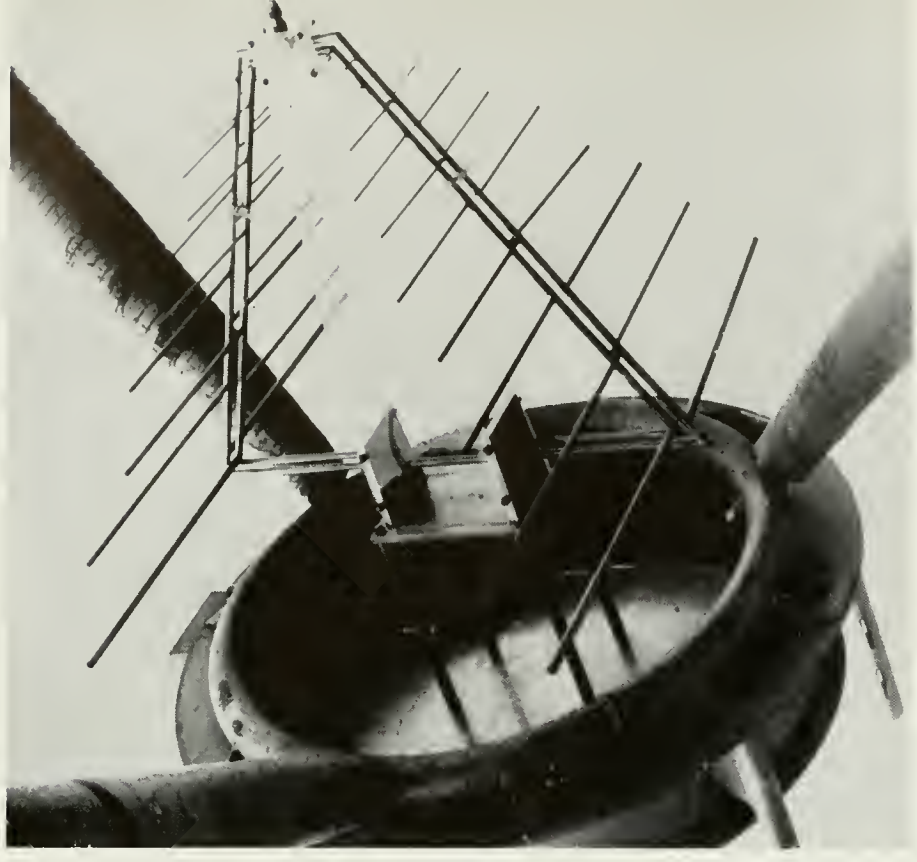


Figure 1. Pictured above is a Log-Periodic Dipole Antenna. This type antenna was invented and developed at the University of Illinois.

Electrical Engineering

Electrical engineering, as we know it today, is one of the youngest of the engineering professions, having come into existence only within the past fifty years. Its growth, however, has been phenomenal, and today the term "electrical engineering" describes a field so immense and diversified that it is being applied not only in other phases of engineering and science, but, with the advent of computers and data-processing devices, in everyday business life.

Products of electrical engineering research can be found in every phase of life—even in the field of medicine. Here, probably the best known contribution is the heart-pacer, an electronic device which automatically stimulates the heart and which can be concealed on, if not implanted in, the body.

Electrical engineering is based on the science of electricity, which is one of the youngest branches of physics. Although the early Greeks knew of the attractive properties of rubbed amber, they could not explain them, and it was not until the 15th and 16th centuries that electricity and its properties really began to be investigated. Within a span of a few centuries the work of Gilbert, Franklin, Volta, Coulomb, Galvani, Faraday, Ohm, Ampere, and many others had contributed to the creation of the electrical engineering profession. In the late 19th and early 20th century, scientists, physicists and experimenters such as Henry, Hertz, Edison, Fleming, DeForest and Maxwell (a name familiar to all EE's) were discovering and experimenting with the properties of electricity and electro-magnetic waves.

In the past electrical engineering was conveniently divided into two main categories—power and communications—classifications which are becoming increasingly more difficult to follow.

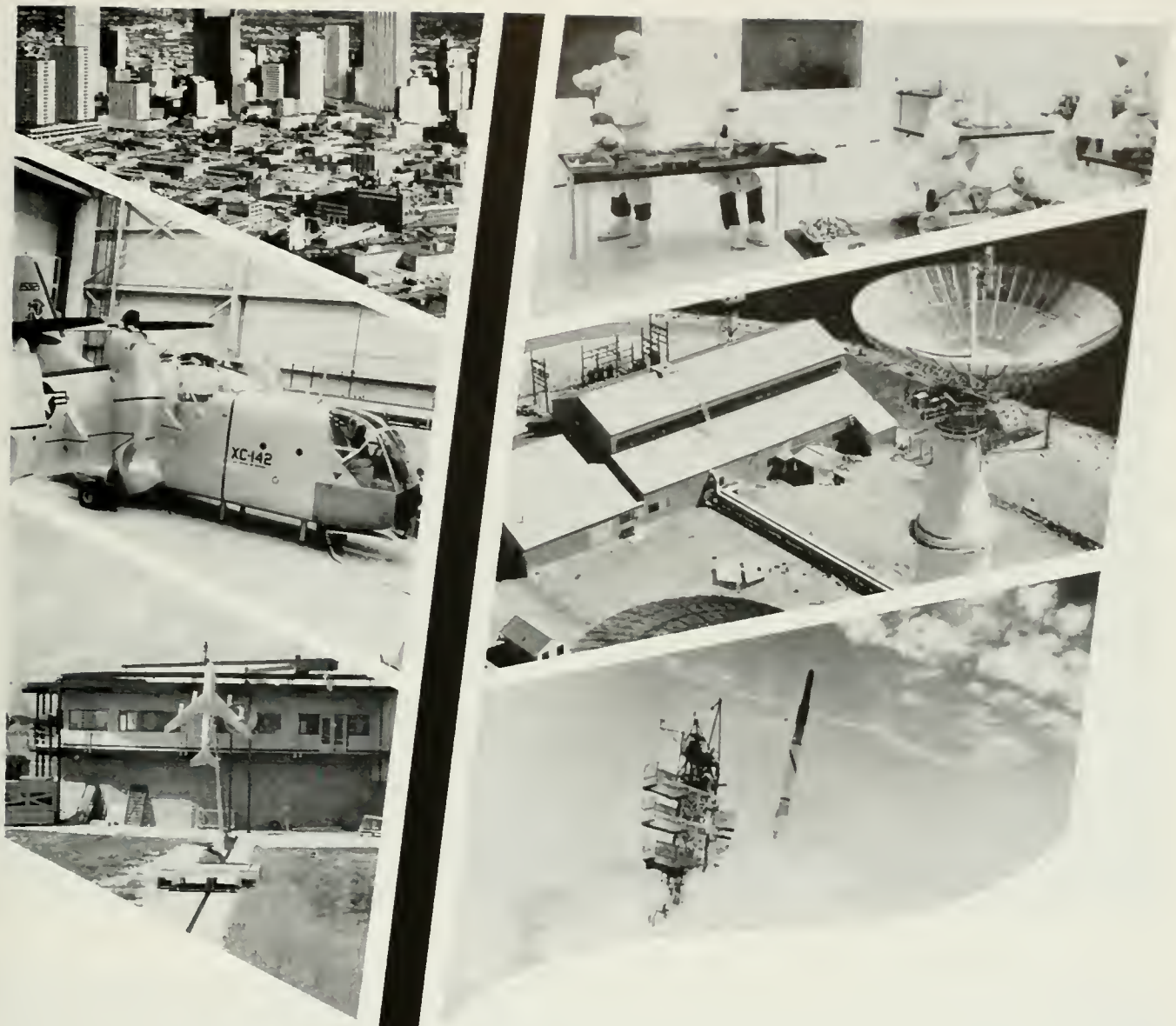
The battery, developed by Volta, was the main source of power until the 1870's when men like Faraday, Saxton and Clark did extensive work on electrical generators and motors. With the development of the incandescent lamp and dynamo by Eidson and the increasing efficiency of generators and motors spurred on by the work of Westinghouse and Tesla, the area of electric power was becoming more and more extensive.

Paralleling the expansion of power were the advances of Wheatstone, Morse, Bell and others who were pioneers in the area of information transmission over wires while Hertz, Marconi, Armstrong, and Zworykin investigated "wireless" communications. The first radio station began broadcasting in 1920 and the first television station began operation in 1941, although the idea of electronic television was conceived as early as 1908.

Since the first radio stations became operative, there has been an ever-increasing demand for greater information carrying capabilities, which are rather limited at the lower frequencies (kilocycles). As a result, there has been a continuous drive to extend the upper limit of obtainable frequencies. At present, the frequency range has been extended to the gigacycle range (10^9c.p.s.) and beyond with devices like klystrons, magentrons and traveling wave tubes. The optical spectra is being investigated with quantum electronic discoveries such as lasers (a contraction of light amplification by stimulated emission of radiation).

In addition to the enormous expansion of the two fundamental areas of electrical engineering—power and communications—advanced technology has given birth to the new areas of medical electronics, ultrasonics, quantum electronics, superconductivity, and cybernetics. With the increased interest in space exploration have come new areas such as radio astronomy, high speed computers and memory systems, ionospheric and plasma physics, and of course microminiaturization—all of which are within the realm of electrical engineering.

These are but a few of the many topics in electrical engineering which have appeared in the last twenty years. It is easy to see electrical engineering has advanced rapidly since the days of Galvani and his "frog's legs." To be sure, electrical engineering has only begun—as is true with all human knowledge. A young student entering the profession can pick from scores of areas for investigation—all fascinating and challenging. ♦♦♦



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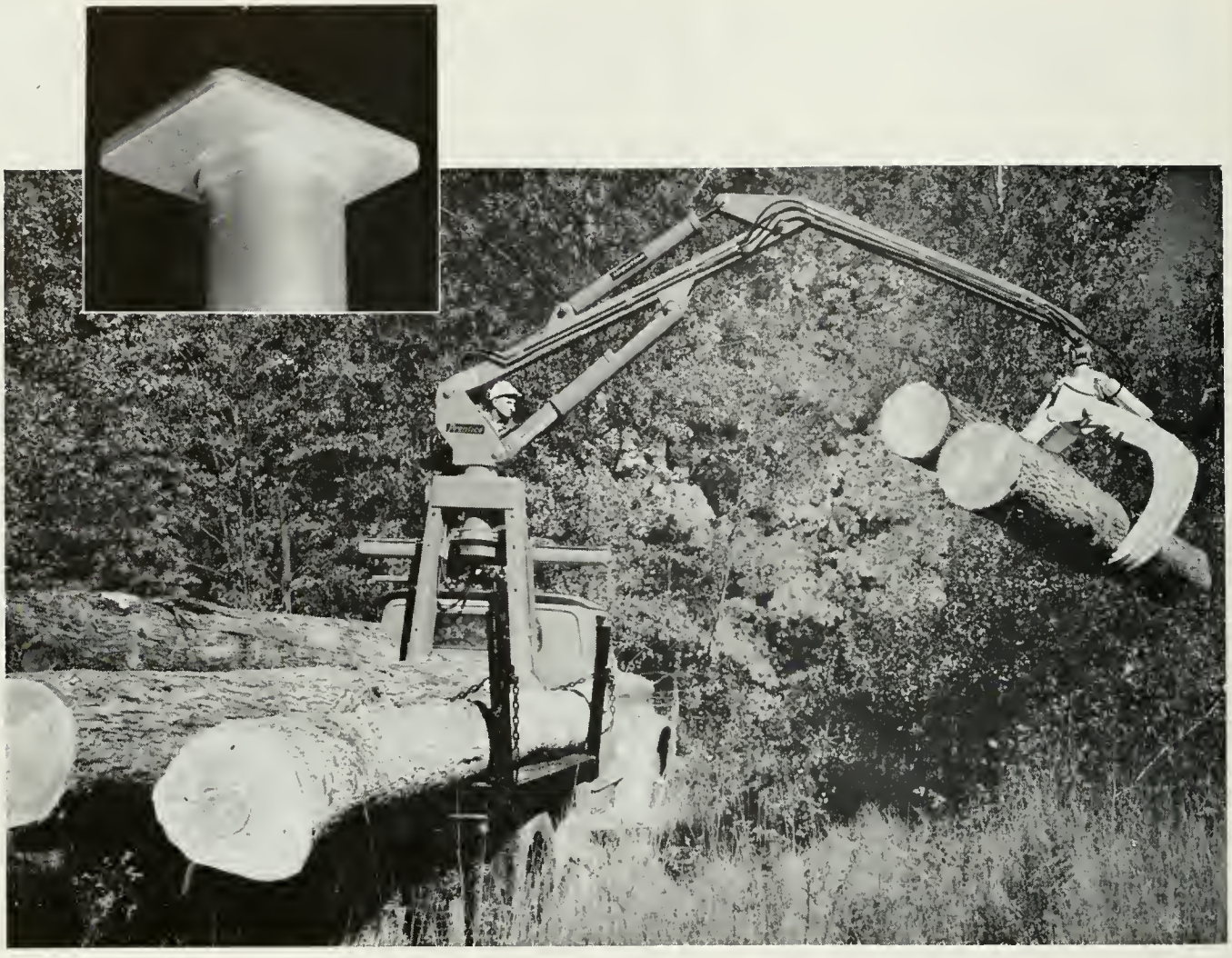

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Metallurgical Engineering

As Metallurgical Engineering students we again feel that we have one of the most interesting displays to be found at Engineering Open House. Our displays range from such old standbys as the rolling mill, the tempering exhibit and the zinco alloy to last year's third prize winner, the powder metallurgy display. One of our other exhibits in which we are sure you will be interested is the electron microscope used to detect minute flaws and dislocations.

Metallurgy at the University of Illinois is a rather small department on the undergraduate level although our graduate program is large and highly regarded throughout the country. Our classes are small and a very close association is developed between faculty and students. Examples of the intradepartment camaraderie are the faculty-student bowling competition, softball game, and picnic as well as the senior-junior basketball game. Few other departments develop this cooperation which is also evidenced by large faculty turnouts at monthly meetings of our student society (Mineral Industries Society).

The undergraduate student may elect two options, research or production. Most students elect the production option choosing to take a large core of metallurgy courses in preparation for industry. Many later go on for advanced degrees. The research option requires more math and physics and demands graduate study in preparation for a career in research. It is interesting to note that about twice as many metallurgy students (by percentage) go on to graduate study as do students in other fields of engineering.

The reason for this is that the primary interest of the metallurgist is in materials rather than in machines. This implies a basic knowledge of the materials themselves as well as their properties and uses.

Some typical problems a metallurgist might face include: operation of a turbine at higher pressures and temperatures, design of a nuclear power station, development of new alloys, or seeking a commercial use for a new material.

Visit the Met. Lab., ask the students what they enjoy about metallurgy, and enjoy the exhibits they have set up for you. ♦♦♦

Students in Metallurgical Engineering are required to take several laboratory courses. Several students are shown doing metallographic work in one of the metallurgical laboratories.

Mechanical and Industrial Engineering

The diversification of engineering processes keynotes the Mechanical Engineering Department's program. The curriculum provides training in the basic courses of science, mathematics, design, energy conversion, and engineering fundamentals, while providing the student with an acceptable background in the social sciences and humanities. Technical electives during the junior and senior years permit students to apply previously learned fundamentals to the area in which he is most interested—heat and power, machine design, production, research, or air-conditioning and refrigeration.

Displays and Facilities

By presenting the theories and practices of the generation, transmission, and utilization of energy as well as the basic design of machine elements, the Mechanical Engineering student displays at the 1963 Open House will utilize the modern educational facilities available . . . ranging from the operation of power equipment in the M. E. Lab to the solution of design problems on a Heathkit Analog Computer. Included with the mechanical engineering displays will be displays by Industrial Engineering students showing product and process planning, work methods and measurements, and the coordination of these activities with plant layout and material flow.

The facilities offered for undergraduate study can be shown best by briefly outlining the equipment displayed in this year's Open House.

Of prime interest in the Mechanical Engineering Laboratory will be the utilization of steam generated at the university-owned Abbott Power Plant. This steam will drive a variety of prime movers such as General Electric turbines and (for the last time) the Allis-Chalmers steam engine, which provided electricity at the St. Louis Exposition of 1903. Also in operation will be the G. E. Educational Power Plant, which contains a turbo-generator unit simulating the actual operation of a conventional steam generating power plant. Other units on display will include air compressors, pumps, air-conditioning equipment, thermoelectric cooler-generator, and the operation of a Freon-12 refrigeration cycle.

The Internal Combustion Laboratory will demonstrate engine testing and different modes of Internal Combustion engine operation. In operation will be four multi-cylinder engines, including the Falcon, Valiant, and Caterpillar Diesel. Also in operation will be the single cylinder, variable compression ratio, Co-ordinated Fuel Research engine used in universities and fuel research centers throughout the country. Experimental fuel ignition apparatus, including one of the two adiabatic compression machines in operation in the world today, will also be on display.

The Foundry exhibit will depict a typical foundry in actual operation. Included in these processes will be molding, core making and baking, melting, pouring, and production finishing processes. Visitors touring the foundry on Friday will see iron castings poured from the cupola, and those on Saturday will see aluminum poured and cast from gas-fired kilns.

In showing the design aspect of the mechanical engineering profession, departmental displays involving basic machine elements such as gears, clutches, transmission shafts, cams, and bearings, will be run in conjunction with the Heathkit Analog Computer.

Exhibits in the machine shop, welding, and heat treatment labs complete the general survey of the facilities available. The operation of such machines as lathes and gear turning machines will be demonstrated in the machine shop. Displays of tools and different metal chip formations will also be on exhibit including the traditional demonstration of drilling square and hexagonal holes.

In the welding lab, demonstrations of flame cutting, flame welding, arc welding, resistance welding, friction welding, and metal spraying will be shown.

The heat treatment lab will show such tests as those for hardenability and ductility, and others necessary to adequately specify metal properties. Crystalline structures will be observed through microscopes and compared with theoretical lattice structures. The program will be rounded out by a general tour of the lab noting metal research facilities available. ◆◆◆

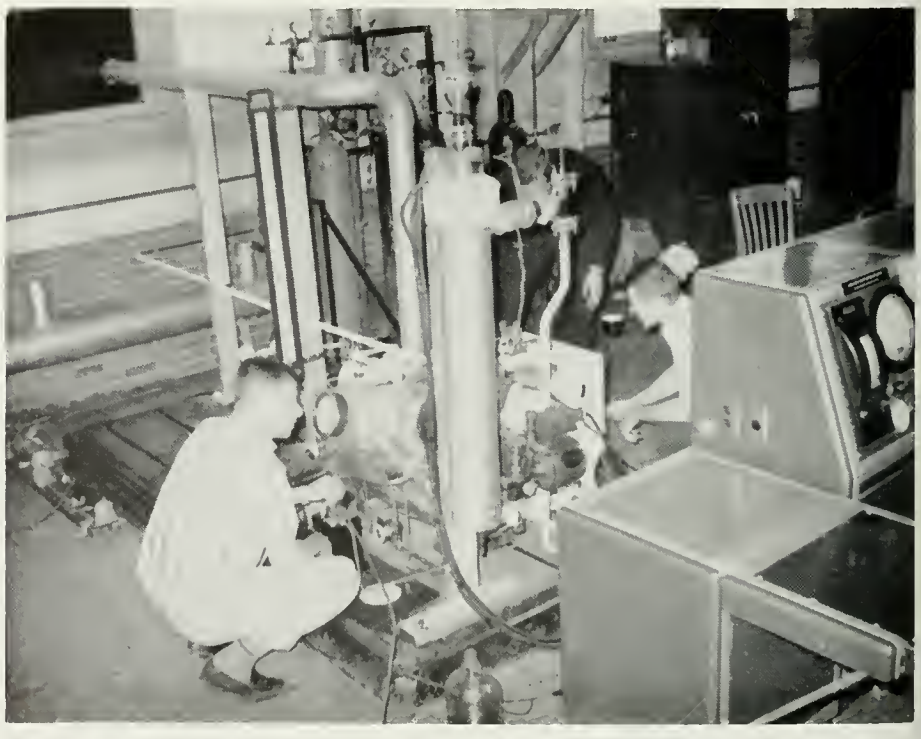

Figure 1. As part of the practical application of the theory taught in the classroom, several Mechanical and Industrial engineering students are shown running tests on the adiabatic compression machine in the Internal Combustion Engine Laboratory.

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Engineering Mechanics

Presently there are sixty students enrolled in the undergraduate Engineering Mechanics program. With a professorial staff of thirty-three and a graduate school of seventy students, the undergraduate is assured a rich environment for study and individual attention by the faculty.

Engineering Mechanics is a rigorous curriculum stressing the fundamentals of physics, mathematics, and engineering science. The program is designed to give students an extensive theoretical background to aid him in future research and developmental work. Several E. M. students obtain valuable research experience working as assistants in the various laboratories of Talbot Laboratory.

During his senior year each student is required to do a research project emphasizing the synthesis of subject matter covered in dynamics, mechanics of materials, nature and properties of materials, fluid mechanics, electricity and magnetism and heat transfer. This research course, T. A. M. 294, teaches students the proper approach to a practical problem and the limitations of theory in solving such a problem. The course is given particular emphasis by the department and the best possible supervision and facilities are offered. Subjects studied last year included "Cyclic Deformation and Rolling Resistance of Perfect Plastic Spheres," "Effect of Plate Thickness on the Stresses in the Plane of a Crack," "A Study of Dislocation Patterns Near a Cleavage Crack in Tithium Fluoride at Low Temperatures," "Cycle Dependent Creep," "Forced Vibrations of a One-Dimensional Non-Linear Magnetic Spring," and "Effect of Launcher Stiffness on Missile-Launcher Response."

The high school student is often dubious as to what an engineer is and what he does. To become an engineer one must first understand certain principles of science and mathematics and their applications to a particular field. For example, in the field of vibrations the student must first obtain an understanding of differential equations. Such a course provides the student with mathematics capable of describing vibratory motion; the situation is somewhat analogous to the solution of word problems by high school algebra. After studying differential equations, the student is prepared for a course in the specific application of the equations to vibratory bodies, mainly to idealized models such as simple springs. This knowledge is the first element of becoming an engineer.

Applications to actual situations are the remaining necessities. Perhaps the trained engineer will be asked to design shock absorbers to dampen vehicle vibrations, such as those resulting from hitting a bump in the road. The engineer will find that he cannot describe exactly the spring effects with the mathematics available to him. He must mentally simplify the situation and make an idealized model which closely approximates the actual situation. From this model he can derive his solution. The judgement required in the adapting of an idealized model is one reason why engineering is often referred to as an art.

What an engineer does is most certainly not limited to the study of fluids, dynamics, plasticity, elasticity, photoelasticity, and material behavior. These fields are all somewhat inter-related, and the student is given an introduction to each. Upon achieving his B. S., the graduate is quite prepared to enter industry. Recent graduates are now at firms such as North American, Allison, McDonald, Boeing, Douglas, Bell Laboratories, General Electric, ACF Industry, and IBM, to mention only a few. Many students, however, prefer to enter graduate school for specialization in a particular field.

Prospective students seeking more information about the Engineering Mechanics curriculum are encouraged to write: 212 Talbot Laboratory, Champaign, Illinois. ♦♦♦

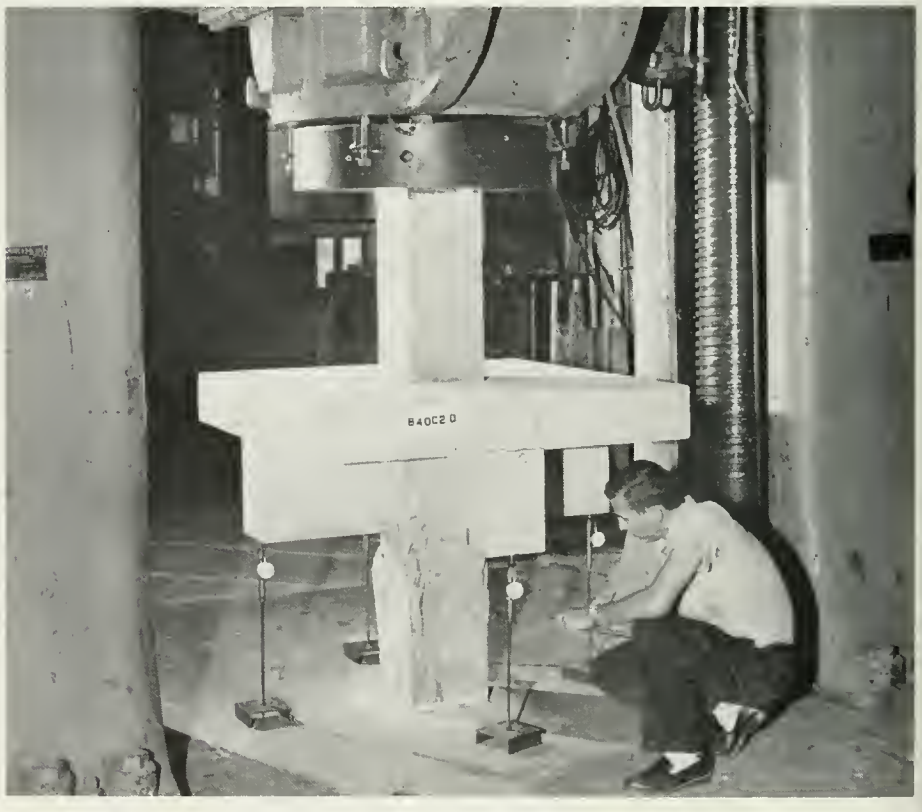
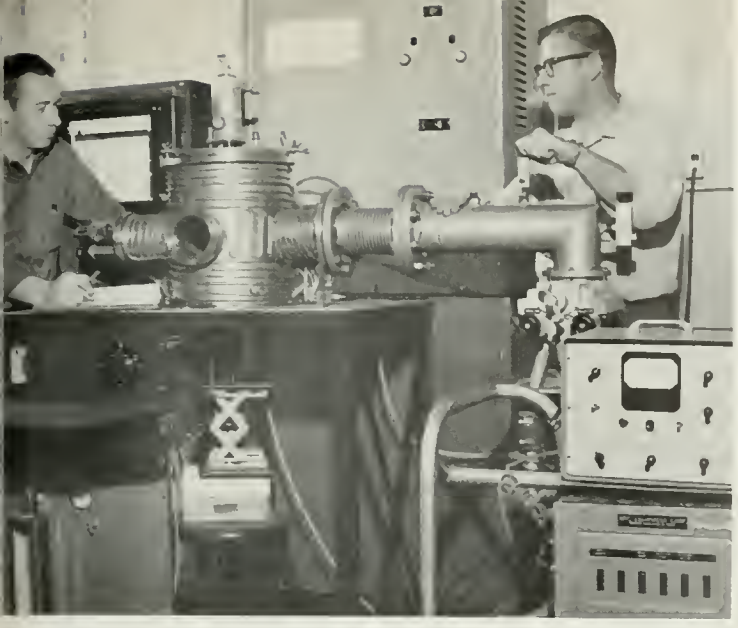


Figure 1. A graduate student is examining the failure in a reinforced concrete specimen. The specimen was loaded by the partly visible machine, which can exert 3,000,000 pounds of compression or expansion.



Ceramics Engineering

Figure 1. Research staff in the Ceramic Engineering High Temperature Technology laboratory assemble an induction-heated cell used for thermal conductivity, ablation transpiration and diffusion studies of aerospace materials to as high as 5000 degrees F.

Ceramic Engineering is at once the oldest and the newest of the engineering sciences. For, while it began with the ancient discovery that, through fire, clay could be used to make durable and useful containers, it has expanded to such an extent that now it is literally leading the world into tomorrow by providing such vital products as the nose cones of space vehicles and the fuels for nuclear reactors.

But just what are ceramic materials and what is ceramic engineering? In a very broad sense, ceramic materials are those inorganic, non-metallic materials which are subjected to elevated temperatures during either their processing or end use. And, in general, ceramic engineering is simply the scientific adaption and processing of these materials to serve a practical purpose.

Some Things to See in Ceramic Engineering During The Weekend

Many of the applications mentioned above and many others will be illustrated by exhibits in the Department of Ceramic Engineering during the Science and Engineering Weekend May 10 and 11. Please make it a point to include a stop in our department in your weekend plans—we promise that what you see will be of interest. But just what are some of the exhibits you will find in Ceramic Engineering? A few of the displays are described below.

The compressive strength of ceramics is strikingly illustrated by one demonstration which many people (including ceramic engineers) find hard to believe. An ordinary commercial spark plug insulator is placed on an ⅛ inch thick steel plate and hydraulically loaded. Soon the unharmed tip of the insulator is seen protruding through the plate through the hole it has punched. This is one demonstration you have to see to believe—and even then you may have doubts.

Another display shows the application of glass to the new field of fiber optics. Specially processed glass fibers are collected together in a flexible bundle which transmits light even though the bundle is bent around corners, looped, or even tied in knots. Still other fiber optic devices not only transmit light, but clear and undistorted images as well. Although we don't recommend using them to read a newspaper, it can be done.

A more theoretical but equally interesting exhibit illustrates the effect of heating a ferroelectric ceramic material beyond a certain temperature, known as its Curie temperature. You will be able to bring a crystal of barium titanate to this critical temperature and, by means of a special microscope, actually see the effects of the complete rearrangement of the atoms within the structure of the crystal.

But perhaps your interests lie with the industrial applications of theoretical concepts. If such is the case, other displays will attract you. One of these is a model of a plant for the porcelain enameling of sheet steel, which shows how many common products are manufactured—including the kitchen sink. Or perhaps you would like to see how the crown of a steel-making open hearth furnace is made, or the various ways of measuring and controlling temperatures high enough to melt or vaporize most materials.

If you are a "do-it-yourself" person, you may want to actually measure the temperature of a kiln operating at temperatures over a dozen times that of boiling water or produce a high voltage spark by squeezing a ceramic crystal.

These are just a few of the many things to see and do in the Department of Ceramic Engineering during Science and Engineering Weekend. Whether you are a high school student deciding on a field of study or a casual observer, we guarantee that you will enjoy your visit to our department.

What Does Ceramic Engineering Mean to Me?

From the time you fill your bowl with breakfast cereal to the time you switch off the light at night, you are surrounded by ceramic products and products made possible only by ceramics.

(Continued on Page 51, Col. 1)

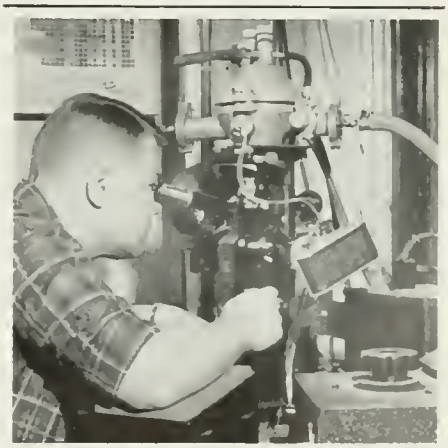


Figure 2. High temperature microscope used in Ceramic Engineering Department to study changes in microstructure of materials during heating to high temperatures.

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Architecture

A career in architecture offers an enormous range of professional activity, from the design and construction of individual buildings to large scale planning and design of cities. Since the dawn of civilization, man has sought a spiritual satisfaction in the molding of his environment beyond the solution of practical problems of protection from the elements and the arrangement of spaces to accommodate the many different functions of living and working. For this reason the architect has always been thought of as both an artist and a master of building technology. In fact the word architect, from Greek, (archi = highest, tect = master technician) implies a responsibility for both the beauty and practicability of buildings, either as isolated structures or in the total design of communities.

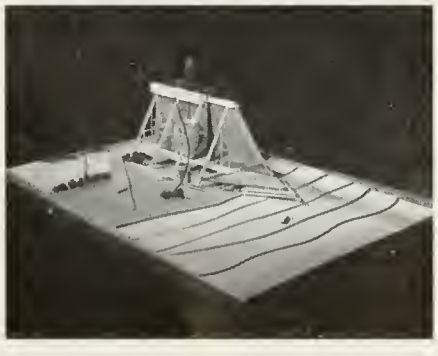
In addition to a wide variety of building sizes and groupings as well as a variety of functional types, such as schools, churches and houses, a career in architecture presents choices as to specialization in architectural design, structural design, production of working drawings and specifications, supervision of construction, architectural research, manufacturing of building products and many other aspects of the broad disciplines of man-made environment. Opportunities for the practice of architecture are wider than ever before in all types of offices, from one-man consulting services to very large firms of several hundred. Of course it is in the larger firms that most of the newly developing activity in urban renewal is found, but many small offices continue to prosper in an atmosphere of very personal service to individual clients.

There is every indication that the future role of the architect will be of even greater breadth of scope, keeping pace with immense increases in population and the resulting need for technological advance. There is, as well, every reason to believe that society, through better education, will demand designs of higher quality and greater beauty, especially in relation to the city as a whole.

Architectural education, at the University of Illinois as well as in most other major universities throughout the world, is geared to these present and future needs of the architectural profession. The two-fold requirement of broad cultural background and high technical competency is met by a five-year curriculum leading to a Bachelor of Architecture Degree in which emphasis shifts from basic studies in mathematics, drawing, visual fundamentals, physics and mechanics to greater concentration in various architectural disciples of design, history, construction, and structural theory.

Beyond the B. Arch. Degree, young architects must work for three years in a registered architect's office before they may take the State Board Examination for a license to practice architecture. Many continue advanced studies in graduate schools in which the programs lead to greater competency in definitive design, urban design, advanced studies in history, construction, and structural theory. There is a strong trend to increase the number of years of architectural education in response to the mounting pressure to know and understand the new resources of materials and technology that are constantly developing and to meet services that are expected of the architect.

All of this combines to lend more comprehensive an aura of excitement and opportunity to architectural practice that is most gratifying in its personal satisfaction as well as in its contribution to human progress. ♦♦♦



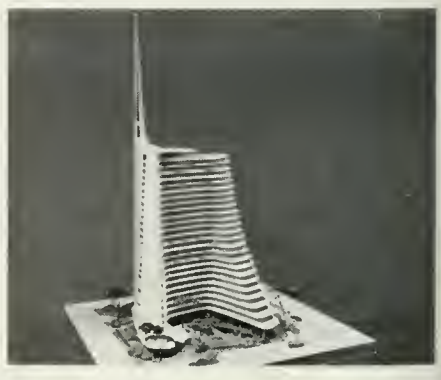


Figure 1. A career in Architecture offers an opportunity to design individual buildings as well as groups of buildings. As depicted by these pictures, architects are answering the public's demand for better quality and more beauty in the man-made physical aspects of their environment.

Ceramics . . .

(Continued from Page 47)

The dishes in your cupboard, the sink in which you wash them, and the light bulb and the insulators in its switch and socket are all ceramic materials. These are rather obvious, but did you realize that the sidewalk in front of your house, the hundreds of tubes, capacitors, resistors, and magnets in your TV set are also ceramic products? Or that your car wouldn't run if it weren't for its ceramic insulated spark plugs? In fact, if it were not for a certain class of ceramic materials called refractories you wouldn't even have a car since your car and all other steel articles begin as a pool of molten metal in refractory containers. And yet this is just one aspect of the vast field of ceramic engineering.

The field includes all products made of glass, which range from ordinary window glass and fiber glass curtains to certain special types of glasses used as the radomes on guided missiles and flexible glass rods which permit doctors to actually see and examine the internal organs of a patient without surgery. Other ceramic products have such lowly but important functions as carrying sewage from your home, while still others act as heat shields to insure that vehicles may return safely from space. A complete list of the applications of ceramics would be virtually endless.

A Career in Ceramic Engineering

Now that you have an idea of the many ramifications of ceramic engineering you may wonder what sort of work is done by ceramic engineers. As you may suspect from the diversity and significance of their field, ceramic engineers are sought by a wide variety of industries. Of course they are in demand for the operation and management of companies dealing exclusively with ceramics, such as glass, refractories, whitewares, porcelain enamels, electronic materials, and the like. However, just as great a need for ceramic engineers exists in such fields the steel, aerospace, electronic, and nuclear power industries as well as most technical governmental agencies and a host of other areas through which ceramic engineering directly contributes to the advancement of our technological society.

If this short article concerning a field of engineering you may not be familiar with has aroused your curiosity, please make it a special point to stop by our displays and meet our students and staff. You will find exhibits and demonstrations illustrating some of the courses in Ceramic Engineering and many people willing to answer your questions and discuss your plans with you at our information center. We in the Department of Ceramic Engineering are looking forward to seeing you during Science and Engineering Weekend. ♦♦♦

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OPPORTUNITY—U. S. Rubber recognizes the importance of our technical staff, knows that the answer to tomorrow's problems is already in the minds of its engineers today. "U.S." rewards individual contributions. Many in our top management started as engineers or technicians with the company. The president of U. S. Rubber is a chemical engineer, several vice presidents hold engineering or technical degrees.

STABILITY—U. S. Rubber is one of America's 50 largest industrial companies, with more than 119 years of industrial experience, operating 74 plants at home and abroad. We are a polymer industry with less than half our business in tire manufacturing. U. S. Rubber is one of the nation's largest textile manufacturers and leading chemical producers. "U.S." provides good working conditions for more than 40,000 employees in the United States, another 30,000 abroad.

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THE U IN FUTURE

(Continued from Page 4)

engineering students and faculty will be at Engineering Open House this May 10th and 11th. One of the purposes of Engineering Open House is to give you a chance to find out more about the branches of engineering.

Future Non-Engineers

For you who are NOT INTERESTED in becoming engineers, I hope that it is because you have decided upon another career, or least have narrowed down the fields from which to choose. I hope that your final decision will be the one that is best for *you*.

We should all strive to learn more about the other professions, in this way we gain a better appreciation and understanding of the other fellow and his problems. Since you are not interested in engineering, you should strive to understand the basic problems in engineering and other fields. In our modern complex civilization, we all depend on each other. If I fail to understand your problems or you fail to understand mine, then we can do little to help each other. This is where I hope Engineering Open House can help you. One of the purposes of Engineering Open House is to inform the public about engineering. This is only one of many ways you can learn about the field of engineering—what has been done; what needs to be done.

Come by and see us May 10th and 11th, and we will try to answer your questions on engineering. ♦♦♦

TECHNOQUIPS

CE: The folks in the next apartment must have had one heck of a blowout last night. They bellowed and pounded on the walls until 3 a.m.

EE: Did they keep you awake?

CE: No, I was up anyhow, practicing on my drums.

* * *

A truck driver stopped beside stalled Volkswagen on highway: "What's the matter buddy—need a new flint?"

* * *

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

Son: "Shooting craps, mother."

Mother: "That must stop. Those little things have as much right to live as you."

* * *

When a man sits with a pretty girl for an hour, it seems like a minute. But let him sit on a hot stove for a minute—and its longer than an hour. That's relativity. —Albert Einstein

* * *

"Hey Dad, I'm home from school again."

"What the devil did you do this time?"

"I graduated."

* * *

"Lips that touch liquor shall never touch mine."

"Your lips?"

"No, my liquor."

* * *

* * *

Sign on bulletin board in front of church in small Wyoming town:

Subject for this Sunday: "Do you know what hell is? Come and hear our new organist."

* * *

Found on a fall registration card of a freshman engineering student: Name of Parents—Mommy and Daddy.

* * *

He was a rather undersized freshman at his first college dance, but despite his smallness and bashfulness, he was sure of himself in his own way. He walked over to a beautiful and over-sophisticated girl and said, "Pardon me, Miss, but may I have this dance?"

She looked down at his small size and lack of fraternity pin and replied, "I'm sorry, but I never dance with a child!"

The freshman bowed deeply and said, "Oh, I'm sorry, I didn't know your condition."

Mother: My son is home from college.

Neighbor: How do you know?

Mother: I haven't had a letter from him in three weeks, and the car is gone.

* * *

Coed: "Don't you kiss me again, you naughty boy."

M.E.: "I won't. I'm just trying to find out who has the gin at this party.

* * *

"Ah wins."

"What you got?"

"Three aces."

"No you don't. Ah wins."

"What you got?"

"Two eight's and a razor."

"You sho do. How come you is so lucky?"

* * *

A small, quiet C.E. ended his phone call, hung up, and then smiled as his dime came back into the slot. Immediately, the telephone rang.

"Are you the man who just made this call?" the operator asked.

"Yes," he said.

"I returned your dime, by mistake. Will you please redeposit it?"

"Sorry," the man said in a typical telephone operator's monotone. "I cannot do this. But if you send me your name and address, I will be glad to send you the dime in stamps."

* * *

The Army reports that its new radar is so sensitive, it can pick up a tank at a distance of ten miles and can identify an enemy soldier three miles away. That is not all. A good operator can tell whether the enemy is male or female. It seems that the hip movement of a woman causes distinctive blips. The question is how are you going to keep the operator's mind on tanks and troops when a hip blip weaves across the screen.

* * *

An instructor asked a new M.E. the purpose of a bolt with a left-handed thread and got this bewildering reply:

"A bolt with a left-handed thread is a bolt which the tighter it's screwed the looser it gets."

* * *

Ag.E.: "I dreamed of you last night."

Coed: (coldly) "Really!"

Ag.E.: "Yes, then I woke up, shut the window, and put on an extra blanket."

Civil Engineering . . .

(Continued from page 35)

at the University under a National Science Foundation grant. These grants allow undergraduate students to enter actively into research work in cooperation with staff members, and at the same time help finance their education. Often, college credit is given for this work.

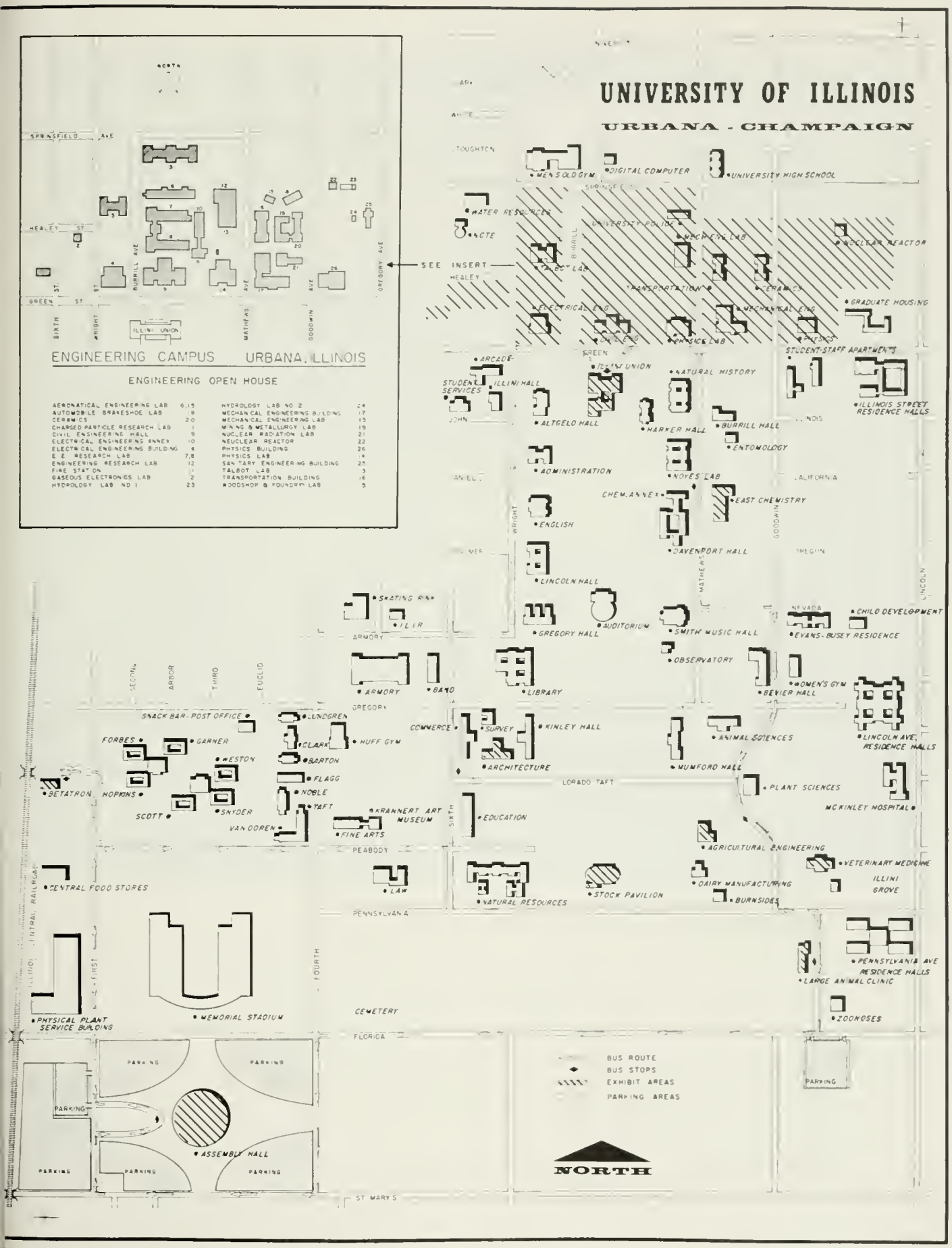
Perhaps more than any other type of civil engineer, the *Sanitary* engineer is being crowded by the expanding population of the United States. In addition to the over-taxed existing, often old, water distribution and sewage disposal systems, new problems of atomic wastes, stream polution and air polution are becoming common.

Civil engineering is indeed a wide and diversified field. However, it is this diversification that should make civil engineering attractive to prospective engineers. Regardless of the project, its geographical location, or its application, some part of civil engineering is likely to be needed for its completion.

Often it is the case that entering freshmen feel that they would like to be an engineer. Generally their capabilities and interest in math and science have created this feeling. But when confronted with the decision to name a particular field the student in general has no real background to base this decision upon. There are exceptions of course but in most cases the decision is made on what they *think* they would like. When making this decision, there are two reasons why civil engineering may be appealing. The first is the wide scope of civil engineering in general. As stated before, almost in any engineering project, civil engineers will be involved at some point. Secondly the new curricula offered by the civil engineering department allows one to gain a basic background in engineering and then choose a specialization or area. This specialization may be in civil engineering or in some other engineering field in which the student has become interested.

The displays and exhibits of the Civil Engineering Department are presented in hopes that the visitors to Open House will gain an insight into the wide scope of civil engineering and will offer a prospective student an idea of what a career in civil engineering will encompass. In addition, we at Open House hope that visitors will make use of the counseling services provided.

Men are available at each exhibit specifically to answer your questions and if any question does arise about the exhibit, be sure to inquire further. It is hoped your visit to Open House is pleasant and that we of the Civil Engineering Department may be of service to you. ♦♦♦


UNIVERSITY OF ILLINOIS
URBANA - CHAMPAIGN
ENGINEERING CAMPUS URBANA, ILLINOIS
ENGINEERING OPEN HOUSE
AERONAUTICAL ENGINEERING LAB 6,15
AUTOMOBILE BRAKESHOE LAB 8
CERAMICS 20
CHARGED PARTICLE RESEARCH LAB 1
CIVIL ENGINEERING HALL 9
ELECTRICAL ENGINEERING ANNEX 10
ELECTRICAL ENGINEERING BUILDING 4
E E RESEARCH LAB 7,8
ENGINEERING RESEARCH LAB 12
FIRE STATION 11
GASEOUS ELECTRONICS LAB 2
HYDROLOGY LAB NO 1 23
HYDROLOGY LAB NO 2 24
MECHANICAL ENGINEERING BUILDING 17
MECHANICAL ENGINEERING LAB 15
MINING & METALLURGY LAB 19
NUCLEAR RADIATION LAB 21
NUCLEAR REACTOR 22
PHYSICS BUILDING 26
PHYSICS LAB 14
SANITARY ENGINEERING BUILDING 25
TALBOT LAB 3
TRANSPORTATION BUILDING 16
WOODSHOP & FOUNDRY LAB 5
SEE INSERT
MEN'S OLD GYM
DIGITAL COMPUTER
UNIVERSITY HIGH SCHOOL
WATER RESOURCES
ACTE
UNIVERSITY POLICE
MECH ENG LAB
NUCLEAR REACTOR
TRANSPORTATION
CERAMICS
GRADUATE HOUSING
ELECTRICAL ENG
MECHANICAL ENG
PHYSICS
STUDENT-STAFF APARTMENTS
ARCADE
STUDENT SERVICES
ILLINI HALL
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ZOONOSES
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ARBOR
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EUCLID
FIRST
FOURTH
LINCOLN
CENTRAL RAILROAD

Science-Engineering Weekend Timetable

Friday, May 10, 1963

7:00 a.m.	Illini Union Building opens
8:00 a.m.	*Science - Engineering Weekend Bus for visitors begins service with buses at five-minute intervals
	Science - Engineering Information Center opens — Phone 333-1867 — Illini Union Building
9:00 a.m.	JETS Exposition Commences—Illini Union Ballroom
10:00 a.m.	Engineering Open House (EOH) commences — all engineering campus Exhibits and Information Centers are open throughout all the Engineering and Architecture Buildings
	Gemini Capsule Launch to Landing Sequence Film every half hour at the Naval ROTC exhibit
	Stress test of Concrete Cylinder with 3 million pounds of force — Theoretical and Applied Mechanics Department—Talbot Laboratory — Hourly after 10:00 a.m., with the exception of noon and 5:00 p.m.
10:15 a.m.	Distribution of tickets for 2:30 special tours of science departments not participating in Open House begins at Assembly Hall. (West entrance)
Noon	IJAS Exhibits opened to public
1:00 p.m.	Veterinary Medicine Open House (Vetevue) commences
2:00 p.m.	JETS judging commences — Illini Union Building
2:30 p.m.	IJAS special tours (See 10:15 listing above)
4:30 p.m.	Award certificates distributed for IJAS projects — Assembly Hall
	Distribution of special awards by E.C.I.C. of the American Meteorological Society — Assembly Hall
	IJAS exhibit ends.
6:30 p.m.	IJAS banquet — Illini Room, Illini Union —closed to public
9:00 p.m.	JETS closes until 9:00 a.m. Saturday
	Vetevue closes until 9:00 a.m. Saturday
	IJAS social and mixer—Illini Union Building
10:00 p.m.	EOH closes until 9:00 a.m. Saturday
	Science - Engineering Information Center closes until 8:00 a.m. Saturday
10:30 p.m.	*Science - Engineering Weekend Bus service ends for the day
Midnight	Illini Union Building closes

Saturday, May 11, 1963

7:00 a.m.	Illini Union Building opens
8:00 a.m.	Science - Engineering Information Center opens — Phone 333-1867 — Illini Union Building
	*Science -Engineering Weekend Bus service commences
9:00 a.m.	IJAS paper session commences — Gregory Hall
	JETS paper session commences — 314 Altgeld Hall
	JETS exhibits open to public — Illini Union Building
	Vetevue commences
	EOH commences
11:30 a.m.	IJAS Special Awards Assembly — Gregory Hall Auditorium
12:00 noon	JETS awards luncheon — Illini Room, Illini Union Building — closed to public
5:00 p.m.	EOH ends
	JETS ends
	Vetevue ends
	Science - Engineering Information Center closes
6:00 p.m.	*Science - Engineering Weekend Bus service ends
Midnight	Illini Union Building closes

(See leaflet distributed on campus for revised timetable)

Kodak beyond the snapshot...

The powder is vitamin E. Vitamin E is essential to human life. Also to poultry and livestock. This much is enough for about 200 multivitamin tablets. We make so much of it for the pharmaceutical manufacturers that the operation long ago entered the domain of chemical engineering.

It's an especially interesting kind of chemical engineering, related to the kind we have been developing over the years in our basic business of manufacturing photographic materials.

Vitamin E is in no way a by-product of photographic manufacturing. Only the engineering skills behind it are a by-product. They come out of the maddeningly sensitive nature of sensitized film and paper. Now they are available for the thousands of other fascinating things we make besides vitamin E.

We need more chemical engineers to indoctrinate in our ways. The snapshot business is excellent, but photography has gone far beyond the snapshot and we have gone far beyond photography. *Please drop us a note asking for an explanation of what all this has to do with you.*

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Manufacturing Careers Offer Diversity, Challenge and Opportunity

An Interview with G.E.'s H. B. Miller, Vice President, Manufacturing Services

Halbert B. Miller has managerial responsibility for General Electric's Manufacturing Services. This responsibility includes performing services work for the Company in the areas of manufacturing engineering; manufacturing operations and organization; quality control; personnel development; education, training and communications; materials management; purchasing and systems as well as the Real Estate and Construction Operation. Mr. Miller holds a degree in mechanical engineering and began his General Electric career as a student engineer on the Company's Test Course

Q. Mr. Miller, what do engineers do in manufacturing?

A. Engineers design, build, equip, and operate our General Electric plants throughout the world. In General Electric, this is manufacturing work, and it sub-divides into categories, such as quality control engineering, materials management, shop management, manufacturing engineering, and plant engineering. All of these jobs require technical men for many reasons. First, the complexity of our products is on the increase. Today's devices—involving mechanical, electrical, hydraulic, electronic, chemical, and even atomic components—call for a high degree of technical knowhow. Then there's the progressive trend toward mechanization and automation that demands engineering skills. And finally, the rapid development of new tools and techniques has opened new doors of technical opportunity—electronic data processing, computers, numerically programmed machine tools, automatic processing, feedback control, and a host of others. In short, the requirements of complex products of more exacting quality, of advanced processes and techniques of manufacture, and of industry's need for higher productivity add up to an opportunity and a challenge in which the role of engineers is vital.

Q. How do opportunities for technical graduates in manufacturing stack up with other areas?

A. Manufacturing holds great promise for the creative technical man with leadership ability. Over 60 percent of the 250,000 men and women in General Electric are in manufacturing. You, as an engineer, will become part of the small technical core that leads this large force, and your opportunity for growth, therefore, is unexcelled. Technical graduates in manufacturing are teamed with those in marketing who assess customer needs; those in research and development who conceive new products; and those in engineering who create new product designs. I sincerely believe that the role of technical graduates of high competence in the manufacturing function is one of the major opportunities for progress in industry.

Q. What technical disciplines are best suited to a career in manufacturing?

A. We need men with Doctor's, Master's, and Bachelor's degrees in *all* the technical disciplines, including engineering, mathematics, chemistry and physics. We need M.B.A.'s also. General Electric's broad diversification plus the demands of modern manufacturing call for a wide range of first-class technical talent. For one example: outside of the Federal Government, we're the largest user of computers in the United States. Just think of the challenge to mathematicians and business-systems men.

Q. My school work has emphasized fundamentals. Will General Electric train me in the specifics I need to be effective?

A. Yes, the Manufacturing Training Program is designed to do just that. Seminars which cover the sub-functions of manufacturing will expose you to both the theoretical and practical approaches to operating problems. Each of the succeeding jobs you have will train you further in the important work areas of manufacturing.

Q. After the Program—what?

A. From that point, your ability and initiative will determine your direction. Graduates of the Manufacturing Training Program have Company-wide opportunities and they continue to advance to positions of greater responsibility.

For complete information about General Electric's Manufacturing Training Program and for a copy of G.E.'s Annual Report, write to: Personalized Career Planning, General Electric Company, Section 699-06, Schenectady 5, New York.

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