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ABSTRACT

This publication, a pamphlet included in the B'nai B'rith Occupational Brief Series, directs its attention to the profession of engineering. It is described as that profession in which knowledge of the mathematical and natural sciences, gained by study, experience, and practice, is applied with judgment to develop ways to utilize economically the materials and forces of nature for the benefit of mankind. The education needed and personal requirements expected are presented; opportunities for minority youths are stressed. Fields of specialization, aeronautical and astronautical engineering, agriculatural engineering, ceramic engineering, chemical, civil, electrical, industrial, mechanical, mining and metallurgical as well as general engineering are briefly discussed. Other points of interest presented include opportunities for men and women, salaries, hours and working conditions, advantages and disadvantages, and employment outlook. Listed are colleges accredited by the Engineers Council for Professional Development. A bibliography is included. (EB)

engineering

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BBCCS Pamphlet #1018

B'NAI B'RITH CAREER AND COUNSELING SERVICES

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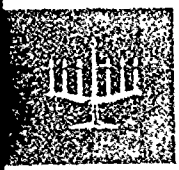

B'nai B'rith (Hebrew for "Sons of the Covenant") was founded in the United States of America in 1843. It is today the largest and oldest Jewish service organization in the world.

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1640 Rhode Island Ave., N.W., Washington, D. C. 20036

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CAREERS IN ENGINEERING

by DAVID R. REYES-GUERRA

Executive Secretary
Engineers' Council for Professional Development

IF ONE ASSEMBLED A HUNDRED PEOPLE who call themselves engineers, and asked each one of them to define what an engineer is, you would probably get a hundred different answers. Each one might be correct. Engineering is both diverse in its practice and in its education. Two people seldom think of it in the same terms. However, for ease of identification of the field, a definition has been coined by the Engineers' Council for Professional Development: "Engineering is the profession in which a knowledge of the mathematical and natural sciences, gained by study, experience and practice is applied with judgment to develop ways to utilize economically the materials and forces of nature for the benefit of mankind."

As the definition implies, engineers are doers. They are problem solvers. They do their thing based on a firm knowledge of the sciences, using mathematics as a basic tool. The ultimate goal of engineers is doing something for their fellow man.

A brief look around exposes the end products of engineering. In a classroom there are, for example: lighting, blackboards, desks, duplicating materials, pencils, radiators, air conditioning, overhead projectors, slide projectors, film material, etc. All these products were designed and produced so that they would not be a danger to the user, and would satisfy his needs. They must be comfortable, and provide human and educational advantages over previously used methods. In your home, for example, there is the hi-fi system, television, telephones, refrigeration, stove, running water, sewage, etc. All these are the products of engineering. Outside are such examples as roads, automobiles and airplanes. All are products of engineering and technology.

But if engineers do so many things that affect each of us in our everyday lives, why aren't they more visible? Why don't we know more about their work? We seem to know more about our physicians, our dentists and other professional personnel. One answer is that engineers work in the background, helping solve the problems that beset mankind. They are not dealing with their "customers" on a one-to-one basis. Except for large products such as dams, their products are mass produced. They do things for many people and work together as a team.

In thinking about engineering, a mistake is sometimes made of confusing engineers with scientists. This happens because many engineers are involved in research. Research is considered synonymous with science. This is not so. There are many engineers involved in research. However, they are interested in finding applications to known science. Scientists are those seeking new truths. This basic difference is frequently misunderstood. Nonetheless, it is vital to our understanding of engineering.

Where do engineers work? You will find them in all sorts of environments. These range from the hospital operating room where they monitor and design lifesaving machines that help surgeons perform their work, to helping archaeologists look for ancient civilizations through surveying methods. They are everywhere doing many things. They designed the heart pump and other lifesaving devices. They are also, as metallurgists, designing new pins and materials that can take the place of joints and bones. Engineers are found placing coherent light (lasers), ultra sound, and other techniques in the hands of surgeons to help make undreamed of strides in health care. In communications, engineers give us television, AM and FM radio, and telephones. We tend to take all this for granted without realizing the ingenuity and knowledge necessary on the part of the engineers to bring all this about. The communi-

cations satellites allow us to witness any event that is happening in any corner of the world as if we are there. By simply dialing a number, we are able to talk to people across the oceans. With the new video phones, we are able not only to hear but also to see those who are talking to us. These advances are made possible through the knowledge of engineering.

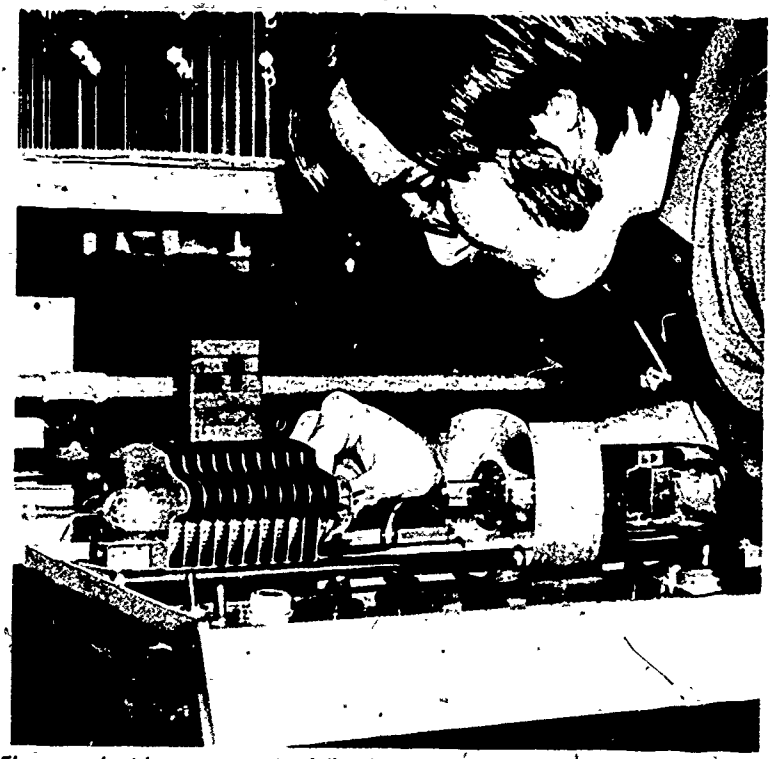
EDUCATION AND PERSONAL REQUIREMENTS

ENGINEERING REQUIRES A PERSON who is interested in solving problems. They are not necessarily physical or mechanical problems. It is any problem that needs a logical sequence of thought, imagination, creativity and an analytical and inquisitive mind. Engineering is an art. An engineer is called upon to ponder and think out every possible approach to a given problem. Based on constraints of the system under which he is operating, he must make a series of assumptions for solutions. He then selects the optimum for the conditions and restrictions associated with the problem. Social and moral responsibility must be taken into account. This problem solving concept is applicable to many professions. However, the engineer differs because of his background needs. Mathematics and the sciences are associated with the problems in which he is working. A facility with mathematics and science offers a strong possibility of one's being successful in engineering. Engineering is primarily practiced as a team effort. The engineer must be able to get along with and handle other people. He must understand human strengths and weaknesses and be able to help his team mates.

The education of the engineer usually requires a four to five year program at an engineering college. The first two years are spent in learning the basic sciences and mathematics. At the completion of this pre-engineering program, the student is able to select a field of engineering specialty or a cross-disciplinary field. He can follow this curriculum for the next two or three years toward the Bachelor of Engineering degree. During the first two years of college, the future engineer is able to explore the fields of specialty which might be of particular interest to him. He does not need to make a decision or commitment until the second year. He may, during this period, change his mind and enter some other field unrelated to engineering. However, it is not lost time. Whatever credit he has obtained in the engineering college is often transferable to other programs. An advantage to the two pre-engineering years that a student may pursue this program at a properly accredited

community or junior college. He then can transfer for the remaining two or three years to a college of engineering.

Approximately 15 percent of the graduates with a baccalaureate degree pursue a masters level degree in a field of specialty in engineering. One percent of all graduates continue towards the doctorate. Another large group of graduates, approximately 25 percent, enter fields unrelated to engineering. They do use engineering approaches, such as in law, medicine, business administration, and accounting. A good 50 percent start a professional career as engineers. Surveys show, however, that less than 30 percent of the graduates are doing straight engineering work ten years after graduation. They are primarily either administrators or managers. An engineering program prepares the graduate to enter the field of engineering or gives him the needed foundation for entering many other fields of human pursuit that require a collegiate background. What a liberal arts education was to the 50's, an engineering education can be to the 70's.



Thermogravimetric measurements of disordered magnesium ferrate are being taken in a magnetic field to obtain Curie temperature values.

A high school student who has not yet made up his mind as to what career to pursue may wish to follow a type of program that allows him to enter into an engineering curriculum in college. The advantage of this move is that it opens many avenues. The student who has taken the requirements of a college of engineering has the option to transfer into other college programs, but the converse is not true. A student who prepares for college in general may find himself lacking some of the prerequisites for pursuing an engineering program if later on he wishes to make a change.

COUNSELING

Many students find educational and vocational counseling helpful in choosing a career. A number of agencies provide professional counseling services. A student interested in assessing his assets and limitations may wish to avail himself of such counseling services. B'nai B'rith Career and Counseling Services field offices, or any counseling agency located in his geographical area can be helpful. A list of these agencies, approved by the American Board on Counseling Services, is published in their DIRECTORY OF APPROVED COUNSELING AGENCIES. Copies of this book are in many public and private libraries.

OPPORTUNITIES FOR MINORITY YOUTH

Although in the past, opportunities for minority youth in this field were limited, today engineering is an open profession with regard to Jewish people and other minority groups. It welcomes all those who want to enter the profession. Engineering has long been a profession which many Jewish youth tend to choose. The study by the National Office of the B'nai B'rith Career and Counseling Services in cooperation with B'nai B'rith Women, involving 6,600 affiliated Jewish youth in forty states and the District of Columbia, clearly confirmed that engineering is among the highest on their list of occupational choices.

FIELDS OF SPECIALIZATION

ENGINEERS TRADITIONALLY CHOOSE A CURRICULUM in one of several fields of specialization available to them. Basically, there are fifteen

major areas of specialization. These are represented by the societies which belong to the Engineers' Council for Professional Development. They are civil, mechanical, electrical, electronic, aeronautical, astronautical, chemical, industrial, mining, metallurgical, petroleum, nuclear, agricultural, ceramic and automotive. In addition, over 100 clearly defined sub-specialties may be easily identified among the main ones mentioned above. Surveys have shown that 50 percent of the graduates complete their work in their original field of specialization. The choice of a specialty is not so important at the beginning of an engineering education. The following are brief descriptions of some of the classical major specialty fields:

Aeronautical and astronautical engineering. This field involves application of engineering to the design of manned and unmanned vehicles that operate above the earth's surface as well as certain types of marine vehicles, both on and under the ocean. The field covers satellites to deep space probes as well as space platforms. Water being a medium similar to air, aeronautical and astronautical engineers also design vehicles for use in this medium. The courses that define the specialty of aeronautical and astronautical engineering usually cover aerodynamic propulsion, structures, flight mechanics, guidance and control systems.

Agricultural engineering is a special branch of the profession that works with agriculture and applies engineering to basic problems in agriculture. In many cases this will involve anything and everything from the design of farm power units and machinery to farm buildings; equipment for crop processing and handling; land improvement; materials and equipment for processing and handling animals.

Ceramic engineering. This is a highly sophisticated field of engineering. At present, this specialty is working at the forefront of the profession. The ceramic engineer is involved with the study of the behavior of ceramic materials under special environments. In the past, clay products, abrasives, cement and lime products have been considered provinces of the ceramic engineer. New events and discoveries in the science of materials have brought forth new techniques and new areas of work for the ceramic engineer. The ceramic engineer has great strength in material science, chemistry and physics.

Chemical engineering. This area of engineering is directly concerned with the development of new products or improving existing products, based on changes in chemical composition and physical form. The chemical engineer deals with fabrics, fuels, drugs, plastics, fertilizers, and other varied products.

Civil engineering is one of the oldest of the engineering fields.

A small analog computer and a remote terminal connected by cable to an IBM 1800 digital computer which is being used to simulate a chemically reacting system.

It is only preceded by military engineering. The broad field of civil engineering is now being subdivided into smaller fields. Some of them may eventually be known on their own as a field of specialty. The structural engineer concerns himself with the design of buildings, dams, retaining walls, tunnels, subway towers and similar type problems. Transportation engineering, another branch of civil engineering, deals with the transportation of people and materials from one place to another. Sanitary engineering is concerned with the development and maintenance of a healthy environment for people. It involves provision of safe water for human consumption as well as the processing and disposal of waste and the recovery of expended water for reuse in the life cycle. Another area within civil engineering is that of hydraulic engineering. This branch of engineering concerns itself not only with hydraulic structures, but also with the flow and control of rivers and other bodies of water, such as lakes and harbors.

Electrical engineering is another broad area which is divided

into two classical areas. One is that of power engineering whose concern is primarily that of production, distribution and utilization of electric power. The other area is electronics, which is concerned with the use of small amounts of electricity in providing instrumentation and controls. It includes design of the hardware plus the micro- and macro-miniaturization of devices used in communications.

Engineering Mechanics and Theoretical and Applied Mechanics are closely related to materials engineering. This area goes through the principles of mechanics that underlie theories and analysis of structures, their members, motion of bodies and many other engineering topics. It is a highly sophisticated and research oriented field.

Industrial engineering is an area which concerns itself with cost and production of goods, according to a specific and strict schedule. The industrial engineer coordinates men, materials, machines and money in order to produce a product of unquestioned quality which can be of some service to the consumer. Industrial engineers have to be quite adept at planning and implementing different plans of action that they might develop in pursuit of a better product.

Mechanical engineering is that which shows a student how to deal with generation and transmission of power, design, construction, operation and testing of all kinds of machines. It is considered, with civil engineering, one of the broadest fields of engineering. Mechanical engineers also get involved with optical devices, but basically we can consider that they usually study moving parts.

The field of *Mining and Metallurgical engineering* is now, in many cases, parting at different levels. Mining has become so complex and automated that many of the mining engineers are taken from the ranks of mechanical, industrial, and civil engineers. However, there are still a few who take mining engineering as a field of specialization. In metallurgical engineering, the engineer deals with properties of metals which can be used for the production of materials. The metallurgical engineer nowadays is mostly called a material science engineer.

General engineering. The general engineer is the general practitioner of the profession. He is trained in the basics of engineering with little depth in any given specialty, but with sufficient knowledge so that he can practice as an engineer. The general engineer in many ways is comparable to the family doctor. He knows enough of medicine to take care of those situations that confront the average patient. He also knows his limitations, so that when a patient needs a specialist's attention, the general practitioner knows who to go to and how to seek this help.

New fields of engineering are constantly being created. The environmental engineer and interdisciplinary engineers such as bio-engineer and engineer-lawyer are some of the latest. A number of engineering specialties team up with social sciences, humanities, economics and other standard areas. This combination provides the opportunity to apply engineering to another area.

OPPORTUNITIES FOR EMPLOYMENT

ENGINEERING, AS WELL AS THE OTHER PROFESSIONS, depends for its marketability on demands placed on it by industry. There are peaks and lows in engineering employment in general as well as in the specialties. A person with an engineering background is usually able to obtain a favorable position. In certain years, some specialty areas become extremely popular. Graduates in these areas may expect from five to even fifteen job offers for their services. In other more stable fields, graduates may find from one to three job offers. In general, engineers are usually welcome into the working field and are productive citizens. An idea of the average employment salaries can be obtained from the following, taken from the College Placement Journal:

NATIONAL AVERAGE MONTHLY SALARY OFFERS—1971

Engineering	*Bachelors*	*Masters*	*Doctors*
Aeronautical	$872	(—)	(—)
Chemical	928	$1,055	$1,411
Civil	859	991	963
Electrical	875	1,013	1,333
Industrial	877	1,007	(—)
Mechanical	886	1,016	1,226
Metallurgical (incl. Metallurgy & Engrg.-Ceramics)	890	(—)	(—)

A graduate with an engineering degree usually starts his professional practice as a Junior Engineer. He is either assigned to work with a group of engineers who are experienced, or he is sent to school to specialize in matters pertaining to the company he has joined or to acquire further knowledge in his specialty field. These training periods may vary from company to company. Once an engineer starts working, his advancement and progress through the profession are based on his initiative, motivation, interest and professional growth.

N.S.F. Fellow is studying the rate of growth of $Li_2B_4O_7$ by use of hot-stage microscopy and time lapse photography.

OPPORTUNITIES FOR WOMEN

A VERY IMPORTANT CONSIDERATION FOR ENGINEERING is that it is a nondiscriminatory profession. However, societal pressures in the past made engineering a non-glamorous profession. It was not considered proper for girl. Nowadays, many young women have seen through this "false nage." They are taking engineering and practicing even in such typically male fields as construction. Women, as well as any minority persons, find ready acceptance and are welcomed as fellow professionals. There are great opportunities in engineering for women just as well as for men.

FUNCTIONS

THE WORK OF AN ENGINEER can be classified by functions. This approach allows a better understanding of what an engineer does. Even if we can define different functions, no one engineer will necessarily perform only one. Many will go through a cross-section of

functions. However, for ease of understanding, we may define the functional areas as follows:

Research engineer. The research engineer studies the literature on a particular subject. He then makes calculations in order to verify theory and conducts experiments in order to prove or reject or modify existing theories. The engineering researcher mainly aims to solve specific manufacturing, design or production problems. He aims to develop new equipment methods and materials for which there is a need, and to evaluate their relationships in terms of actual behavior of materials and engineering requirements.

Development engineer. The development engineer's function is mainly to take all the results of research and convert them into useful apparatus, products or methods. It involves experimental and analytical work.

Design engineer. The design engineer's function, enables an engineer to follow detailed plans and specifications, or prepare such, in order to obtain the end product called for. The design engineer makes all the necessary calculations to insure that the product follows the code of engineering practice.

Test engineer. The test engineer has a variety of functions. Basically they depend on the particular field of engineering in which he is performing. However, as the name implies, the test engineer is the person who evaluates efficiency, productivity and reliability of various engineering products.

Planning engineer. The planning engineer's function is to help solve plant and systems problems. It involves a selection and combination of different equipment, methods or facilities in order to obtain the optimum solution. There are a number of variables that enter into the planning engineering scheme of things. Most of these engineers are proficient in the use of computers and their facility for comparing different options and variables.

Production engineer. The production engineer's function is responsibility for the manufacture of products and apparatus.

Construction engineer. The construction engineer provides the carrying out of the design engineer's function in the field.

Operating engineer. The operating engineer's function takes in the entire operation of engineering and makes certain, through supervision, that it follows recommendations and references of the design, production and other engineers.

Sales engineer. Sales engineering has become a very important field with the advent of technical equipment. A sales engineer is someone who is well prepared in the techniques of salesmanship. At the same time he is able, through his engineering expertise, to

explain the functioning of his product in terms of its engineering characteristics.

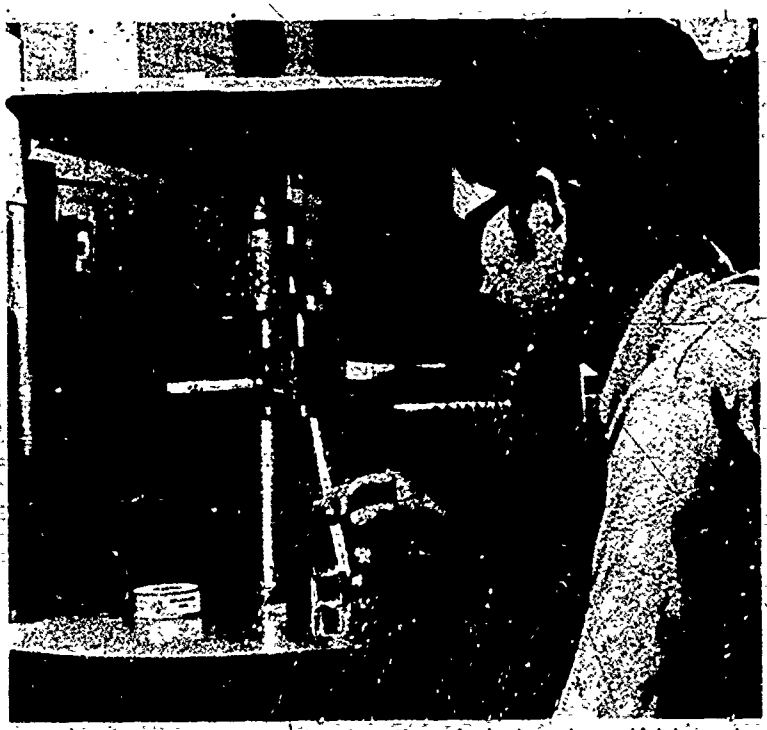
Service engineer. The service engineer's function is to maintain and develop new concepts for existing equipment and machinery. Service engineers are maintenance and safety oriented.

Administration engineering. Administration engineering is the function of the person in charge of a particular team of engineers or a mixture of engineers with other professionals.

Other important functions in engineering are those in management, publications and in public relations. These areas are becoming better known in engineering organizations. Here, professional knowledge of engineering subject matter is necessary for those who carry out public relations functions.

HOURS AND WORKING CONDITIONS

ENGINEERS WORK IN ALL SORTS of climates and under all sorts of



Replication tape is being attached to the surface of a lead specimen which has undergone reversed creep in torsion. Tape aids in making a microscopic examination of the surface configuration.

conditions. Some are working on construction projects in Africa, the Antarctic, Hawaii or almost any geographic location one can think of. Some are already planning for work in space or in the ocean. The environment within the working location is also quite changeable. Some will work in "gray rooms" under optimum conditions of cleanliness. Others in computer installations or in design offices will be under a controlled environment—air-conditioning, heating and adequate lighting. Still others will necessarily work indoors.

In general, engineers work the same as other professional persons; that is, from 35-40 working hours per week. When circumstances require additional work and study, engineers, as other professionals, will find themselves working additional hours.

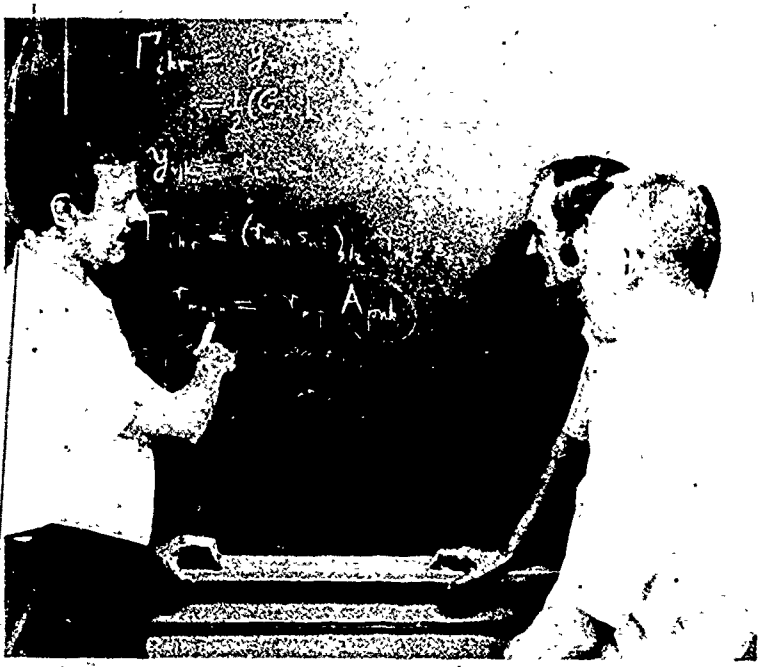
ADVANTAGES AND DISADVANTAGES

ENGINEERING OFFERS GREAT ADVANTAGES because of its flexibility and ready adaptability to the world of work. It is a team profession where each engineer works with others (not necessarily engineers) toward the solution of a common problem. It is a profession for those who like people and who enjoy mixing with other professionals.

Some educators claim that engineering obsolescence occurs at the rate of 20 percent per year. This means that unless an engineer is willing to update his education, he may find himself out of the current knowledge market within five or six years. Continuing education is stressed in the engineering profession. The young engineer should be prepared to spend much of his time keeping up with the profession and improving his knowledge.

COOPERATIVE EDUCATION

MANY STUDENTS OF ENGINEERING would like to get a taste of practice at the same time they are obtaining their education. This may be a very desirable approach. The student enrolls in a university or college where he usually spends the first two years. He then goes to industry for a one semester on-the-job experience. From then on, terms are alternated between the industry and the educational institution. There is no obligation for the student to stay with the industrial concern with which he has been a co-op student. However, many students choose to do so. A cooperative education allows the student to become acquainted in greater depth with a given industry while still going to college. The co-op program pro-



Professors discuss a mathematical question arising in the kinematics of the deformation of a continuum.

longs the study program for the student from one year to two years. Students who have pursued a cooperative program are of the opinion that it is an excellent way of obtaining an education, especially in engineering.

The so-called co-op approach is in use at 104 of the 275 engineering schools in the U.S. According to Dean Harold Liebowitz, the School of Engineering and Applied Science of the George Washington University has revised in the past three years its entire undergraduate and graduate curricula to be especially responsive to the needs of our changing society. This school, has a cooperative education program in engineering, and anticipates little difficulty in placing its graduates because of the demand for students with practical engineering experience at the time of graduation. At a recent meeting of this school, 100 jobs were pledged by industrial and governmental organizations for students going into the undergraduate cooperative education program in engineering.

Additional information about the School of Engineering and Applied Science may be obtained by writing: W. J. S. Mannion, Director of Engineering Admissions and Coordinator, Cooperative Education Program, School of Engineering and Applied Science, George Washington University, Washington, D. C. 20016.

In addition to the above illustration, information concerning national cooperative education programs may be obtained from the "Cooperative Education Association," Stewart B. Collins, Executive Secretary, Drexel University, Philadelphia, Pa. 19104.

FINANCIAL AID

STUDENTS WITH ABILITY WHO WISH to pursue a career in engineering should not drop their career aspirations because of a lack of funds. Although college undergraduate and graduate training can be costly in terms of time and money, student aid resources are increasing, particularly in the area of educational loans. Graduate students in engineering usually have opportunities to earn some of their expenses while at school.

A major student reference source providing information about student aid is SCHOLARSHIPS, FELLOWSHIPS AND LOANS published by the Bellman Publishing Company, Cambridge, Massachusetts 02138. This company also issues the SCHOLARSHIPS, FELLOWSHIPS AND LOANS NEWS SERVICE, a quarterly newsletter devoted to reporting new developments in student aid funds as they are established. The selective bibliography at the end of this career brief lists these publications, as well as many others that provide information on sources of funds available for youth who need financial help and are seeking a career in the engineering field.

EMPLOYMENT OUTLOOK

THE EMPLOYMENT OUTLOOK FOR ENGINEERS appears to be not as good as it was in the 60's. Engineering employment suffers from cyclical changes and shifts in industrial efforts. A shortage or oversupply of engineers with a given specialty may occur in any given time period. However, usually such changes are not permanent. Such a case occurred in 1969-70 with the change in emphasis from aerospace to the environment. In any case, competent engineers are always being sought by industry, with shortages of technically prepared people indicated up to the year 2000.

Most engineers are able to adapt to changes in industrial requirements and can change from one area of specialty to another with minimum training.

Persons who have had an engineering education find out that employment opportunities are many. Those who choose to continue in engineering naturally will seek employment in their field of

specialty. However, nowadays, a large number of engineers are using their technical background as the first step toward a career in some other field. It is becoming increasingly common to find physicians, lawyers and business executives with an engineering education as their basic background. Statistics show that ten years after graduation, less than 40 percent of the engineers are working strictly in engineering capacities.

PROFESSIONAL SOCIETIES

EACH OF THE SPECIALTIES IN ENGINEERING has a professional society that reacts to the needs of its members. Therefore, someone who wants pertinent information about what is happening in a given field can always obtain such material and an appropriate guide from each individual society. A listing of these societies appears in this publication. Students who would like further information on any particular field are urged, not only to request the publication, but also the names of members of the societies who might live in their immediate neighborhood and who may be available for personal interview. This allows the student to obtain firsthand information on what the profession is all about.

Some students in high school obtain part-time work, paid or volunteer, during the school year, and full-time work during summer vacations in work related to engineering. In a number of B'nai B'rith Career and Counseling Services offices, high school boys and girls considering a career as an engineer, have the opportunity to meet and spend time with B'nai B'rith Career and Counseling Services advisors who are successfully employed as engineers. The Engineers' Council for Professional Development can give general information on engineering. This organization should be contacted whenever a student is not certain about his interests in engineering. Write directly to:

Engineers' Council for Professional Development
345 East 47th Street
New York, N. Y. 10017

Engineering societies, with indicated specialty, represented in ECPD are:

American Institute of *Aeronautics* and *Astronautics*
American Institute of *Chemical* Engineers
American Institute of *Industrial* Engineers
American Institute of *Mining, Metallurgical* and *Petroleum* Engineers
American Society of *Civil* Engineers

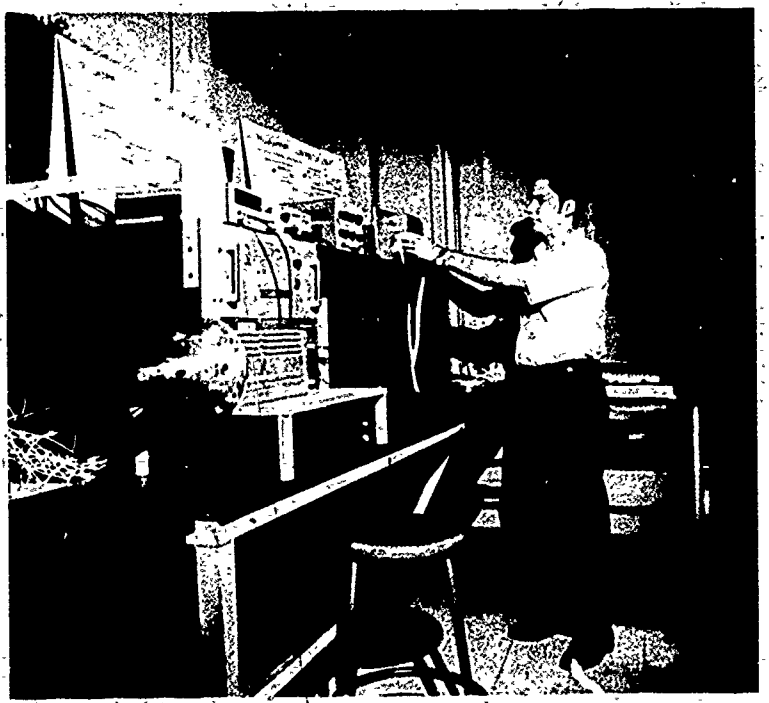
The American Society of *Mechanical* Engineers
The Institute of *Electrical* and *Electronics* Engineers

State engineering schools may also offer additional information on engineering specialties.

WHERE CAN I OBTAIN AN ENGINEERING EDUCATION?

As MENTIONED EARLIER, the first two years can be followed in most good liberal arts or pre-engineering junior or community colleges. The last two or three years should be taken in accredited curricula in a school offering such programs.

It is of interest to the person who is looking for an engineering career to also investigate the possibility of a career in engineering technology. The engineering technologist is a part of the engineering team. He is more interested in production and in direct application of engineering to the needs at hand. His education is at the baccalaureate level. Others may be interested in obtaining a degree as an engineering technician. This is usually at the associate level, in a junior college.



A digital step-motor control using paper tape input is being operated.

Following is a list of colleges of engineering that have programs accredited by the Engineers' Council for Professional Development. The programs offered lead to the first professional degree. To obtain a free, up-to-date copy, including the titles of the accredited curricula, write to: ECPD, 345 East 47th Street, New York, New York 10017. A list of technology programs is also available.

Air Force Institute of Technology
Akron, University of
Alabama, University of
Alaska, University of
Arizona State University
Arizona, University of
Arkansas, University of
Auburn University
Bradley University
Bridgeport, University of
Brigham Young University
Brooklyn, Polytechnic Institute of
Brown University
Bucknell University
California Institute of Technology
California State College, Long Beach
California State College, Los Angeles
California State Polytechnic College (Kellogg-Voorhis Campus)
California State Polytechnic College
California, University of
Carnegie-Mellon University
Case Western Reserve University
Catholic University of America
Chico State College
Christian Brothers College
Cincinnati, University of
Citadel, The
Clarkson College of Technology
Clemson University
Cleveland State University
Colorado School of Mines
Colorado State University
Colorado, University of
Columbia University
Connecticut, University of
Cooper Union
Cornell University
Dartmouth College
Dayton, University of
Delaware, University of
Denver, University of
Detroit, University of
Drexel University
Duke University
Evansville, University of
Fairleigh-Dickinson University
Florida Institute of Technology
Florida, University of
Fresno State College
Gannon College
George Washington University
Georgia Institute of Technology
Georgia, University of
Hartford, University of
Harvard University
Harvey Mudd College
Hawaii, University of
Houston, University of
Howard University
Idaho, University of
Illinois Institute of Technology
Illinois, University of
Iowa State University
Iowa, University of
Johns Hopkins University
Kansas State University
Kansas, University of
Kentucky, University of
Lafayette College
Lamar State College of Technology
Lehigh University
Louisiana Polytechnic Institute
Louisiana State University
Louisville, University of
Lowell Technological Institute
Loyola University of Los Angeles
Maine, University of
Manhattan College
Marquette University
Marshall University
Maryland, University of
Massachusetts Institute of Technology
Massachusetts, University of
Merrimack College
Miami, University of
Michigan State University
Michigan Technological University
Michigan, University of
Minnesota, University of
Mississippi State University
Mississippi, University of
Missouri, University of
Missouri at Rolla, University of
Monmouth College

Montana College of Mineral Science & Technology
Montana State University
Nebraska, University of
Nevada, University of
Newark College of Engineering
New Hampshire, University of
New Haven, University of
New Mexico Institute of Mining & Technology
New Mexico State University
New Mexico, University of
New York, City College of the City University of
New York, State University of, College of Ceramics at Alfred
New York at Buffalo, State University of
New York at Stony Brook, State University of
New York University
North Carolina State University at Raleigh
North Carolina at Chapel Hill, University of
North Dakota State University
North Dakota, University of
Northeastern University
Northwestern University
Norwich University
Notre Dame, University of
Oakland University
Ohio Northern University
Ohio State University
Ohio University
Oklahoma State University
Oklahoma, University of
Old Dominion University
Oregon State University
Pennsylvania State University, The
Pennsylvania, University of
Pittsburgh, University of
PMC Colleges
Prairie View A&M College
Pratt Institute
Princeton University
Puerto Rico, University of
Purdue University
Rensselaer Polytechnic Institute
Rhode Island, University of
Rice University
Rochester Institute of Technology
Rochester, University of
Rose Polytechnic Institute
Rutgers University—The State University of New Jersey
Sacramento State College
St. Louis University
St. Martin's College
San Diego State College
San Fernando Valley State College
San Jose State College
Santa Clara, University of
Seattle, University of
South Carolina, University of
South Dakota School of Mines & Technology
South Dakota State University
Southeastern Massachusetts University
Southern California, University of
Southern Methodist University
Southern University
Southwestern Louisiana, University of
Stanford University
Stevens Institute of Technology
Swarthmore College
Syracuse University
Tennessee Technological University
Tennessee, University of
Texas A&I University
Texas A&M University
Texas at Arlington, University of
Texas Tech University
Texas, University of
Texas at El Paso, University of
Toledo, University of
Trinity University
Tri-State College
Tufts University
Tulane University
Tulsa, University of
Tuskegee Institute
Union College
United States Air Force Academy
United States Naval Academy
United States Naval Postgraduate School
Utah State University
Utah, University of
Valparaiso University
Vanderbilt University
Vermont, University of
Villanova University
Virginia Military Institute
Virginia Polytechnic Institute & State University
Virginia, University of
Washington State University
Washington University
Washington, University of
Wayne State University
Webb Institute of Naval Architecture

West Virginia Institute of Technology
West Virginia University
Wichita State University
Wisconsin State University
Wisconsin, University of
Wisconsin-Milwaukee, University of
Worcester Polytechnic Institute
Wyoming, University of
Youngstown State University

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AUDIO VISUAL GUIDANCE AIDS

All of the following may be obtained on a loan basis from the Engineers' Council for Professional Development Guidance Committee. Your request should be made at least three to four weeks ahead of the scheduled showing date. An alternate date should be provided in case the primary date cannot be met. ECPD will advise you on which date they will be able to ship the requested films. There is no charge associated with this service, except that the borrower must provide postage and insurance for the return of the film to ECPD headquarters.

1) Copies of the twelve charts which were included in the publication EC-12, "Manual for Engineers Serving as Career Advisors," are available on heavy board 20 x 26 inches.

2) Slide Presentations—A set of over 74, 35mm slides prepared by the Education Committee of Fort Worth, Texas Chapter of the Texas Society of Professional Engineers provides three different programs: "Romance of the Engineering Profession," "The Challenge of the

Engineering Profession," and "The Engineer's Fuzzy Image." A narration to accompany each slide is enclosed as well as a chart to help organize each presentation. They are geared for high school, junior high, professional groups, parent and teacher associations and teachers.

3) Films on Engineering Guidance

a) "Engineering Makes a World of Difference"—released in September 1968 by the Kansas Society of Professional Engineers. There is no narration. The message is made through scenes showing the work and products of engineering with background rock music. The film is 14 minutes in length, 16mm sound and color projection.

b) "Careers in Engineering"—a 1966 General Electric production in engineering guidance. Basic disciplines in engineering are described. It is 16 minutes in length, a color film with 16mm sound.

c) "Engineering—The Challenge of the Future"—released in late 1968 by Eta Kappa Nu, the Electrical Engineering Honorary Fraternity—presents the story of engineering using an interview technique. A 16mm sound and color presentation, it runs for 23 minutes.

Graduate student at University of Illinois College of Engineering adjusts the piezoelectric transducers of ultrasonic adsorption measuring equipment.

ADDITIONAL FILMS:

"A Certain Tuesday"—American Society of Civil Engineers. 14 minutes.

"Careers & Opportunities in Mechanical Engineering"—The American Society of Mechanical Engineers. Slides/Tape. 15 minutes.

"Engineering Makes A World of Difference"—Kansas Society of Professional Engineers. Slides/Tape. 10 minutes.

"Exciting Careers in Engineering"—A Walter J. Klein Production. 15 minutes.

"Joe Ogg—The First Industrial Engineer" is available for both rental and purchase from the American Institute of Industrial Engineers, Inc., 345 East 47th St., New York, N. Y. 10017. (16mm color with optical sound running 16 minutes.)

"Six in Electronics"—Devry Technical Institute. 18 minutes.

"The Universe & Other Things"—The Consulting Engineers Council. 23 minutes.

"Two Selected One Min. TV Commercials"—The New York ECPD Guidance Committee and the National Society of Professional Engineers. 3 minutes.

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