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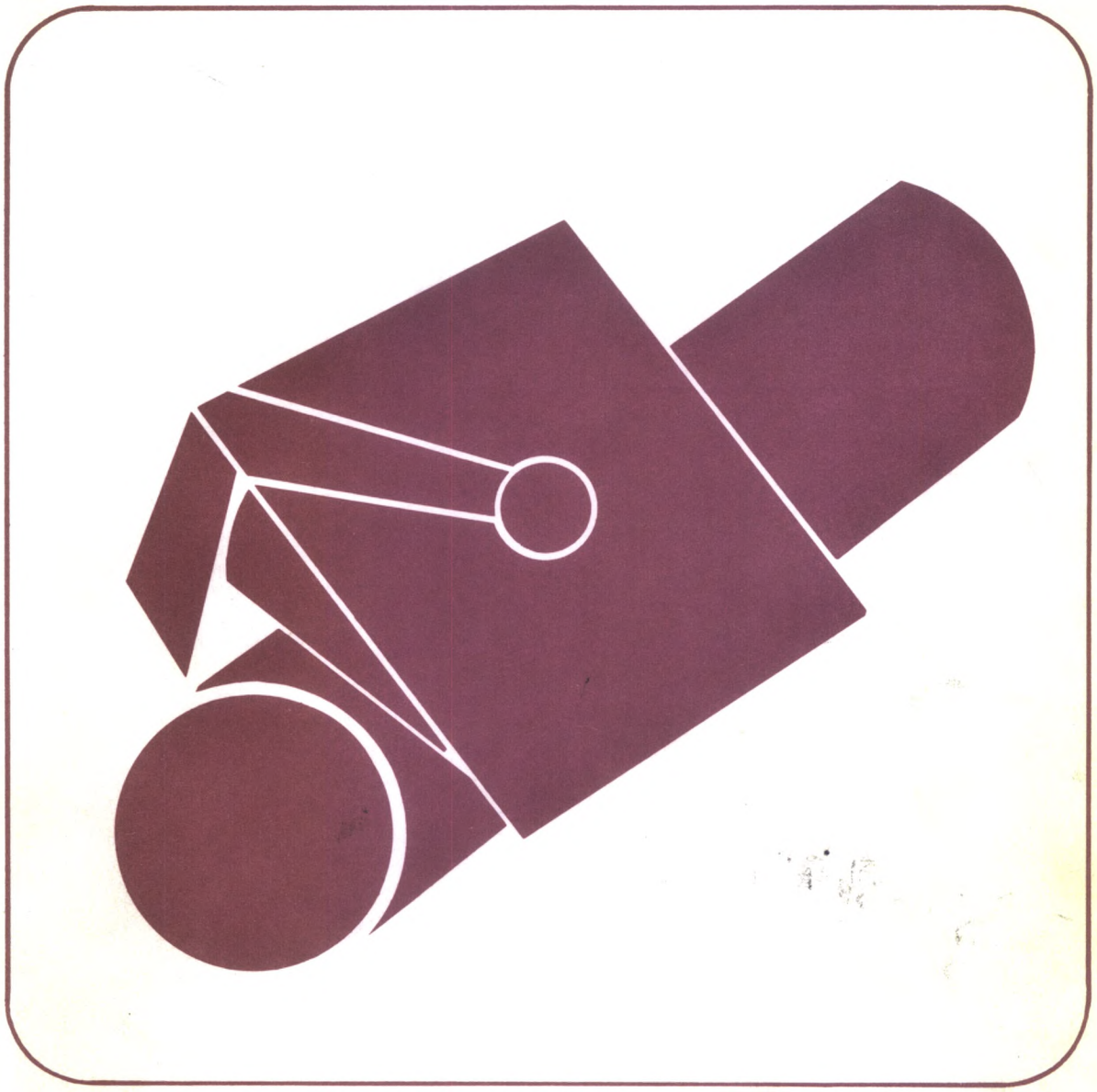

occupational outlook for college graduates

1970-71 edition

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U.S. Department of Labor
Bureau of Labor Statistics

Bulletin 1681

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occupational outlook for college graduates

excerpts from the 1970-71 occupational outlook handbook

Bulletin 1681

U.S. DEPARTMENT OF LABOR
J. D. Hodgson, Secretary

BUREAU OF LABOR STATISTICS
Geoffrey H. Moore, Commissioner

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Preface

America's college students, who are on the threshold of pursing a productive and rewarding career, have a great need for occupational information to help guide their career decisions. This need is evident particularly in increasingly complex and technologically oriented occupations which are being created continually and in new job functions which are evolving in established occupations.

The *Occupational Outlook for College Graduates* is a guide to employment opportunities in a broad range of professional and related occupations for which a college education is either required, becoming increasingly necessary, or is the usual educational background for employment. The information is being reprinted from the 1970–71 edition of the *Occupational Outlook Handbook,* which follows a format that describes, by occupation, the nature of work, places of employment, education and training requirements, employment outlook, and earnings and working conditions.

The Bureau of Labor Statistics wishes to express its gratitude to the College Placement Council for its instrumental role in helping to develop this publication. The Council is a national organization representing career counselors and placement directors of higher education and employers of college graduates.

Letter from the College Placement Council

Accurate and detailed vocational guidance information is becoming increasingly important to college students planning their careers in a rapidly evolving occupational complex. However, until now, no publication has offered complete and authoritative information tailored to the needs of young people preparing for professional and related work. The *Occupational Outlook for College Graduates* makes a notable contribution by supplying this information.

The College Placement Council is very grateful to those staff members of the Bureau of Labor Statistics who develop occupational outlook information, for their interest in supplying the career literature so vital to college men and women in planning for their future.

Robert F. Herrick
Executive Director
The College Placement Council, Inc.

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I. INTRODUCTION

About 13.3 million degrees will be awarded between 1968 and 1980 by the Nation's colleges and universities: 10.2 million bachelor's degrees; 2.7 million master's degrees; and 400,000 doctorates. Not all these new degree recipients, however, will be looking for work upon receiving their degree. For example, the majority of master's and doctorate degree recipients have been employed prior to completing their studies. Some new degree recipients continue their education and defer their entry to the labor force, others enter the Armed Forces, and women graduates often become full-time housewives. Of the 13.3 million degree recipients, about 9.3 million will enter the labor force upon graduation. Bachelor's degree recipients will constitute the largest number, 8.4 million; master's degree recipients, 900,000; and those earning a doctorate, 18,000.

New college graduates will not be the only segment of the supply of college educated workers who will be seeking jobs between 1968 and 1980. College educated immigrants and persons who received their degree before 1968 but who were not in the labor force during that year, including persons who never worked or who worked during some previous period, will also be competing for available jobs with new graduates. Reentrants, delayed entrants, and immigrants are expected to provide 1.2 million additional workers having 4 years or more of college training between 1968 and 1980. This number added to that available from new degree recipients brings total expected additions to the college educated work force during the 1968–80 period to 10.5 million.

Job openings for workers with a college education stem primarily from growth in demand and the need to replace workers who die, retire, or leave the labor force for other reasons. During the 1970's, continued very rapid growth in the demand for college graduates is expected as a result of factors such as expansion in research and development activities; improvements in standards of living, medical care, and education; and the growing concentration of the population in metropolitan areas. Another factor that must be considered in estimating requirements for college trained workers is the increasing entry requirements for occupations that make a college degree necessary for jobs once performed by workers with less education. In 1968, about 60 percent of all professional and technical workers, 20 percent of all managerial workers, and 10 percent of all salesworkers had a college degree. By 1980 these proportions are expected to increase to 66 percent, 30 percent, and 13 percent, respectively. Thus, the emphasis on a college education for work in high level occupations will be reinforced in the years ahead as the growing complexity of our society constantly increases the amount of specialized knowledge required for job performance.

An assessment of the factors underlying growing demand for college educated workers indicates a need for about 10.4 million college graduates over the 1968–80 period. The statistical analysis indicates a rough balance of the overall supply and demand for college educated workers for the decade of the 1970's. This overall picture, however, does not imply that imbalances between supply and demand in individual occupations will be nonexistent. Prospective imbalances are in the offing in several occupations if college students continue to prepare for work according to past patterns.

In the individual occupational statements which follow, the information on propsective imbalances reflects the occupational analysis conducted by economists in the Bureau of Labor Statistics which is explained in the technical appendix of the *Handbook*. This, along with other information on nature of work, training requirements, and earnings and working conditions, will help college students plan their careers. Occupational Outlook service publications and materials, as well as outside sources, are listed.

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II. TOMORROW'S JOBS

Choosing a career is one of the most important decisions a person will make in his lifetime. Planning a career calls for an evaluation of an individual's abilities and interests and for knowledge of employment opportunities that will be favorable or not so favorable in the future. However, because employment opportunities depend on shifts among industries and occupations that comprise the economy, this chapter focuses on overall patterns of change. Information of this type gives placement officers, counselors, and students a background to understand the outlook, education an dtraining requirements, and the nature of particular occupations.

Our Nation's vast and complex economy offers individuals numerous career choices. Thousands of different jobs are available as well as a huge variety of employers. Several questions are of major importance to young persons as they view the variety of occupational choices open to them. Among these questions are: What fields look especially promising for employment opportunities? What competition will other workers furnish? What type and how much training and education are required to enter particular jobs? How do earnings in certain occupations compare with earnings in other occupations requiring similar training? What types of employers provide which kinds of jobs? What are the typical environment and working conditions associated with particular occupations?

Of importance in evaluating information that answers these and related questions is knowledge of the dynamic changes that are continually occurring in our economy—the trends in the Nation's work force and its business, industrial, and occupational development. New ways of making goods, new products, and changes in living standards are constantly changing the types of jobs that become available.

No one can accurately forecast the future. Nevertheless, by using the wealth of information available, extensive economic and statistical analyses, and the best judgment of informed experts, the work future can be described in broad terms.

To project the demand for all workers in the economy, specific assumptions have to be made about general economic movements and broad national policy. The picture of the future employment outlook as indicated in this publication is based on the following assumptions:

1. Maintenance of high levels of employment and of utilization of available manpower in 1980;
2. that no major event will alter substantially the rate and nature of economic growth;
3. that economic and social patterns and relationships will continue to change at about the same rate as in the recent past;
4. that scientific technological advancement will continue at about the same rate as in recent years; and
5. that defense activities in 1980 in terms of expenditures will approximate the 1963 level which is somewhat higher than the levels before the Viet Nam Buildup.

The assessment of 1980 industrial and occupational outlook assumes a projected total labor force of 100.7 million in 1980, an Armed Forces of 2.7 million, and a resulting civilian labor force of 98 million.

Understanding the world of work requires knowledge of location where the specific types of work is done because employers seek a wide variety of skills; for example, many different industries employ engineers, scientists, and salesmen. Analyses of the character of the economy's industrial composition show that work locations have changed sharply over the years and are expected to continue to do so. These changes greatly affect employment opportunities and occupational choices.

Industry employment and occupational requirements change as a result of many factors. A new machine or a newly automated process may require different occupational skills or may even create an entirely new occupation; a change in product demand may affect the number of workers needed; an invention may all but eliminate an industry or create a new one.

To help understand the Nation's industrial composition, industries may be viewed as either goods producing or service producing. They may further be grouped into nine major divisions according to this product or service. (See chart 1.)

Most of the Nation's workers are in industries producing services, in activities such as education, health care, trade, repair and maintenance, and in Government, transportation, and banking and insurance service. The production of goods—raising food crops, building, extracting minerals, and manufactur-

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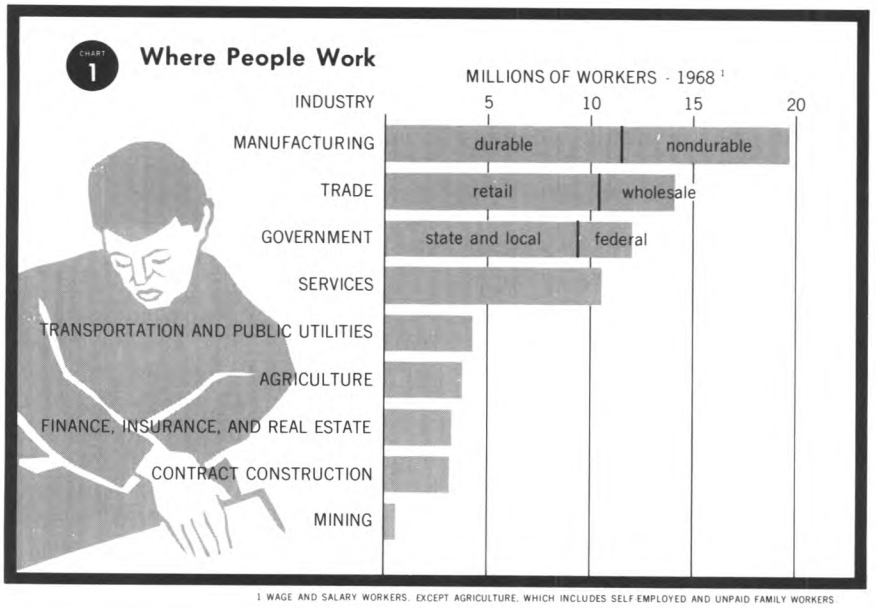


ing of goods—has required less than half of the country's work force since the late 1940's. (See chart 2.) In general, job growth through the 1970's is expected to continue to be faster in the service-producing industries than in the goods-producing industries. However, among industry divisions within both the goods-producing and service-producing sectors, the growth pattern will continue to vary.

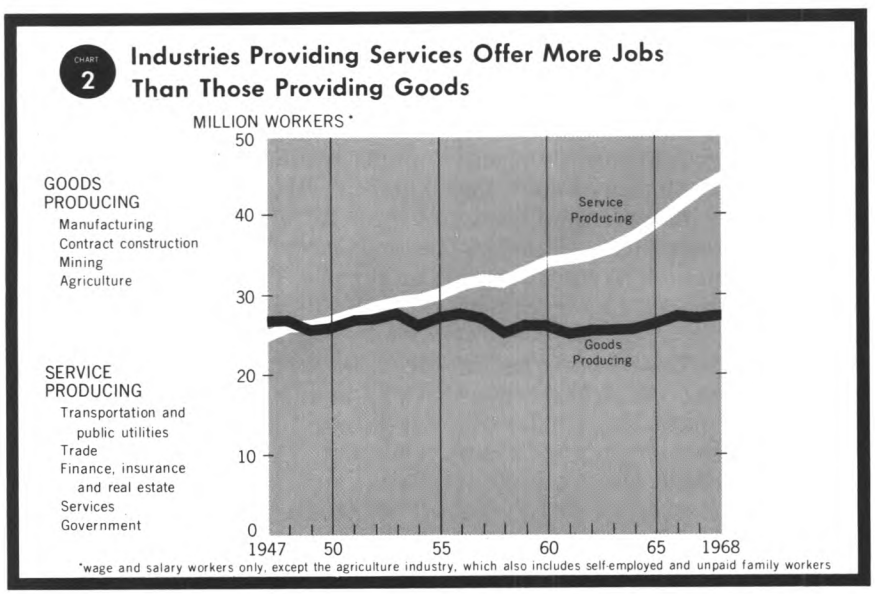
Service-Producing Industries

In 1968, about 44.2 million workers were on the payrolls of service-producing industries—trade; Government; services and miscellaneous; transportation and other utilities; and finance, insurance, and real estate—about 18.8 million greater than the number employed in 1947. The major factors underlying this rapid Post World War II growth have been (1) population growth; (2) increasing urbanization, with its accompanying need for more city services; and (3) rising income and living standards accompanying demand for improved services, such as health, education, and security. These factors are expected to continue to result in rapid growth of service industries as a group, and to employ 59.5 million by 1980, an increase of 35.0 percent above the 1968 level.

Trade, the largest division within the service-producing industries, has expanded sharply since 1947. Wholesale and retail outlets have multiplied in large and small cities to satisfy the need of an increasingly urban society. Employment in trade was about 14.1 million in 1968, about 57 percent above the 1947 level.

Employment in trade is expected to grow one-fourth between 1968 and 1980. (See chart 3.) Although an ever increasing volume of merchandise will be distributed as a result of increases in population and consumer expenditures, the rate of increase in manpower needs will be slowed by laborsaving technology such as the greater use of electronic data processing equipment and automated warehousing equipment, growth in the number of self-service stores, and the growing use of vending machines.

Government employment has grown faster than any other industry division, and has more than doubled from 5.5 million to 11.8 million between 1947 and 1968. Growth has been mostly



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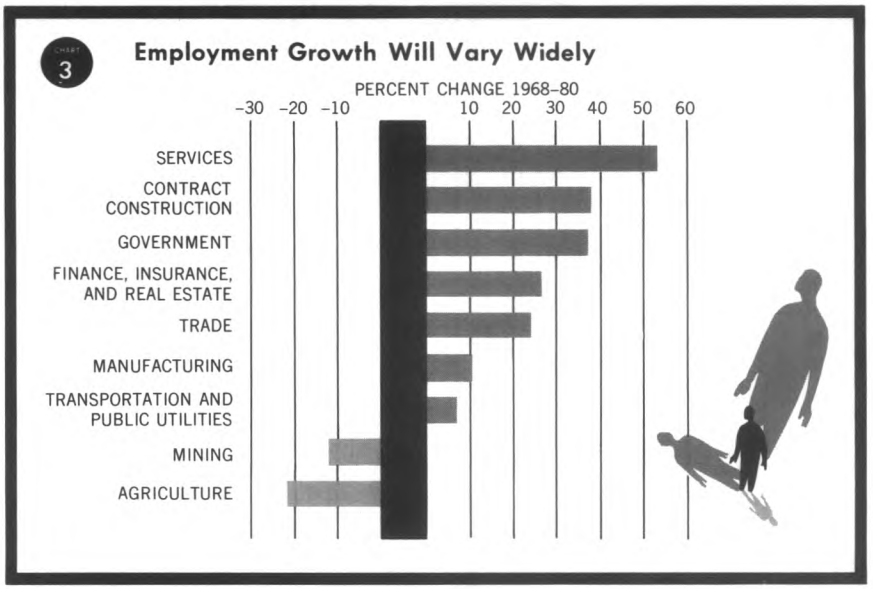
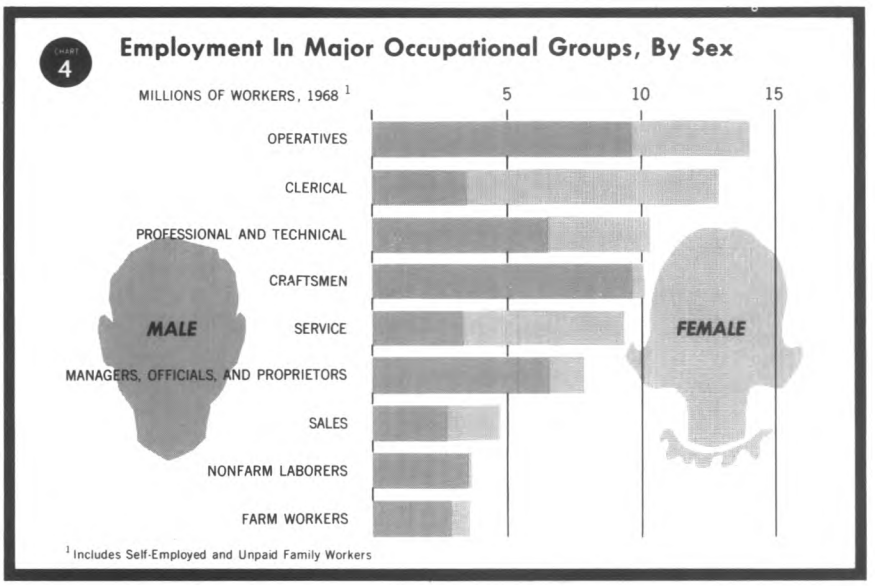


at the State and local levels, which combined increased more than 150 percent. Employment growth has been greatest in agencies providing education, health, sanitation, welfare, and protective services. Federal Government employment increased about 45 percent between 1947 and 1968.

Government will continue to be a major source of new jobs through the 1970's. By 1980, employment in Government may be as much as 42 percent higher than in 1968. Most of the growth will be in State and local governments in which employment needs may rise in 1980 to 13.8 million, about 52 percent higher than the 9.1 million employed in 1968. Federal Government employment is expected to rise slowly to about 3 million in 1980, 300,000 or about 10 percent above the 1968 level of 2.7 million.



Services and miscellaneous industries employment has increased rapidly since World War II as a result of the growing need for maintenance and repair, advertising, domestic, and health care services. From 1947–68, total employment in this industry division doubled from slightly more than 5.0 million to about 10.6 million.

Service and miscellaneous industries will continue to be among the fastest growing industries through the 1970's. More than one-half again as many workers are expected to be employed in this industry division in 1980 as in 1968. Manpower requirements in health services are expected to grow rapidly due to population growth and the increasing ability of persons to pay for health care. Business services including accounting, data processing, and maintenance also are expected to grow very rapidly.

Transportation and public utility employment in 1968 at 4.3 million was only slightly higher than in 1947. Different parts of this industry, however, have experienced different growth trends. For example, air travel employment increased rapidly but the railroad industry declined.

The number of jobs in transportation and public utilities as a whole is expected to continue to increase slowly through the 1970's and widely differing employment trends will continue to be experienced among individual industries within the division. Rapid increases in employment are expected in air transportation and a decline is expected to continue in railroad employment and little or no change is expected in water transportation,

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and electric, gas, and sanitary services. Overall employment in this industry division is expected to increase to more than 4.7 million in 1980, 10 percent above the 1968 level.

Finance, insurance, and real estate, the smallest of the service-producing industry divisions, has grown about 90 percent since World War II, from nearly 1.8 million in 1947 to nearly 3.4 million in 1968. Employment has grown especially rapidly in banks; credit agencies; and security and commodity brokers, dealers, exchanges and services.

Job growth in finance, insurance, and real estate will keep in step with the overall employment increases of nonfarm employment through the 1970's. Finance, insurance, and real estate employment is expected to expand to nearly 4.3 million by 1980, about one-fourth above 1968 levels. The most rapid advances will be in banking and credit agencies, which combined account for nearly two-fifths of total employment in this industry division.

Goods-Producing Industries

Employment in the goods-producing industries—agriculture, manufacturing, construction, and mining—more than 27.5 million in 1968—has increased slowly in recent years. Significant gains in productivity resulting from automation and other technological developments as well as the growing skills of the work force have permitted large increases in output without corresponding increases in employment. Employment in goods-producing industries is expected to increase to about 30 million in 1980, 10 percent above the 1968 level. However, widely different patterns of employment change have occurred and will continue among the industry divisions in the goods-producing sector.

Agriculture, which until the late 1800's employed more than half of all workers in the economy, employed only 5 percent, or 3.8 million workers, in 1968. Employment in agriculture has dropped by more than one-half since 1947. Increases in the average size of farms, rapid mechanization, and improved fertilizers, feeds and pesticides have created large increases in output at the same time that employment has fallen sharply.

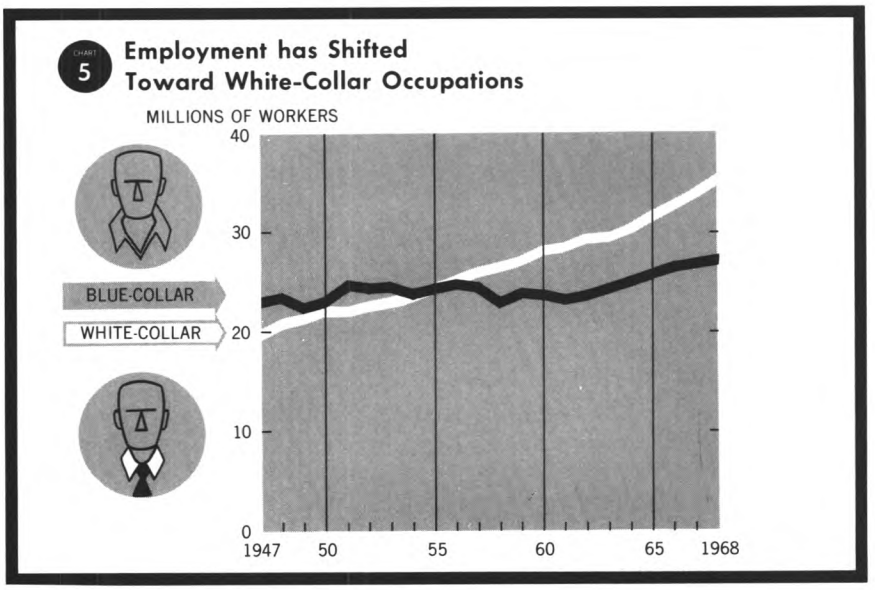
Agriculture is facing a continuing decline in manpower needs. Factors resulting in past declines will continue and the outlook is for a 1980 farm work force 21 percent lower than in 1968.

Mining employment, at about 610,000 workers in 1968, has declined by nearly two-fifths since 1947, primarily because of labor-saving technological changes and a shift to sources of power other than coal.

This trend is likely to continue and mining is the only nonagricultural industry division that is not expected to increase between 1968 and 1980. Although minor employment increases are expected in quarrying and other nonmetallic mining, they will be more than offset by continuing declines in the coal mining, crude petroleum and natural gas extraction industries. The job level of the entire mining group is expected to decline about 10 percent to about 550,000 between 1968 and 1980.

Contract construction employment, at nearly 3.3 million in 1968, has increased more than three-fifths since World War II. The Nation's rapidly growing need for homes, offices, stores, highways, bridges, dams, and other physical facilities resulted in this sharp increase in employment.

Between 1968 and 1980, contract construction is expected to grow by more than two-fifths to about 4.6 million. Construction activity will be spurred by several factors. An expanding economy will result in more industrial plants and commercial establishments such as office buildings, stores, and banks. The volume of construction mainte-



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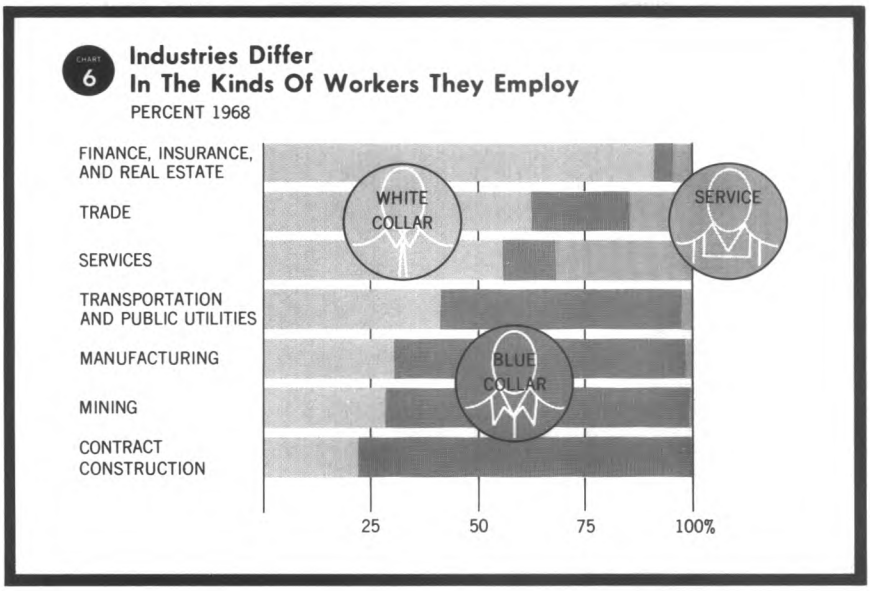
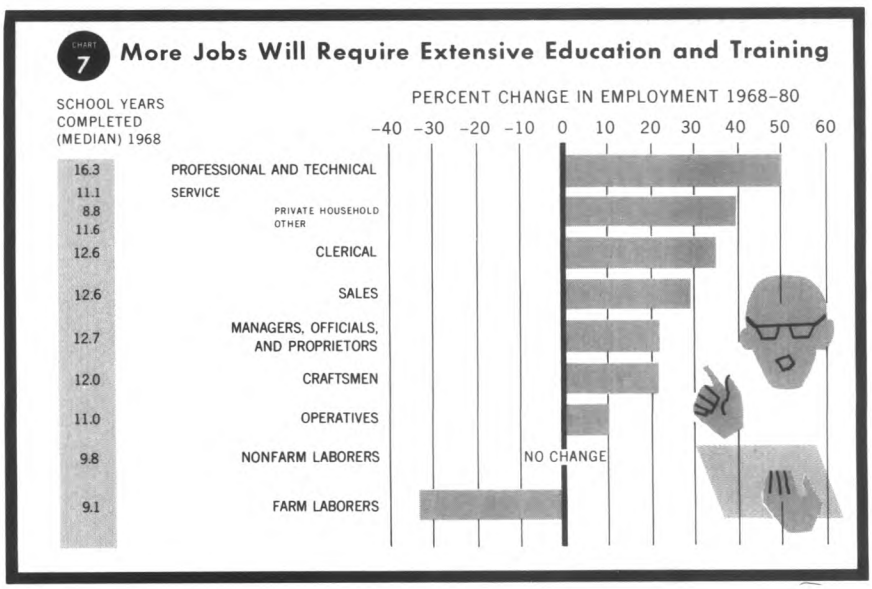


nance and repair, which is now about one-third of new construction activity, also is expected to grow significantly through the 1970's. Home and apartment building will be stimulated by the increase in population, new family formations, and higher income levels. Also, large government expenditures for urban renewal, school construction, and roads are likely.

Manufacturing, the largest division within the goods-producing sector that had about 19.8 million workers in 1968, increased about 27 percent in employment between 1947 and 1968. New products for industrial and consumer markets and the rapid growth of the defense-space market have spearheaded the post World War II growth.



Manufacturing employment is expected to increase about 11 percent through the 1970's and reach about 21.9 million in 1980. Durable goods manufacturing is projected to increase slightly faster (12 percent) and nondurable goods slightly slower (10 percent) than the total. However, the rate of growth will vary among the individual manufacturing industries. The machinery industry is expected to have the largest need for additional people, as employment grows from nearly 2.0 million to more than 2.4 million. Producers of rubber and plastic products; furniture and fixtures; stone, clay, and glass products; and instruments, will be among other rapidly growing manufacturing industries. In contrast, employment in some manufacturing industries may decline, for example, leather, textile mill products, tobacco, and petroleum refining. Ordnance industry manpower requirements in 1980 may be as much as one-fourth lower than 1968 levels, if the Viet Nam conflict has ended.

Occupational Profile

As American industries continue to grow larger, more complex, and more mechanized, fundamental changes will take place in the Nation's occupational structure. Furthermore, occupations will become more complex and more specialized. Thus, an imposing and confusing number of occupational choices is provided to individuals who are planning their careers. An individual, in examining the vast number of choices, should first look at broad groupings of jobs that have similar characteristics such as entrance requirements. (See chart 4.)

Among the most significant changes in the Nation's occupa-

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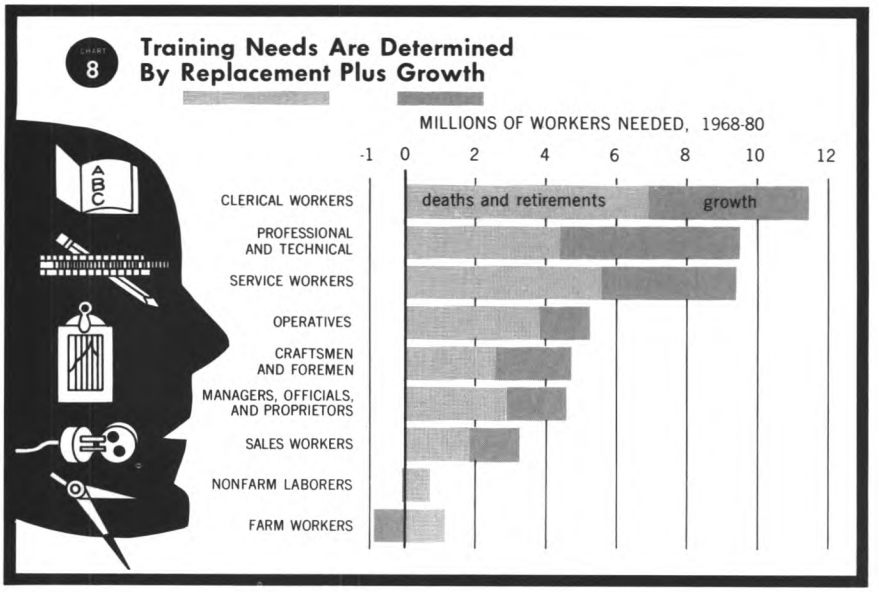
tional structure has been the shift toward white-collar jobs. In 1956, for the first time in the Nation's history, white-collar workers—professional, managerial, clerical, and sales—outnumbered blue-collar workers—craftsmen, operatives, and laborers. (See chart 5.).

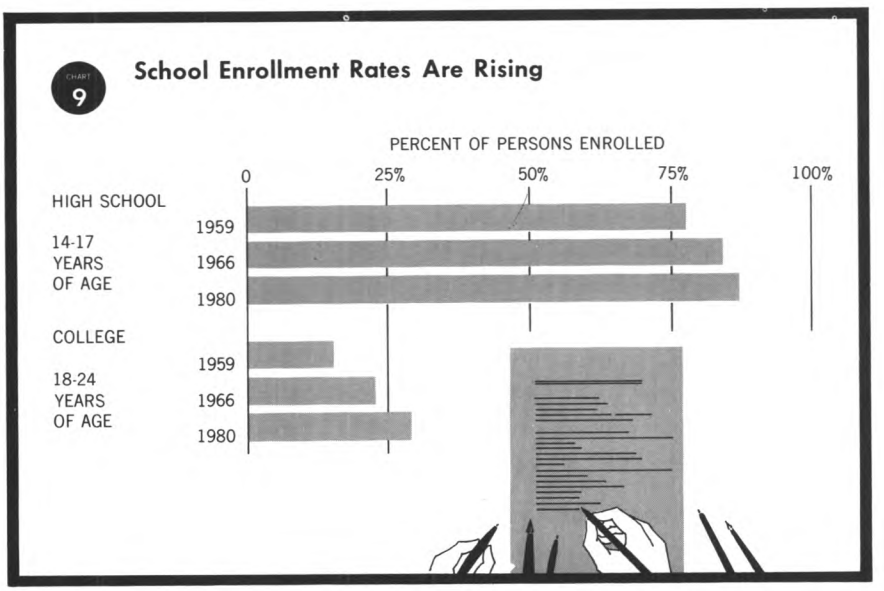
Through the 1970's, we can expect a continuation of the rapid growth of white-collar occupations, a slower than average growth of blue-collar occupations, a faster than average growth among service workers, and a further decline of farm workers. Total employment is expected to increase about 25 percent between 1968 and 1980. In comparison, an increase of about 36 percent is expected for white-collar jobs, and only about 13 percent for blue-collar occupations. By 1980, white-collar jobs will be more than one-half of all employed workers compared with about 47 percent in 1968. The rapid growth expected for white-collar workers and service workers reflects continuous expansion of the service-producing industries which employ a relatively large proportion of these workers. (See chart 6.) The growing demand for workers to perform research and development, to provide education and health services, and to process the increasing amount of paperwork throughout all types of enterprises, also will be significant in the growth of white-collar jobs. The slower than average growth of blue-collar and farm worker employment reflects the expanding use of labor saving equipment in our Nation's industries and the relatively slow growth of the goods-producing industries that employ large proportions of blue-collar workers.

The following section describes in greater detail the changes that are expected to occur through the 1970's among the broad occupational groups that employ large numbers of college graduates.



Professional and technical workers, the third largest occupational group in 1968, include among more than 10.3 million workers such highly trained personnel as teachers, engineers, dentists, accountants, and clergymen.

Professional occupations will be the fastest growing occupations from 1968–80. (See chart 7.) Personnel in this area will be in great demand as the Nation puts greater efforts toward the country's socioeconomic progress, urban renewal, transportation, harnessing the ocean, and enhancing the beauty of the land. The quest for scientific and technical knowledge is bound to grow and raise the demand for



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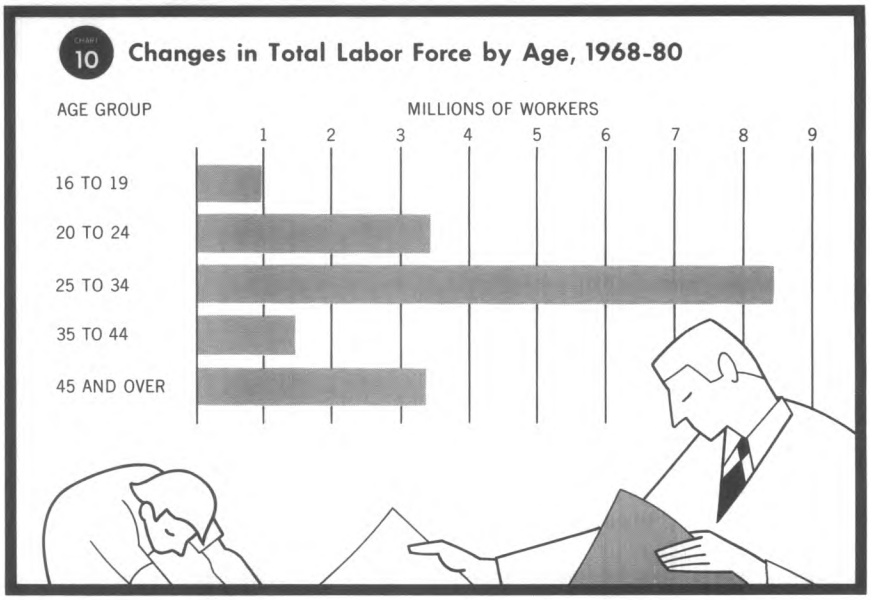
workers in scientific and technical specialties. The 1970's will see a continuing emphasis in the social sciences and medical services. By 1980 the requirements for professional, technical, and kindred workers may be about one-half greater than 1968 employment.

Managers, officials, and proprietors totaled about 7.8 million in 1968. As a group, they will increase more than one-fifth between 1968 and 1980, somewhat slower than the rate of growth for all occupations. As in the past, requirements for salaried managers are likely to continue to increase rapidly because of the increasing dependence of business organizations and government agencies on management specialists. On the other hand, the number of self-employed managers is expected to continue to decline through the 1970's as larger businesses continue to restrict growth of the total number of firms and as supermarkets continue to replace small groceries, and general stores.



Job Openings

In considering a career, young people should not eliminate occupations just because their preferences will not be among the most rapidly growing. Although growth is a key indicator of future job outlook, more jobs will be created between 1968–80 from deaths, retirements, and other labor force separations than from employment growth. (See chart 8.) Replacement needs will be particularly significant in occupations which have a large proportion of older workers and women. Furthermore, large occupations that have little growth may offer more openings than a fast growing small one. For example, among the major occupational groups, openings for operatives resulting from growth and replacement combined will be greater than for craftsmen, although the rate of growth of craftsmen will be more than twice as rapid as the rate of growth for operatives.

Outlook and Education

Numerous opportunities for employment will be available for jobseekers during the years ahead. Employers are seeking people who have higher levels of education because jobs are more complex and require greater skill. Furthermore, employment growth generally will be fastest in those occupations requiring the most education and training. For example, professional occupations requiring the most education will show the fastest growth through the 1970's. (See chart 7.)

Although training beyond high school has been the standard for sometime for many professional occupations, many other areas of work require more than just a high school diploma. As new automated equipment is introduced on a wider scale in offices, banks, insurance companies, and government operations, skill requirements are rising for clerical and other office jobs. Employers increasingly are demanding better trained workers to operate complicated machinery.

In many areas of sales work, new developments in machine design, use of new materials, and the complexity of equipment are making greater technical knowledge a requirement for demonstrators; and repairmen must become familiar with even more complicated machines.

Along with the demand for greater education, the proportion of youth that pursue higher education is growing ever larger. (See chart 9.) This trend is expected to continue through the 1970's. In 1980, college degree credit enrollment is projected at 10.2 million, 50 percent above the 1968 level of 6.8 million.

The number of persons in the labor force (including those in the Armed Forces) is a related

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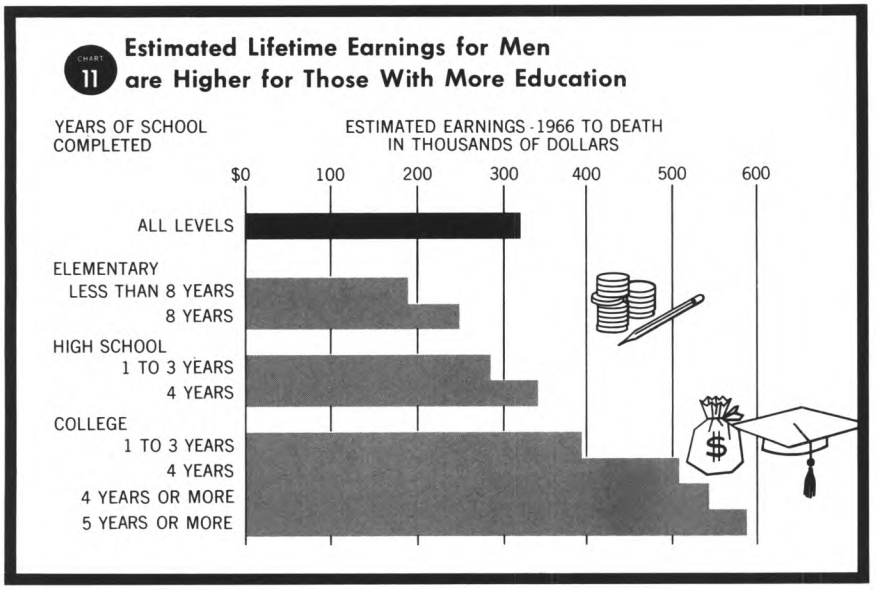

aspect of job competition. Although the number of all workers and jobseekers will increase about 25 percent from 1968 to 1980, the growth in the labor force is really a story of young men and women between 16 and 34 who will be about two-thirds of the net increase in workers between 1968 and 1980. (See chart 10.) Thus, in the 1970's the number of young workers will increase and these workers will have more education on the average than new entrants to the labor force in previous years.

In addition to importance in competing for a job, education is highly valued in the determination of income. In 1966, men who had college degrees could expect to earn more than a half-million dollars in their lifetime, or nearly 3 times the $189,000 likely to be earned by workers who had less than 8 years of schooling, nearly twice that earned by workers who had 1 to 3 years of high school, and nearly one and three-fourths as much as high school graduates. (See chart 11.)

In summary, young people who have acquired a college education will have a better chance at interesting work, good wages, and steady employment.

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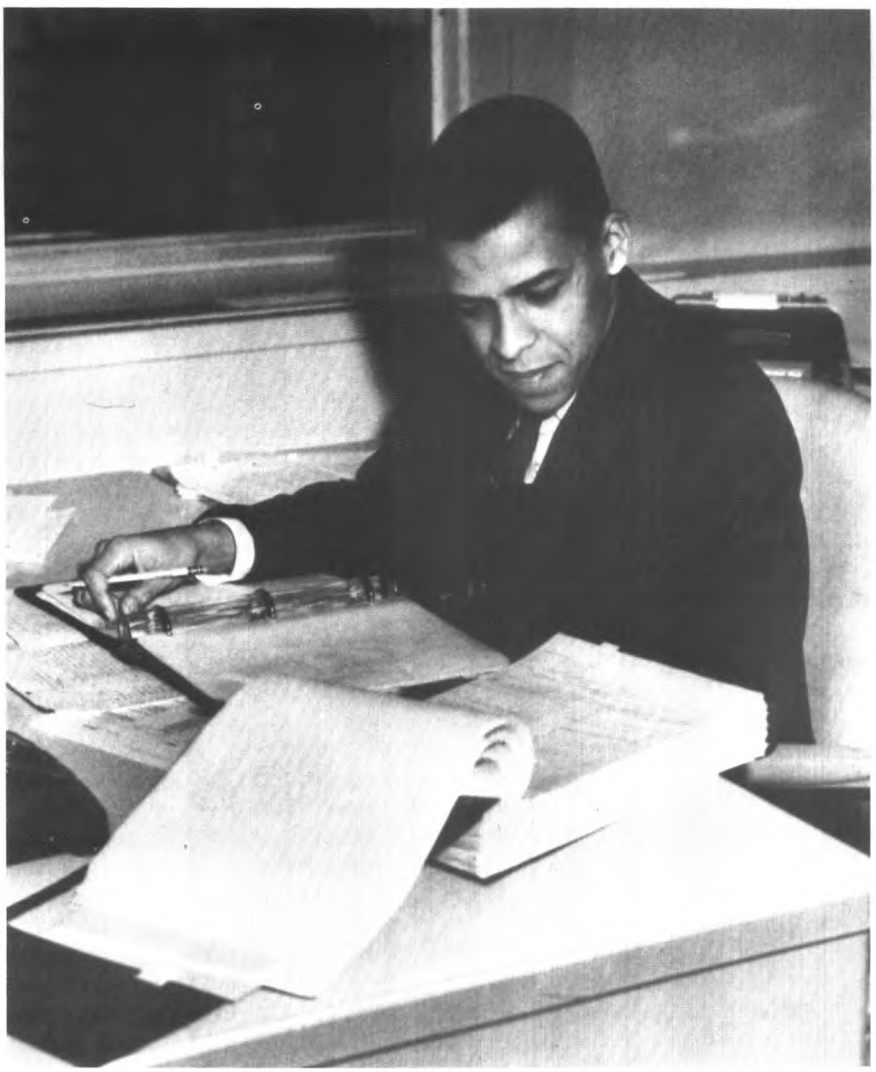
III. OCCUPATIONS

BUSINESS ADMINISTRATION AND RELATED PROFESSIONS

Many professional workers play a major role in administering businesses and a wide variety of other organizations, both private and governmental. These workers generally need a college degree to qualify for jobs in their respective fields. Though their disciplines are oriented toward business management, they perform functions which are highly specialized and varied. Whether their organizations are small or large, employing only a few people or many thousands, the decisions they make and their effectiveness in implementing these decisions contribute greatly to the success or failure of the enterprise.

This chapter describes a few selected professional occupations that are of vital importance to the Nation's businesses—accountants, advertising workers, marketing research workers, personnel workers, and public relations workers.



Accountant reviews financial report.

ACCOUNTANTS

(D.O.T. 160.188)

Nature of the Work

Accountants compile and analyze business records and prepare financial reports, such as profit and loss statements, balance sheets, cost studies, and tax reports. The major fields of employment are public, management, and government accounting. Public accountants are independent practitioners who work on a fee basis for business enterprises or for individuals wishing to use their services or as a member or employee of an accountancy firm. Management accountants, often referred to as industrial or private accountants, handle the financial records of the particular firm for which they work on a salary basis. Government accountants work on the financial records of government agencies and often audit the records of private business organizations and individuals whose dealings are subject to government regulations.

Accountants in any field of employment may specialize in such areas as auditing, taxes, cost accounting, budgeting and control, information processing, or systems and procedures. Probably 100 or more specialties now exist in the accounting field. Public accountants are likely to specialize in auditing—that is, in reviewing financial records and reports and giving opinions as to their reliability. They also advise clients on tax matters and other financial and accounting problems. Most management account-

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ants are involved in some aspects of providing management with information for decision-making. Sometimes they specialize in taxes, budgeting or internal auditing—that is, examining and appraising financial systems and management control procedures in their company. Many accountants in the Federal Government are employed as Internal Revenue agents, investigators, and bank examiners, as well as in regular accounting positions.

Places of Employment

More than 500,000 accountants were employed in 1968, of whom over 100,000 were certified public accountants. Accounting is one of the largest fields of professional employment for men. About 2 percent of the CPA's and less than 20 percent of all accountants are women.

Nearly three-fifths of all accountants do management accounting work for the business and industrial firms that employ them. An additional one-fifth are engaged in public accounting as proprietors, partners, or employees of independent accounting firms. Over 10 percent work for Federal, State and local government agencies. A small number teach in colleges and universities.

Accountants are employed wherever business, industrial, or governmental organizations are located. The majority, however, work in large metropolitan centers where there is a particularly heavy concentration of public accounting firms and central offices of large business organizations.

Training, Other Qualifications, and Advancement

Training in accounting can be obtained in universities, 4-year colleges, junior colleges, accounting and private business schools, and correspondence schools. Graduates of all these institutions are included in the ranks of successful accountants; however, a bachelor's degree with a major in accounting or a closely related field is increasingly an asset, and for better positions it may be required. Candidates having a master's degree in accounting, as well as college training in other business and liberal arts subjects, are preferred by many firms. Previous work experience also can be of great value in qualifying for employment. A number of colleges offer students an opportunity to get such experience through internship programs conducted in cooperation with public accounting or business firms. For beginning accounting positions, the Federal Government requires 4 years of college training (including 24 semester hours in accounting) or an equivalent combination of education and experience. Most universities require the master's degree or the doctorate with the Certified Public Accountancy Certificate for teaching positions.

All States require that anyone practicing in the State as a "certified public accountant" must hold a certificate issued by the State board of accountancy. The CPA examination, administered by the American Institute of Certified Public Accountants, is used by all states to establish certification. In 1968, half the States had laws that require CPA candidates to be college graduates. In recent years, nearly 9 out of 10 successful CPA candidates have been college graduates, and a majority of the remainder have had at least 1 year of college training. Young people interested in an accounting career should be aware that recent reports by the American Institute of Certified Public Accountants indicate that in the near future, some States may require CPA candidates to have a graduate degree. Before the CPA certificate is issued, at least 2 years of public accounting experience is required by nearly all States.

Considerably more than half the States restrict the title "public accountant" to those who are licensed or registered. Requirements for licensing and registration vary considerably from one State to another. Information on these requirements may be obtained directly from individual State boards of accountancy, or from the National Society of Public Accountants.

Inexperienced accountants usually begin with fairly routine work. Junior public accountants may be assigned to detailed work such as verifying cash balances or inspecting vouchers. They may advance to semisenior positions in 1 or 2 years and to senior positions within another 1 or 2 years. In the larger firms, those successful in dealing with top industry executives often become supervisors, managers, or partners, or transfer to executive positions in private accounting. Some become independent practitioners. Beginners in management accounting may start as ledger accountants, junior internal auditors, or as trainees for technical accounting positions. They may rise to chief plant accountant, chief cost accountant, budget director, senior internal auditor, or manager of internal auditing, depending on their specialty. Some become controllers, treasurers, financial vice-presidents, or corporation presidents. In the Federal Government, beginners are hired as trainees and usually are promoted in a year or so. In colleges and universities, those having minimum training and experience may receive the rank of instructor

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without tenure; advancement and permanent faculty status are dependent upon further education.

Accountants who want to get to the top in their profession usually find it necessary to continue their study of accountancy and related problems—even though they already may have obtained college degrees or CPA certificates. Even experienced accountants may spend many hours in study and research in order to keep abreast of legal and business developments that affect their work. More and more accountants are studying computer operation, programing, mathematics, and quantitative methods in order to adapt accounting procedures to new methods of processing business data. Although advancement may be rapid for capable accountants, those having inadequate academic preparation are likely to be assigned to routine jobs and find themselves handicapped in obtaining promotions.

Employment Outlook

Employment opportunities for accountants are expected to be excellent through the 1970's. Demand for college-trained accountants will be stronger than the demand for people without this academic background because of the growing complexity of business accounting requirements. However, graduates of business and other schools which offer thorough training in accounting also should have good job prospects. In addition, the trend toward specialization is creating excellent opportunities for accountants trained in a specific phase of accounting. In addition to openings resulting from employment growth several thousand accountants will be needed annually during this period to replace those who retire, die, or leave the occupation for other reasons.

Accounting employment is expected to expand rapidly in the 1970's because of such factors as the greater use of accounting information in business management; complex and changing tax systems; the growth in size and number of business corporations required to provide financial reports to stockholders; and the increasing use of accounting services by small business organizations.

The computer is having a major effect on the accounting profession. Electronic data processing systems are replacing manual preparation of accounting records and financial statements. As a result, the need for junior accountants at the lower level may be reduced or eliminated. On the other hand, computers can process vast quantities of routine data which will require the employment of additional accountants so that these data can be analyzed. Also, the computer is expected to cause radical changes in management information systems and decisionmaking processes in large companies. Additional highly-trained accountants will be required to prepare, administer and analyze the information made available by these systems.

Earnings and Working Conditions

Starting salaries for bachelor's degree holders majoring in accounting were about $8,300 a year in 1968, according to a private survey covering accounting positions. Information provided by the American Institute of Certified Public Accountants indicates that salaries vary by educational background and size and location of firm. Beginning accountants in small firms earned between $6,000 and $7,000 a year; those in medium size firms earned between $7,000 and $8,000; and in large firms, beginners received between $8,000 and $10,000 a year.

Accountants having 6 months to 1 year of experience generally receive salaries $500 to $1,000 higher than those having no experience. In 1968, accountants having 1 to 3 years of experience earned between $8,500 and $10,000 in small firms, and from $12,000 to $16,000 in medium and large firms. Salary differentials by size of firm narrowed as the level of responsibility increased. The average salary for a senior accountant in a small firm was about $14,000, whereas a senior accountant in a large firm earned about $16,000 a year. Annual salaries of accounting operations managers of medium and large firms ranged from $15,000 to $30,000 and from $16,000 to $35,000, respectively.

Salaries are generally 10 per cent higher for those holding a graduate degree or a CPA certificate. Earnings also are higher for those who are required to travel a great deal.

The average income of a self-employed CPA acting as a sole practitioner was $13,000 a year in 1967. The average income earned by partners in CPA firms having 2 to 15 partners and a professional staff was $18,500 a year. Those in firms having 16 to 35 partners and a professional staff earned incomes that averaged about $28,000 a year.

In the Federal Civil Service the entrance salary for junior accountants and auditors was $6,690 in late 1968. Some candidates having superior academic records could qualify for a starting salary of $7,680. Many experienced accountants in the Federal Government earned more than $12,000 a year. Those having administrative responsibilities earned more.

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Public accountants are likely to work especially long hours under heavy pressure during the tax season. They do most of their work in their client's offices, and sometimes do considerable traveling to serve distant clients. A few management and government accountants also do much traveling and work irregular hours, but the majority remain in one office and work between 35 and 40 hours a week, under the same general conditions as their fellow office workers.

Sources of Additional Information

Information; particularly on CPA's and on the aptitude and achievement tests now given in many high schools and colleges and by many public accounting firms, may be obtained from:

American Institute of Certified Public Accountants, 666 Fifth Ave., New York, N.Y. 10019.

Further information on specialized fields of accounting may be obtained from:

National Association of Accountants, 505 Park Ave., New York, N.Y. 10022.

National Society of Public Accountants, 1717 Pennsylvania Avenue N.W., Washington, D.C. 20006.

Financial Executives Institute, 50 West 44th St., New York, N.Y. 10036.

The Institute of Internal Auditors, Inc., 170 Broadway, New York, N.Y. 10038.

Information describing accounting as a career may be obtained free from:

Accounting Careers Council, National Distribution Center, P.O. Box 650, Radio City Station, New York, N.Y. 10019.

ADVERTISING WORKERS

(D.O.T. 050.088; 132.088; 141.081 and .168; and 164.068 through .168)

Nature of the Work

Through advertisements published in newspapers and magazines, broadcast on the radio, shown on television, displayed on billboards, sent through the mail, or even written in smoke in the sky, businessmen try to reach potential customers and persuade them to buy their products or services. Advertising workers plan and prepare these advertisements and get them before the public. They include executives responsible for planning and overall supervision, copywriters who write the text, artists who prepare the illustrations, layout specialists who put copy and illustrations into the most attractive arrangement possible, administrative and technical workers who are responsible for the satisfactory reproduction of the "ads," and salesmen who sell advertising space in publications or time on radio and television programs. In a very small advertising organization, one person may do all these things. Large organizations employ specialists for research, copywriting, and layout work. They sometimes have staff members who specialize in writing copy for particular kinds of products or for one type of advertising media, such as radio, popular magazines, or direct mail. The following are the specialized occupations most commonly found in advertising work.

Advertising managers direct a company's advertising program. They work mostly on policy questions—for example, the type of advertising, the size of the advertising budget, and the agency to be employed. They then work with the agency in planning and carrying through the program. They also may supervise the preparation of special sales brochures, display cards, and other promotional materials.

The advertising manager of a newspaper, radio station, or other advertising medium is concerned chiefly with selling advertising time or space; his functions are similar to those of the sales manager in other businesses.

Account executives employed in advertising agencies handle relations between the agency and its clients. An account executive studies the client's sales and advertising problems, develops a plan to meet the client's needs, and seeks his approval of the proposed program. Account executives must be able to sell ideas and maintain good relations with clients. They must know how to write copy and use artwork, even though copywriters and artists usually carry out their ideas and suggestions.

Some advertising agencies have account supervisors who oversee the work of the account executives. In others, account executives are responsible directly to agency heads.

Advertising copywriters create the headlines, slogans, and text that attract buyers. They collect information about products and the people who might use them. They use psychology and writing techniques to prepare copy especially suited for readers or listeners and for the type of advertising medium to be used. Copywriters may specialize in copy that appeals to certain groups—housewives, businessmen, scientists, engineers—or even in copy that deals with items such as packaged goods or industrial products. In advertising agencies, copywriters work closely with account executives, although they may be under the supervision of a copy chief.

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Account executive reviews advertising copy with client's representatives.

Advertisers and advertising agencies employ *media directors* (or *space buyers* and *time buyers*) to determine where and when advertising should be carried to reach the largest group of prospective buyers at the least cost. They must have a vast amount of information about the cost of advertising in all media and the relative size and characteristics of the reading, viewing, or listening audience which can be reached in various parts of the country by specific publications, broadcasting stations, and other media.

Production managers and their assistants arrange to have the final copy and artwork converted into printed form. They deal with printing, engraving, filming, recording and other firms involved in the reproduction of advertisements. The production manager must have a thorough knowledge of various printing processes, typography, photography, paper, inks, and related technical materials and processes.

Research directors and their assistants assemble and analyze information needed for effective advertising programs. They study the possible uses of the product, its advantages and disadvantages compared with competing products, and the best ways of reaching potential purchasers. Such workers may make special surveys of the buying habits and motives of customers, or may try out sample advertisements to find the most convincing selling theme or most efficient media for carrying the advertising message. The research director is an important executive in advertising organizations. More information on this occupation is contained in the statement on Marketing Research Workers.

Artists and layout men are part of a key creative group in advertising work. They work closely with advertising managers, copywriters, and other advertising personnel in planning and creating visual effects in advertisements. More information about this group appears in the separate statements on Commercial Artists and on Photographers.

Places of Employment

In 1968, about 140,000 men and women were employed in positions requiring considerable knowledge of advertising. More than one-third of these workers are employed in advertising agencies, and more than half of the agency workers are employed in the New York City and Chicago metropolitan areas. However, there are many independent agencies in other cities, and many leading agencies operate branch offices outside the major centers.

Advertising workers not employed in advertising agencies work for manufacturing companies, stores, and other organizations having products or services to sell; for advertising media, such as newspapers and magazines; and for printers, engravers, art studios, product and package designers, and others who provide services to advertisers and advertising agencies.

Training, Other Qualifications, and Advancement

Most employers, in hiring advertising trainees, prefer college graduates having liberal arts training or majors in advertising, marketing, journalism, or business administration. However, there is no typical educational background for success in advertising. In 1968, an estimated one-

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fourth of all advertising workers did not have a college degree. Some successful advertising people have started in such varied occupations as engineer, teacher, chemist, artist, or salesman.

Most advertising jobs require a flair for language, both spoken and written. Since every assignment requires individual handling, a liking for problem-solving also is very important. Advertising personnel should have a great interest in people and things to help them sell their ideas to their superiors, to advertisers, and to the public. They must be able to accept criticism and to gain important points with tact.

Young people planning to enter the advertising field should get some experience in copywriting or related work with their school publications and, if possible, through summer jobs connected with marketing research services. Some large advertising organizations recruit outstanding college graduates and train them through programs which cover all aspects of advertising work. Most beginners, however, have to locate their own jobs by applying directly to possible employers. Young men sometimes begin as mail clerks or as messengers and runners who pick up and deliver messages and proofs for departments and agency clients. Some start as assistants in research or production work or as space or time buyers. A few begin as junior copywriters. In most advertising organizations, women begin as secretaries or, if they have the required education, as research assistants. One of the best avenues of entrance to advertising work for women is through advertising departments in retail stores.

Employees having initiative, drive, and talent may progress from beginning jobs to creative, research, or managerial work. Management positions require experience in all phases of the advertising business including some work with advertising agencies, media, and advertisers.

Copywriters and account executives can usually look forward to rapid advancement if they demonstrate exceptional ability in dealing with clients, since the success of an advertising organization depends upon satisfied advertisers. Many of these workers prefer to remain in their own specialties and for them advancement is to more responsible work at increased pay. Some topflight copywriters and account executives establish their own agencies.

Employment Outlook

Employment of advertising workers is expected to increase slowly through the 1970's. Most new jobs will be created in advertising agencies as more and more advertisers turn their work over to agencies. Most openings—several thousand each year—will result from the need to replace those who retire, die, or leave the occupation for other reasons.

The many young people attracted to advertising will face stiff competition for entry jobs in this field through the 1970's. Opportunities should be favorable, however, for the highly qualified, especially in advertising agencies.

Earnings and Working Conditions

According to the limited information available, starting salaries for beginning advertising workers ranged from $6,000 to $8,000 a year in 1968. The higher starting salaries were paid most frequently in very large firms that recruit outstanding college graduates; the lower salaries were earned in stores and small advertising agencies.

Salaries of experienced advertising workers vary according to type of employer. In 1967 the average salary paid to advertising people employed by advertisers was $13,700 a year, whereas those employed by communications media averaged about $17,800 a year. The average annual salary of advertising workers employed by advertising agencies was about $17, 700 in 1967.

In advertising agencies, workers who had 1 to 3 years of advertising experience generally earned from $10,000 to $14,000 a year; for those who had 5 years of experience, earnings were as high as $20,000 a year. Pay for exceptional individuals ranges much higher at each level of experience; some of the top people in charge of large accounts make from $50,000 to $70,000 a year.

Advertising workers frequently work under great pressure. Working hours are sometimes irregular because publication and broadcast deadlines must be met and last minute changes are not uncommon. People in creative jobs often work evenings and weekends to finish important assignments.

At the same time, advertising offers a satisfying career to people who enjoy variety, excitement, and a constant challenge to their creative ability, and who can meet the competition. Advertising workers have the satisfaction of seeing their work in print or hearing it over the radio or television even though they remain unknown to the public at large.

Sources of Additional Information

American Advertising Federation, 1225 Connecticut Ave. N.W., Washington, D.C. 20036.

American Association of Advertising Agencies, 200 Park Ave., New York, N.Y. 10017.

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Association of Industrial Advertisers, 41 East 42nd Street, New York, N.Y. 10017.

A list of schools which provide training in advertising may be obtained from:

Advertising Education Publications, 3429 Fifty-Fifth Street, Lubbock, Texas 79413.

BANK OFFICERS

(D.O.T. 186.118, .138, .168, and .288; 161.118; 189.118 and .168)

Nature of the Work

Practically every bank has a president who exercises general direction over all operations; one or more vice presidents who either act as general managers or have charge of bank departments such as trust, credit, and investment; and a comptroller or cashier who (unlike cashiers in stores and other businesses) is an executive officer generally responsible for all bank property. Large banks also may have treasurers and other senior officers, as well as assistant officers, to supervise the various sections within different departments. Banking institutions employed more than 125,000 officers in 1968; women represented about one-tenth of the total.

A bank officer makes decisions within a framework of policy set by the board of directors. His job requires a broad knowledge of business activities, which he must relate to the operations of the particular department for which he is responsible. For example, the loan officers must exercise his best judgment in considering applications for loans, bearing in mind general business conditions and the nature of the collateral offered. He must evaluate carefully the reports of credit analysis on the individual or business firm applying for a loan, and balance the favorable and unfavorable elements in reaching a decision. Similarly, the trust officer must have a thorough understanding of the provisions of each trust which he is administering, and the knowledge necessary to manage properly the fund or estate involved; he must invest wisely in order to manage trust funds which were established for purposes such as supporting families, sending young people to college, or paying pensions to retired workers. Besides supervising financial services, bank officers are called upon frequently to advise individuals and businessmen and to participate in many different kinds of community projects.

Because of the great variety of services offered by banks, a wide choice of officer careers in different areas of the bank is available for those who wish to specialize. For example, in the lending area, the *loan officer* must be familiar with the principles of economics, production, distribution, and merchandising, as well as the fundamentals of commercial law. He also must have the ability to analyze financial statements and have some knowledge of the operations and customs of businesses to which the bank expects to extend credit. Careers in the lending area include: Installment loan officer, commercial loan officer, credit department loan officer, real estate mortgage loan officer, and agricultural loan officer. In the trust services area, the *trust officer* is responsible for the management of assets belonging to individuals, families, corporations, and charitable and educational institutions. Trust management requires specialization in fields such as financial

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planning, investment, administration, taxes, and business and real estate management. Specialized careers in the trust management area include, for example, estate administration, individual and institutional trust administration, and investment research positions. The *operations officer* plans, coordinates, and controls the work flow, updates systems, and strives for more efficient operations of a bank. He must be able to train and supervise a large number of people, since most of a bank's staff works in operations. Career opportunities in the bank operations area include the following: Customer services, electronic data processing services, and internal services. Other career specialities for bank officers include *correspondent bank officer*, who is responsible for relations with other banks, *branch bank manager*, who has full responsibility for all aspects of a branch office; and *international officer*, who is financial advisor to customers in the United States and abroad. A working knowledge of a foreign language and knowledge of a foreign country's geography, politics, history, and economic growth can be very helpful to those interested in careers in international banking. Other career fields for bank officers are auditing, economics, personnel administration, public relations, and operations research.

Training, Other Qualifications, and Advancement

Bank officer positions may be filled by promoting either experienced clerical employees or management trainees. Outstanding bank clerks may be selected for promotion, even though their academic background is limited, but college graduation is the usual requirement for young people who enter as management trainees. A business administration curriculum with a major in finance or a liberal arts curriculum including accounting, economics, commercial law, political science, and statistics are considered excellent preparation for trainee positions. Valuable experience may be gained in the summer employment programs recently initiated by some large city banks for college students.

Most large city banks have well-organized officer-training programs. Usually, these range from 6 months to 1 year in length. Trainees may start as credit or investment analysts or be rotated among various jobs in several bank departments so that they get the "feel" of banking; bank officers then are better able to determine the position for which each employee is best suited. Many banks too small to operate formal officer-trainee programs provide some other form of training program which enables trainees to gain an understanding of bank operations.

Advancement to officer positions may come slowly in small banks where the number of these positions is limited. In large city banks having special training programs, initial promotions may come more quickly. For a senior officer position, however, many years of experience are usually necessary before an employee can acquire the necessary knowledge of the bank's operations and customers and of the community.

Although experience, ability, and leadership qualities receive great emphasis when bank employees are considered for promotion to officer positions, advancement also may be accelerated by special study. Courses in every phase of banking are offered by the American Institute of Banking, a long-established, industry-sponsored school. (See introduction to this chapter for more information on the Institute's program and other training programs sponsored jointly by universities and local bankers' associations.)

Employment Outlook

The number of bank officers is expected to increase very rapidly through the 1970's. Many new positions will be created by the expected expansion of banking activities. Others will develop because the increasing use of electronic computers enables banks to analyze and plan banking operations more extensively and to provide new kinds of services. In addition, because bank officers are somewhat older, on the average, than most employee groups, a large number of additional officers will be needed each year to replace those who retire or leave their jobs for other reasons. About 10,000 workers will be needed annually because of employment growth and the need to replace bank officers who retire or stop working for other reasons. Many other openings will arise as bank officers transfer to other types of employment.

Most of the officer positions which become available will be filled by promoting people who have already acquired experience in banking operations. Although competition for these promotions is likely to remain keen, particularly in large banks, college graduates who meet the standards for executive trainees should find good opportunities for entry positions.

Earnings

According to a private survey conducted in 1968, large banks,

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insurance companies, and other financial institutions paid salaries ranging from about $525 to almost $750 a month to new executive trainees who were college graduates having majors in business administration or in the liberal arts.

The salaries of senior bank officers may be several times as great as these starting salaries. For officers, as well as for other bank employees, salaries are likely to be lower in small towns than in big cities.

See introductory section of this chapter for information on Where Employed and Sources of Additional Information; and for additional information on Training, Employment Outlook, and Earnings and Working Conditions.

HOTEL MANAGERS AND ASSISTANTS

(D.O.T. 163.118 and 187.118 and .168)

Nature of the Work

Hotel and motel managers are responsible for operating their establishments profitably and at the same time, providing maximum comfort for their guests. Of the more than 150,000 hotel and motel managers employed in 1968, about 70,000 were salaried and more than 80,000 were owner-managers. Managers direct and coordinate the activities of the front office, kitchen, dining rooms, and the various hotel departments, such as housekeeping, accounting, personnel, purchasing, publicity, and maintenance. They make decisions on room rates, establish credit policy, and have final responsibility for dealing with many other kinds of problems that arise in operating their hotels or motels. Like other managers of business enterprises, they also may spend considerable time conferring with business and social groups and participating in community affairs.

In small hotels, the manager also may perform much of the front office clerical work. In the smallest hotels and in many motels, the owners—sometimes a family team—do all the work necessary to operate the business.

The general manager of a large hotel may have several assistants who manage one department or more and assume general administrative responsibility when the manager is absent. Because preparing and serving food is important in the operation of most large hotels, a special manager usually is in charge of this department. Managers of large hotels usually employ a special assistant, known as a sales manager, whose job it is to promote maximum use of hotel facilities. The sales manager spends much time traveling about the country explaining to various groups the facilities his hotel can offer for meetings, banquets, and conventions.

Manager checks convention reservations.

Since large hotel chains often centralize activities such as purchasing supplies and equipment and planning employee training programs, managers of these hotels may have fewer duties than managers of independently owned hotels. Hotel chains may assign managers to help organize work in a newly acquired hotel, or may transfer them to establish hotels in different cities or in foreign countries.

Training, Other Qualifications, and Advancement

Since most hotels promote from within, individuals who have proven their ability, usually in front office jobs, may be promoted to assistant manager positions and eventually to general manager.

Although successful hotel experience is generally the first consideration in selecting managers, employers increasingly emphasize a college education. Many believe the best educational preparation is provided by the colleges which offer a specialized 4-year curriculum in hotel and restaurant administration. Specialized courses in hotel work, available in a few junior colleges, and study courses given by the Educational Institute of the American Hotel and Motel Association, are also helpful.

In colleges offering a specialized 4-year curriculum in hotel management, the courses include hotel administration, hotel accounting, economics, food service management and catering, and hotel maintenance engineering. Students are encouraged to spend

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their summer vacations working in hotel or restaurant jobs—for example, as busboys or bellmen, room clerks, or assistant managers. The experience gained in these jobs and the contacts with employers may enable young people to obtain better hotel positions after graduation. In addition, students are encouraged to study foreign languages and other subjects of cultural value such as history, philosophy, and literature.

College graduates who have majored in hotel administration usually begin their hotel careers as front office clerks; after acquiring the necessary experience, they may advance to top managerial positions. An increasing number of employers require some experience in food operations. Hotel chains may offer better opportunities for advancement than independent hotels, since vacancies may arise in any hotel of the chain, as well as on the central management staff.

Some large hotel organizations have established special programs for management trainees who are college graduates or for less highly trained personnel promoted from within. These programs consist mainly of on-the-job training assignments in which the trainee is rotated among jobs in the various hotel departments. In addition, some large hotels provide financial assistance to outstanding employees for college study.

Employment Outlook

Well-qualified young people will find favorable opportunities through the 1970's to obtain entry positions that offer the possibility of promotion to managerial work. Young men applicants who have college degrees in hotel administration will have an advantage in seeking such entry positions and later advancement. Many openings for management personnel also will result from the need to fill vacancies resulting from turnover.

The number of hotel managers is expected to increase moderately during the 1970's. New positions will arise as additional hotels are built, and as the number of motor hotels and luxury motels expand.

See the introductory section of this chapter for information on Earnings and Working Conditions, Sources of Additional Information, and for additional information on Employment Outlook.

INDUSTRIAL TRAFFIC MANAGERS

(D.O.T. 184.168)

Nature of the Work

Determining the most efficient way of shipping freight across the country or around the world can be a complicated matter. Piggyback trains and air freight, as well as regular rail, truck, and ship are the available methods of transportation. The thousands of freight classifications, rates, routes, and regulations, however, are factors to be considered in deciding which method or combination of methods should be used. Trained specialists called industrial traffic managers are responsible for analyzing transportation possibilities and determining the most efficient method to use.

Industrial traffic managers and their assistants arrange the transportation of raw materials and finished products to and from industrial and commercial firms. They make sure that goods are shipped in a manner that will ensure prompt and safe delivery at the lowest possible cost.

After taking into consideration the kind and amount of goods to be shipped, the time when delivery is needed, and other factors, they choose the type of transportation, the route, and finally the particular carrier or transportation company. (Traffic managers employed by railroads, airlines, trucking firms, and other transportation companies, who chiefly are concerned with attracting business to their firms, are not covered by this statement.)

The duties of industrial traffic managers range from routine tasks, such as checking freight bills, to major planning and policymaking matters such as deciding whether the company should buy and operate its own fleet of trucks. Other duties include ascertaining the freight classifications and rates that apply to goods shipped, routing and tracing shipments, arranging with carriers for transportation services, preparing bills of lading and other shipping documents, and handling claims for lost or damaged goods. In addition, traffic managers are responsible for maintaining records not only of shipments but also of freight rates, commodity classifications, and applicable government regulations. Sometimes traffic managers are responsible for the packaging of shipments and for their companies' warehouse facilities and transportation equipment.

In small companies or in firms without separate traffic departments, transportation arrangements for incoming goods may be made by the purchasing department, and for outgoing goods, by the sales department. Employees

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Industrial traffic managers discuss warehouse shipping facilities.

who handle transportation arrangements in such firms must have a broad knowledge of the transportation field, but usually they do not have the title "traffic manager."

Since many aspects of transportation are subject to Federal, State, and local government regulations, traffic managers must know about these and any other legal matters that apply to their companies' shipping operations. Many traffic managers represent their companies before rate-making and regulatory bodies—such as the Interstate Commerce Comsion, State Commissions, and local traffic bureaus—to request or oppose changes in rates, commodity classifications, or types of service provided by carriers.

Places of Employment

An estimated 15,000 people held jobs as industrial traffic managers in 1968. The majority were employed by manufacturing firms, although some worked for stores and other types of establishments. A few traffic managers are in business for themselves, acting as consultants on transportation problems for various clients. Most traffic managers are men.

Training, Other Qualifications, and Advancement

Although persons having only a high school education can qualify for traffic manager positions on the basis of experience in traffic departments, a college education is becoming increasingly important for a career in this field. For some kinds of work, college training may be required. For example, in order to argue cases before the U.S. Government's Interstate Commerce Commission, a traffic manager must meet certain "qualification standards" which generally include at least 2 years of college training. In selecting college graduates for trainee positions, some employers prefer to hire graduates of schools of business administration who have majored in transportation; others prefer holders of degrees in liberal arts who have had courses in transportation, management, economics, statistics, marketing, or commercial law.

The first jobs of new traffic department employees are often in shipping rooms, where they gain experience in routing shipments and preparing bills of lading and other shipping forms, or in general traffic offices where they may do clerical work such as filing schedules of freight rates and calculating freight charges. After gaining experience in various routine tasks, employees may be advanced to more technical work

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such as analyzing rates and transportation statistics. After further experience, a competent worker may advance to a supervisory position, such as supervisor of rates and routes. For the most competent, promotion to assistant manager and eventually to manager is possible.

Workers in traffic departments may prepare themselves for advancement by participating in company-sponsored training programs, by taking courses in colleges, universities, and vocational schools, or by attending seminars sponsored by various private organizations. A mark of professional recognition in traffic management work is "certified" membership in the American Society of Traffic and Transportation, Inc., which can be acquired by successful completing the Society's examinations and meeting certain education and experience requirements.

Employment Outlook

A steady increase in employment in this occupation is expected through the 1970's. Some large companies will follow the example already set by many corporations and reorganize their shipping and receiving activities into separate traffic departments with traffic managers in charge. In other companies, new transportation jobs probably will be located in purchasing or sales departments and thus have different job titles.

Among the factors expected to contribute to the growth in this field are the increasing emphasis in many industries on efficient management of transportation activities, and the trend toward procuring raw materials and finished products from more distant places and distributing them to increasingly wider markets. Since transportation costs are a major factor in the price of many items, companies are becoming increasingly concerned about economics in shipping. A strong demand is expected for specialists who know how to classify products so as to obtain the lowest possible freight rates, choose the carriers that are best able to handle each shipment, and otherwise protect their companies from excessive shipping expenses.

Earnings and Working Conditions

Young men having college degrees who started as business trainees in the traffic departments of large industrial firms often received annual salaries of about $7,000 in 1968, according to the limited data available. Beginners having less schooling, however, usually received lower salaries.

Earnings of experienced traffic managers are related generally to their companies' sales volume and transportation costs. The average (median) salary of traffic managers in companies with transportation costs totaling less than $1 million annually was about $12,000 in 1968, according to the limited information available. In companies where transportation costs ranged between $4 million and $10 million, annual salaries averaged about $20,000. In firms where these costs were still higher, some traffic executives earned considerably more than $25,000.

Traffic department employees usually work the standard workweek of their companies—generally from 35 to 40 hours. Those in particularly responsible jobs may have to spend some time outside regular working hours preparing reports, attending meetings, and traveling to hearings before State and Federal regulatory agencies.

Sources of Additional Information

For information on the requirements for certification write to:

American Society of Traffic and Transportation, Inc., 22 West Madison St., Chicago, Ill. 60602.

MARKETING RESEARCH WORKERS

(D.O.T. 050.088)

Nature of the Work

Businessmen make decisions daily regarding the marketing of their goods and services. Marketing research workers help to increase the fund of information upon which these basic business decisions are made. They act as fact-finders—seeking out, analyzing, and interpreting many different kinds of information. They prepare reports and recommendations to help management make decisions on such widely differing problems as forecasting sales; selecting a brand name, package, or design; choosing a new plant location; deciding whether to move goods by rail, truck, or other method; and determining the kinds of advertising likely to attract the most business. In investigating these and other problems, they consider expected changes in population, income levels, and consumer credit policies, or other subjects relevant to marketing policies.

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Most marketing research starts with the collection of facts from published materials, from the firm's own records, and from specialists on the subject under investigation. For example, research workers analyzing the fluctuations in a company's sales may first study sales records in a number of different cities to determine periodic changes in sales volume. They may then compare these changes with changes in population, income levels, the size of the company's sales force, and the amounts spent by the company for advertising in each city and, from these comparisons, discover the reasons for changes in the volume of sales. Other marketing research workers may study changes in the quantity of company goods on store shelves, or make door-to-door surveys to learn how many company products already are used in households.

Marketing research is often concerned with the personal opinions of the people who are using company products or who might use them in the future. For example, a survey intended to help management decide on the design and pricing of a new line of television sets may involve the use of a questionnaire to learn from a limited number of consumers the price they would be willing to pay and their preferences in such things as the color and size of the set.

A survey of this kind is usually conducted under the supervision of marketing research workers who specialize in research on consumer goods—that is, merchandise sold to the general public. In planning the survey, the marketing research worker may get help from a statistician in selecting a group (or "sample") of individuals to be interviewed, in order to be confident that the opinions obtained from them represent those held by most potential customers. He may also consult a specialist in "motivational research"—an expert in framing questions that will produce reliable information about the motives that lead people to make the purchases they do. When the investigation gets underway, the marketing research worker may supervise a number of interviewers who call on consumers to obtain answers to the questions. He also may direct the work of the office employees who tabulate and analyze the information collected. His report summarizing the survey findings also may include other information that company officials need in making decisions about the new line.

Marketing research surveys concerned with products used by business and industrial firms may be conducted somewhat differently from consumer goods surveys. Because research on some industrial products requires interviewers with a technical knowledge of the product involved, the interviews are often conducted by the marketing research worker himself (or by several research workers if the survey is a particularly extensive one). In his interviews, the worker not only tries to get opinons about the proposed product but keeps on the lookout for possible new ways of adapting it to industrial needs. He must, therefore, be a specialist both in marketing research and in the industrial uses of the product involved.

Marketing research worker plans location of test market.

Places of Employment

More than 20,000 marketing research workers were estimated to be employed full time in 1968. This number included research assistants and others in junior positions, as well as research supervisors and directors. The majority of these workers were men; positions held by women were most frequently at the junior professional levels.

In addition to these marketing research workers, a limited number of other professional employees (statisticians, economists, psychologists, and sociologists) and several thousand clerical

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workers (clerks who code and tabulate survey returns, typists, and others) were employed full time in this field. Thousands of additional workers, many of them women, were employed on a part-time or temporary basis as survey interviewers.

Among the principal employers of marketing research workers are manufacturing companies and independent advertising and marketing research organizations which do this kind of work for clients on a contract basis. Marketing research workers also are employed by very large stores, radio and television firms, and newspapers; others work for university research centers, government agencies, and other organizations which provide information for businessmen. Marketing research organizations range in size from one-man enterprises to large firms having a hundred employees or more.

The largest number of marketing research workers are in New York City, where many major advertising and independent marketing research organizations are located, and where many large manufacturers have their central offices. The second largest concentration is in Chicago. However, marketing research workers are employed in many other cities —wherever there are central offices of large manufacturing and sales organizations.

Training, Other Qualifications, and Advancement

A bachelor's degree is usually required to enter trainee positions in marketing research. A master's degree in business administration is becoming increasingly desirable, especially for advancement to higher level positions. Many people qualify for positions in marketing research through experience gained in other kinds of research jobs or in work related to the field of marketing. University teachers of marketing research or statistics sometimes are sought by employers to head new marketing research departments.

Among the college courses considered valuable as preparation for work in marketing research are marketing, statistics, English composition, speech, psychology, and economics. Candidates for some marketing research positions need specialized training in engineering or other technical subjects, or a substantial amount of sales experience and a thorough knowledge of the company's products. A knowledge of electronic data-processing procedures is becoming important because of the growing use of electronic computers in sales forecasting, distribution, cost analysis, and other aspects of marketing research. Graduate training may be necessary for some kinds of work—for example, motivational research or sampling and other statistical work connected with large-scale surveys.

Trainees in marketing research usually start as research asistants or junior analysts. At first, they are likely to do considerable clerical work, such as copying information from published sources, editing and coding questionnaires, and tabulating results of questionnaires returned in surveys. They also learn how to conduct interviews and how to write reports on survey findings.

After gaining experience, assistants and junior analysts may advance to higher level positions and be responsible for specific marketing research projects, or to supervisory positions. An exceptionally able individual may eventually become marketing research director or vice president in charge of marketing and sales.

Marketing research workers must have exceptional ability in recognizing and defining problems, and imagination and ingenuity in applying marketing research techniques to their solution. Above all, this work calls for the ability to analyze information and to write reports which will convince management of the significance of the information.

Employment Outlook

College graduates trained in marketing research methods and statistics are likely to find very good job opportunities in this growing occupation through the 1970's. The growing complexity of marketing research techniques also has led to expanded opportunities for people trained in psychology, economics, and related fields. Advanced degrees are becoming increasingly important for employment in marketing research, and as a result, opportunities for holders of Masters and PhD degrees will be excellent.

The demand for marketing research services is expected to increase very rapidly through the 1970's. It is expected that existing marketing research organizations will expand and that many new marketing research departments and new independent research firms will be set up. Business managers will find it increasingly important to obtain the best information possible for appraising marketing situations and planning marketing policies. Furthermore, as marketing research techniques improve and more statistical data accumulate, company officials are likely to turn to marketing research workers for information and advice with increasing frequency. In addition to growth needs, many openings will occur each year as persons retire, die or leave the field for other reasons.

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Earnings and Working Conditions

Starting salaries for market research trainees averaged about $7,300 a year in 1968 according to the limited data available. Persons having masters degrees in related fields usually started at $8,400 to $10,800 a year.

Earnings were substantially higher for experienced marketing research workers who attained positions with considerable responsibility. In 1968, earnings of senior analysts generally ranged between $12,000 and $15,000 a year. Marketing research directors' average salaries were more than $16,000 annually; and vice-presidents in charge of marketing received salaries well over $20,000 a year.

A private survey indicates further that of the four management functions (marketing, finance, manufacturing, and research), executives in marketing tend to be the highest paid.

Marketing research workers usually work in modern, centrally located offices. Some, especially those employed by independent research firms, do a considerable amount of traveling in conection with their work. Also, they may frequently work under pressure and for long hours to meet deadlines.

Sources of Additional Information

Information about specialized types of marketing research is contained in a report entitled "Selecting Marketing Research Services" which may be obtained from:

Small Business Administration,
Washington, D.C. 20416.

Additional information on marketing research may be obtained from:

American Marketing Association,
230 North Michigan Ave., Chicago, Ill. 60601.

PERSONNEL WORKERS

(D.O.T. 166.088 through .268 and 169.118 and .168)

Nature of the Work

Attracting and keeping the best employees available, and matching them to jobs they can do effectively are important for the successful operation of business and government (Personnel) workers are responsible for helping their employers attain these objectives. They develop recruiting and hiring procedures and interview job applicants, selecting or recommending the ones they consider best qualified for the openings to be filled. In addition, personnel workers counsel employees, deal with disciplinary problems, classify jobs, plan wage and salary scales, develop safety programs, and conduct research in personnel methods. Other important aspects of their work involves employee management relations, employee training, and the administration of employee benefit plans.

Some personnel jobs require only limited contact with people; others involve frequent contact with employees, union representatives, job applicants, and other

Interviewing job applicants is an important responsibility in personnel work.

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people in and outside the company.

Business organizations with large personnel departments employ personnel workers at varying levels of responsibility. Usually the department is headed by a director who formulates personnel policy, advises other company officials on personnel matters, and administers his department. Within the department, supervisors and various specialists—in wage administration, training, safety, job classification, and other aspects of the personnel program—may be responsible for the work of staff assistants and clerical employees. Small business organizations employ relatively few personnel workers. Sometimes one person may be responsible for all the personnel activities as well as other types of duties.

Personnel workers in Federal, State, and local government agencies do much the same kind of work as those employed in large business firms. Government personnel workers however, spend considerably more time in activities related to classifying jobs, and in devising, administering, and scoring the competitive examinations given to job applicants.

Places of Employment

Personnel workers are employed in nearly all kinds of business enterprises and government agencies. The total number employed in 1968 was estimated to be about 110,000. Well over half of all personnel workers were employed by private firms. Large numbers also were employed by Federal, State, and local government agencies. A small group of personnel workers were in business for themselves, often as management consultants or employee management relations experts. In addition, colleges and universities employed some professionally trained personnel workers as teachers of courses in personnel administration, industrial relations, and similar subjects.

Most personnel workers are employed in large cities and in the highly industrialized sections of the country. Almost three-fourths of all personnel workers are men. Many women, however, occupy personnel positions in organizations that employ large numbers of women workers—for example, in department stores, telephone companies, insurance companies, banks, and government agencies.

Training, Other Qualifications, and Advancement

A college education is becoming increasingly important for entrance into personnel work. Some employers hire new graduates for junior positions, and then provide training programs to acquaint them with their operations, policies, and problems.

Other employers prefer to fill their personnel positions by transferring people who already have firsthand knowledge of operations. A large number of the people now in personnel work who are not college graduates entered the field in this way.

Many employers in private industry prefer college graduates who have majored in personnel administration; others prefer graduates who have a general business administration background. Still other employers consider a liberal arts education the most desirable preparation for personnel work. Young people interested in personnel work in government are advised to major in public administration, political science, or personnel administration; however, those having other college majors also are eligible for personnel positions in government.

For some positions, more specialized training may be necessary. Jobs involving testing or employee counseling often require a bachelor's degree with a major in psychology and sometimes a graduate degree in this field. An engineering degree may be desirable for work dealing with time studies or safety standards, and a degree with a major in industrial relations may be helpful for work involving employee management relations. A background in accounting may be useful for positions concerned with wages or pension and other employee benefit plans.

After the initial period of orientation, through formal or on-the-job training programs, college graduates may progress to classifying jobs, interviewing applicants, or handling other personnel functions. After they have gained experience, those with exceptional ability may be promoted to executive positions, such as personnel director. Personnel workers sometimes advance by transferring to other employers having larger personnel programs or from a middle-rank position in a big organization to the top job in a smaller one.

Personal qualities regarded as important for success in personnel work include the ability to speak and write effectively and a better-than-average aptitude for working with people of all levels of intelligence and experience. In addition, the prospective personnel worker should be the kind of person who can see the employee's point of view as well as the employer's, and should be able to give advice in the best interests of both. A liking for detail, a high degree of persuasiveness, and a pleasing personality also are important.

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Employment Outlook

College graduates who enter personnel work are expected to find many opportunities through the 1970's. Although employment prospects will probably be best for college graduates who have specialized training in personnel administration, positions will be available also for people having degrees in other fields. Opportunities for young people to advance to personnel positions from production, clerical, or subprofessional jobs will be limited.

Employment in personnel work is expected to expand very rapidly as the Nation's employment rises. More personnel workers will be needed to carry on recruiting, interviewing, and related activities. Also, many employers are recognizing the importance of good employee relations, and are depending more heavily on the services of trained personnel workers to achieve this.

Employment in some specialized areas of personnel work will rise faster than others. More people will probably be engaged in psychological testing; the need for workers to handle work related problems will probably continue to increase; and the growth of employee services, safety programs, other benefit plans, and personnel research also is likely to continue.

Earnings and Working Conditions

A national survey indicated that the average annual salary of trainees employed as job analysts in private industry was about $7,600 in early 1968; experienced job analysts averaged about $12,000; directors of personnel generally earned between $10,000 and $19,200; and some top personnel and industrial relations executives in very large corporations earned considerably more.

In the Federal Government, inexperienced graduates having bachelor's degrees started at $5,732 a year in late 1968; those having exceptionally good academic records or master's degrees began at $6,981; a few master's degree holders who ranked high in their respective classes received $8,462 a year. Federal Government personnel workers with higher levels of administrative responsibility and several years of experience in the field were paid more than $14,000; some in charge of personnel for major departments of the Federal Government earned about $20,000 a year.

Employees in personnel offices generally work 35 to 40 hours a week. During a period of intensive recruitment or emergency, they may work much longer. As a rule, personnel workers are paid for holidays and vacations, and share in the same retirement plans and other employee benefits available to all professional employees in the organizations where they work.

Sources of Additional Information

General information on personnel work as a career may be obtained by writing to:

American Society for Personnel Administration, 52 East Bridge St., Berea, Ohio 44017.

Information about government careers in personnel work may be obtained from:

Public Personnel Association, 1313 East 60th St., Chicago, Ill. 60637.

PUBLIC RELATIONS WORKERS

(D.O.T. 165.068)

Nature of the Work

All organizations—both profit and nonprofit—want to present a favorable image of themselves to the public. By keeping themselves informed about the attitudes and opinions of customers, employees, and other groups, public relations workers help an employer build and maintain such a public image.

Public relations workers provide information about an employer's business to newspapers and magazines, radio and television, and other channels of communication. They plan the kind of publicity that will be most effective, contact the people who may be interested in using it, and prepare and assemble the necessary material. Many items in the daily papers; human interest stories in popular magazines; and pamphlets giving information about a company, its product, and job opportunities with it, have their start at public relations workers' desks. These workers also may arrange speaking engagements for company officials and write the speeches they deliver. Often, they participate in community affairs, serving as an employer's representative during safety campaigns and other community projects. In addition, showing a film at a school assembly, staging a beauty contest, calling a press conference, and planning a convention may be all part of a public relations worker's job.

Public relations workers tailor their programs to an employer's particular needs. In a business firm, the public relations worker usually is concerned with his employer's relationships with em-

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Public relations worker checks materials for press release.

ployees, stockholders, government agencies, civic organizations, and other community groups.

Public relations staffs in large firms sometimes number 200 or more. Responsibility for developing overall plans and policies may be shared between a company vice president or another top executive who is responsible for final decisions, and the director of the public relations department. In addition to writers and research workers, public relations departments employ specialists to do work such as preparing material for the differerent media or writing reports sent to stockholders.

Public relations workers who handle publicity for an individual or who are in charge of a public relations program for a university, fraternal organization, or small business firm may handle all aspects of the work. They make their own contacts with outsiders, do the necessary planning and research, prepare material for publication, and perform other duties. Such public relations workers may combine public relations duties with advertising or other managerial work, and they may be top-level officials or occupy positions of less importance.

Places of Employment

In 1968, about 100,000 public relation workers were employed, according to the limited data available. Over one-fourth were women. In recent years, an increasing number of women have entered public relations work.

The majority of public relations workers are employed by manufacturing firms, stores, public utilities, trade and professional associations, and labor unions. Others are employed by consulting firms which provide public relations services to clients on a fee basis.

Employment in public relations work tends to be concentrated in big cities where press services and other communications facilities are readily available, and where large corporations and trade, professional, and other associations have their headquarters. More than half of the personnel and consulting firms in the United States are in New York City, Los Angeles, Chicago and Washington, D.C.

Training, Other Qualifications, and Advancement

Although college education generally is regarded as the best preparation for public relations work, employers differ in the specific type of college background they require of applicants. Some seek graduates who have majors in English, journalism, or public relations; others prefer candidates with a background in science or some other field related to the firm's business activities.

College graduates who have secretarial skills also are desired by some employers, especially in small firms, because they can combine secretarial duties with public relations work. After a few years' experience, these workers may advance to a full-time public relations position.

In 1968, six colleges offered a bachelor's degree in public relations, and six offered the master's degree. In addition, about 200 colleges offered at least one course in public relations.

Among the college subjects considered desirable in preparing for a career in public relations are journalism, economics and other social sciences, business administration, psychology, public speaking, literature, and physical sciences. Extracurricular activities which may provide students with some valuable experience include writing or other work connected with school publications, participation in student government activities, and part-time or summer employment in selling, public relations or a related field of work such as broadcasting. The personal qualifications usually considered important for work in this field include creativity, initiative, drive and the ability to express thoughts clearly and simply. Fresh ideas are so important to effective public relations work that some experts in this field spend all of their time providing ideas and planning programs but take no active part in carrying out the programs. In selecting new employees, many employers prefer people who have had some previous work experience, particularly in journalism or a related field.

Some companies—particularly those with large public relations programs—have formal training programs for new employees. In other companies, new employees learn on the job by working under the guidance of experienced staff members. Beginners often maintain files of material about the

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company and its activities, scan newspapers and magazines for appropriate articles to clip, and do the research needed to assemble information for speeches and pamphlets. After gaining experience, they may be given progressively more difficult assignments, such as writing press releases, speeches, and articles for publication. Promotion to supervisory and managerial positions may come as the worker demonstrates ability to handle more difficult and creative assignments. The most skilled public relations work, which involves developing the plans and maintaining the contacts which are essential to a successful public relations program usually is in the hands of the director of the department and his most experienced staff members. Some experienced public relations workers eventually establish their own consulting firms, and others move on to better positions with another employer.

Employment Outlook

Employment in this field is expected to expand very rapidly through the 1970's. In addition to the new jobs created as expanding organizations require more public relations specialists, other openings will occur because of the need to replace workers who retire or leave the field for other reasons.

The demand for public relations workers is expected to grow through the 1970's as population increases and the general level of business activity rises. In recent years, there has been an increase in the amount of funds spent on public relations, and many organizations have newly developed public relations departments. This trend is expected to continue in the years ahead.

Earnings and Working Conditions

Starting salaries for public relations workers averaged about $5,500 a year in 1968, according to the limited data available. The highest starting salaries were paid by consulting firms in major cities to beginning public relations workers who were very well qualified from the standpoint of educational background and previous work experience. Many public relations workers who have a few years of experience earned between $8,000 and $12,000 a year.

The salaries of experienced public relations workers generally are highest in large organizations, where public relations programs are likely to be extensive. In 1968, directors of public relations employed by medium-size firms generally earned $12,000 or more annually, and those employed by large corporations had salaries in the $15,000 to $25,000 range, according to the Public Relations Society of America. Some officials, such as vice presidents in charge of public relations, earned from $25,000 to $50,0000 a year or more. Many consulting firms employ fairly large staffs of experienced public relations specialists and often pay salaries which are somewhat higher than those paid public relations workers in other business organizations. In social welfare agencies, nonprofit organizations, and universities, salary levels tend to be somewhat lower.

The workweek for public relations workers usually is 35 to 40 hours. Irregular hours and overtime often may be necesary, however, to prepare or deliver speeches, attend meetings and community functions, and make trips out of town. On occasion, the nature of their reular assignments or special events require that public relations workers be on call around the clock.

Sources of Additional Information

The Information Center, Public Relations Society of America, Inc., 845 Third Ave., New York, N.Y. 10022.

Service Department, Public Relations News, 127 East 80th Street, New York, N.Y. 10021.

PURCHASING AGENTS

(D.O.T. 162.158)

Nature of the Work

In order for a company or other organization to function, it has to purchase materials, supplies, and equipment. These necessities often represent a large part of the total costs of operation and can affect significantly a company's profits. Because of its importance, purchasing usually is designated as a separate responsibility to be handled by one of the management team—the purchasing agent.

What purchasing agents and their assistants buy depends upon the kinds of organizations employing them. For manufacturers, it may be largely machinery, raw materials, and product components; for government agencies, it may be office supplies, office furniture, and business machines. Whatever the organization, purchasing agents are responsible for obtaining goods and services at the lowest cost consistent with required quality and for seeing that adequate supplies are on hand.

Although the head of the purchasing department usually is called a purchasing agent, he may have the title of vice president-purchasing, procurement or purchasing officer, director or manager of purchasing, or buyer. ("Buyers" in retail stores and others who are engaged in buying merchandise for resale in its original form are not included in this report.) In a large firm, the head

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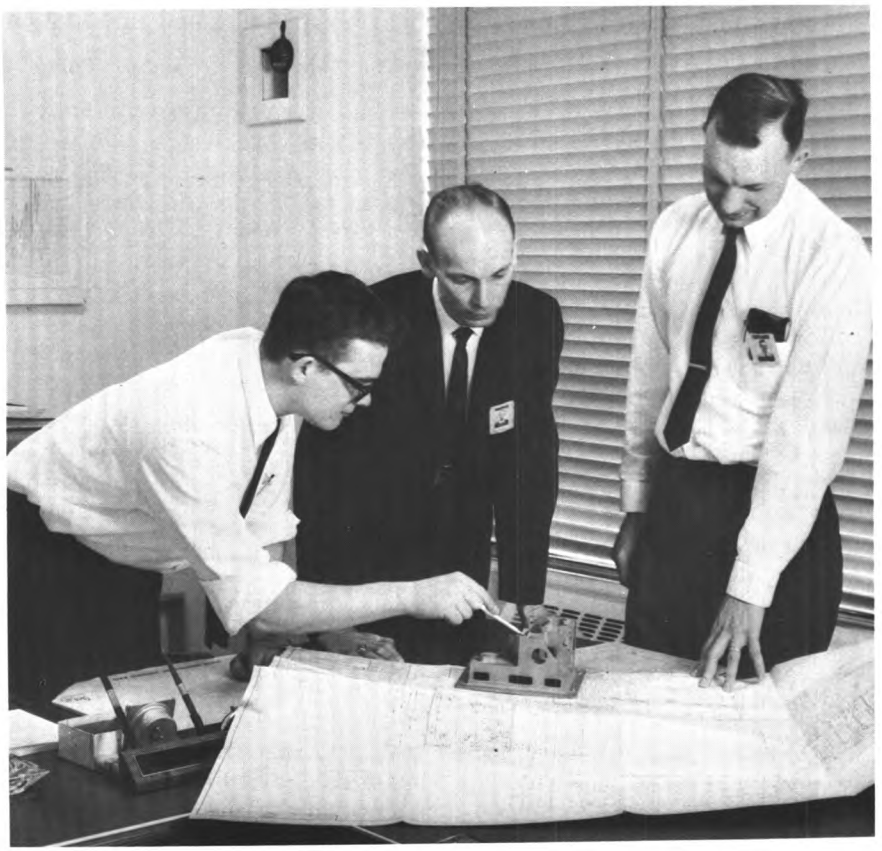

Purchasing agent discusses new product design with other staff members before buying parts.

of the purchasing department directs the work of a staff including assistant purchasing agents and clerical workers. Each purchasing assistant may be assigned to a broad area. One person may be responsible for buying raw materials; another, factory machinery; and another, office supplies. Others may specialize in buying certain items—for example, steel, lumber, cotton, or oil.

The purchasing agent receives order forms or requisitions from various departments of the company. These requisitions list and describe needed items and include information such as required quantities and delivery dates. Since the agent usually can purchase from many sources, his main job is to select the seller who offers the best value. To do this, the agent must consider many factors, such as the exact specifications for the required items, price, quality, quantity discounts, transportation cost, and delivery time. Much of the information is obtained by comparing listings in catalogs and trade journals and by telephoning various suppliers, but the purchasing agent also meets with salesmen to examine sample goods, watch demonstrations of equipment, and discuss items to be purchased. Sometimes, suppliers are invited to bid on large orders, and the purchasing agent selects the lowest bidder who meets the requirements regarding the specifications established for the goods and date of delivery.

It is important for purchasing agents to develop good working relations with their suppliers. These relations can result in savings on purchases, favorable terms of payment, and quick delivery on rush orders or material in short supply. They also work closely with personnel in various departments of their own company. For example, they frequently discuss product specifications with company engineers or discuss shipment handling problems with employees in the shipping and receiving, storage, or traffic departments.

Places of Employment

In 1968, more than half of the estimated 140,000 purchasing agents and closely related types of buyers worked in manufacturing industries. Large numbers were employed in government agencies—Federal, State, and local—and in the wholesale and retail trade. Public utilities, transportation companies, and service institutions, such as schools and hospitals, employed substantial numbers of purchasing agents and assistants. Even the smallest industries employed some purchasing personnel.

Most purchasing agents work in firms that have fewer than 10 employees in the purchasing department. Some large firms, however, may have a hundred specialized buyers or more. More than 10 percent of all purchasing agents are women.

Training, Other Qualifications, and Advancement

For beginning positions as purchasing agents, many employers prefer to hire graduates of schools of business administration or engineering who have had courses in accounting, economics, and

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purchasing. A few require graduate training in business administration. On the other hand, many firms prefer experience with the company and select purchasing workers from among their own personnel, whether or not they have a college education. For advancement to high-level positions, however, a college degree is becoming increasingly important.

Regardless of previous training and experience, the beginner in the purchasing field must spend considerable time learning about his company's operations and purchasing procedures. Some companies provide classroom instruction and on-the-job training. The beginner may be assigned to the storekeeper's section to learn about operations such as keeping inventory records, filling out forms to initiate purchases of additional goods, or providing proper storage facilities. He then may work with an experienced buyer to learn about types of goods purchased, prices, and sources of supply. Following the initial training period, the trainee may become a junior buyer of standard catalog items. After he gains experience in the various aspects of purchasing and demonstrates ability to exercise good judgment and accept responsibility, he may be promoted to assistant purchasing agent and then to purchasing agent. In large companies, purchasing agents or heads of purchasing departments may become vice presidents with overall responsibility for purchasing, warehousing, traffic, and related functions.

Employment Outlook

Opportunities are expected to be very good through the 1970's for young people to enter and advance in purchasing occupations. Demand is expected to be especially strong for graduates of schools of business administration who have taken courses in purchasing. Demand also is expected to be excellent for graduates whose background in engineering and science qualifies them for jobs in purchasing departments of firms that manufacture complex machinery, chemicals, and other technical products. Liberal arts college graduates should be able to obtain trainee positions in many types of firms. Outstanding persons who do not have a college education will continue to be promoted from clerical, sales, and other types of jobs, but their opportunities for advancement to high-level purchasing jobs will be limited.

Employment of purchasing agents and their assistants is expected to grow moderately through the 1970's. Some of the major factors underlying this expected growth are the continuing increase in the size of business and manufacturing firms, the development of new products and new sources of supply (including foreign markets), and the ever-increasing complexity and specialization of business functions. Competition among manufacturers for new, improved, and less costly goods, raw materials, and services will further direct the attention of top management to the importance of the purchasing functions. In addition to job openings resulting from growth, a few thousand job opportunities are expected annually because of the need to replace personnel who retire, transfer to other jobs, or leave the field for other reasons.

Earnings and Working Conditions

Beginning annual salaries of male college graduates hired as trainees in purchasing departments of large private firms ranged between $5,700 and $6,800 in late 1968, according to the limited data available. In the Federal Government, beginning purchasing agents who had college degrees started at $5,732 or $6,981 in late 1968 depending on the individual's college record.

In 1968, the annual earnings of buyers in private firms, generally ranged from $7,300 to $9,000; assistant purchasing agents' earnings ranged from about $9,000 to $12,500; and purchasing agents, from approximately $12,500 to $20,000. Some top purchasing executives earned between $35,000 and $75,000.

Employees in purchasing departments usually work the standard workweek of the company—generally from 35 to 40 hours a week. In addition, purchasing agents may spend time attending meetings, preparing reports, or visiting suppliers' plants.

Sources of Additional Information

Persons interested in a career in purchasing may consult members of local purchasing associations, or they may write to:

National Association of Purchasing Management, 11 Park Pl., New York, N.Y. 10007.

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THE CLERGY

The choice of the ministry, priesthood, or rabbinate as one's lifework involves considerations that do not influence to the same degree the selection of a career in most other occupations. When young people decide to become clergymen, they do so primarily because of their religious faith and their desire to help others. Nevertheless, it is important for them to know as much as possible about the profession and how to prepare for it, the kind of life it offers, and its needs for personnel. They also should understand that the civic, social, and recreational activities of clergymen often are influenced, and sometimes restricted, by the customs and attitudes of their community.

The number of clergymen needed is broadly related to the size and geographic distribution of the Nation's population and participation in organized religious groups. These factors affect the number of churches and synagogues that are established and thus the number of pulpits to be filled. In addition to the clergy who serve congregations, many others teach in seminaries and other educational institutions, serve as missionaries, and perform various other duties.

Young people considering a career as a clergyman should seek the counsel of a religious leader of their faith to aid them in evaluating their qualifications for the profession. Besides a desire to serve the spiritual needs of others and to lead them in religious activities, they need a broad background of knowledge and the ability to speak and write clearly. Emotional stability is necessary, since a clergyman must be able to help others in times of stress. Furthermore. young people should know that clergymen are expected to be examples of high moral character.

The amount of income clergymen receive depends, to a great extent on the size and financial status of the congregation they serve and usually is highest in large cities or in prosperous suburban areas. Earnings of clergymen, as of other professional groups, usually rise with increased experience and responsibility. Most Protestant churches and a number of Jewish congregations provide their spiritual leaders with housing. Roman Catholic priests ordinarily live in the rectory of a parish church or are provided lodgings by the religious order to which they belong. Many clergymen receive allowances for transportation and other expenses necessary in their work. Clergymen receive gifts or fees for officiating at special ceremonies such as weddings and funerals. In some cases, these gifts or fees are an important source of additional income; however, they frequently are donated to charity by the clergymen. Some churches establish a uniform fee for these services, which goes directly into the church treasury.

More detailed information on the clergy in the three largest faiths in the United States—Protestant, Roman Catholic, and Jewish—is given in the following statements that were prepared in cooperation with leaders of these faiths. Information on the clergy in other faiths may be obtained directly from leaders of the respective groups. Numerous other church-related occupations—those of the missionary, teacher, director of youth organizations, director of religious education, editor of religious publications, music director, church secretary, recreation leader, and many others—offer interesting and satisfying careers. In addition, opportunities to work in connection with religious activities are present in many other occupations. Clergymen or educational directors of local churches or synagogues can provide information on the church-related occupations and other areas offering opportunities for religious service.

PROTESTANT CLERGYMEN

(D.O.T. 120.108)

Nature of the Work

Protestant clergymen lead their congregations in worship services and may administer the rites of baptism, confirmation, and Holy Communion. They prepare and deliver sermons and give religious instruction to persons who are to be received into membership of the church. They also perform marriages, conduct funerals, counsel individuals who seek guidance, visit the sick and shut-in, comfort the bereaved, and serve their church members in many other ways. Protestant ministers also may write articles for publication, give speeches, and engage in interfaith, community, civic, educational, and recreational activities sponsored by or related to the interests of the church. Some clergymen teach in seminaries, colleges, and universities.

The types of worship services that ministers conduct differ among Protestant denominations and also among congregations within a denomination. In some denominations, ministers follow a traditional order of worship,

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whereas in others, they adapt the services to the needs of youth and other groups within the congregation. Most services include Bible reading, hymn singing, prayers, and a sermon. Bible reading by a member of the congregation and individual testimonials may constitute a large part of the service in some denominations.

Ministers serving small congregations generally work on a personal basis with their parishioners. Those serving large congregations usually have greater administrative responsibilities and spend considerable time working with committees, church officers, and staff, besides performing their other duties. They may have one or more associates or assistants who share specific aspects of the ministry, such as a Minister of Education who assists in educational programs for different age groups.

Places of Employment

In 1968, about 244,000 ministers served almost 72 million Protestants. In addition, thousands of ordained clergymen were in other occupations closely related to the parish ministry. The greatest number of clergymen are affiliated with the five largest groups of churches—Baptist, Methodist, Lutheran, Presbyterian and Episcopal. Most ministers serve individual congregations; some are engaged in missionary activities in the United States and in foreign countries; others serve as chaplains in the Armed Forces, in hospitals, and in other institutions. Still others teach in educational institutions, engage in other religious educational work, or are employed in social welfare and related agencies. Less than 5 percent of all ministers are women; however, about 80 denominations ordain women. In some denominations, an increasing number of women who have not been ordained are serving as pastors' assistants.

All cities and most towns have one or more Protestant churches with a full-time minister. The majority of ministers are located in cities and towns. Many others live in less densely populated areas where each may serve two or more congregations. A larger proportion of Protestants than members of other faiths live in rural areas.

Training and Other Qualifications

The educational preparation required for entry into the Protestant ministry has a wider range than for most professions. Some religious groups have no formal educational requirements, and others ordain persons having varying amounts and types of training in liberal arts colleges, Bible colleges, or Bible institutes. An increasingly large number of denominations, however, require a 3-year course of professional study in a theological school following college graduation. After completion of such a course, the degree of bachelor or master of divinity is awarded.

One hundred of the theological institutions in the Nation in 1969 were accredited by the American Association of Theological Schools. Accredited institutions admit only students who have received the bachelor's degree or its equivalent from an approved college. In addition, certain character and personality qualifications must be met, and endorsement by the religious group to which the applicant belongs is required. The American Association of Theological Schools recommends that preseminary studies be concentrated in the liberal arts. Although courses in English, philosophy, and history are considered especially important, the pretheological student also should take courses in the natural and social sciences, religion, and foreign languages. The standard curriculum recommended for accredited theological schools consists of four major fields: Biblical, historical, theological, and practical. There is a trend toward more courses in psychology, pastoral counseling, sociology, religious education, administration, and other studies of a practical nature. Many accredited schools require that students gain experience in church work under the supervision of a faculty member or experienced minister. Some institutions offer the master of theology and the doctor of theology degrees to students completing 1 year or more of additional study. Scholarships and loans are available for students of theological institutions.

In general, each large denomination has its own school or schools of theology that reflect its particular interests and needs; however, many of these schools are open to students from various denominations. Several interdenominational schools associated with universities give both undergraduate and graduate training covering a wide range of theological points of view.

Among the most necessary personal qualifications in a candidate for the ministry are a deep religious conviction, a sense of dedication, a genuine concern for and love of people, a wholesome personality, high moral and ethical standards, and a vigorous and creative mind. Good health is a valuable asset.

Persons who have denominational qualifications for the ministry usually are ordained following graduation from a seminary. In denominations that do not re-

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quire seminary training, clergymen are ordained at appointed times. Clergymen often begin their careers as pastors of small congregations or as assistant pastors in large churches. Protestant clergymen in many of the larger denominations—especially those groups that have a well-defined church organization—often are requested to serve in positions of great administrative and denominational responsibility.

Outlook

The demand for Protestant ministers has been greater than the supply in recent years. The increase in the number of graduates of theological schools has not been sufficient to satisfy needs for growth and to replace clergymen who retire, die, or transfer to other work.

Requirements for Protestant clergymen probably will continue to exceed supply through the 1970's, especially in denominations that require many years of formal preparation for the ministry. The continued growth in the number of church members and the continued establishment of new congregations, particularly in metropolitan suburbs, will be leading factors in increasing demands for clergymen. The trend for large congregations to hire assistant ministers also will be a factor in rising demand. Increasing opportunities for clergymen in youth and family relations work, welfare programs, religious education, the campus ministry, and chaplaincies in the Armed Forces, hospitals, universities, and correctional institutions also point toward additional needs for clergymen. Furthermore, demand for clergymen on the faculty of departments of religion in both public and private colleges and universities is growing. As the number of clergymen increases, the replacement of those who retire, die, or leave the ministry for other reasons also will require an increasing number of newly trained ministers.

Sources of Additional Information

Young people who are interested in the Protestant ministry should seek the counsel of a minister or church guidance worker. Additional information on the ministry and other church-related occupations also are available from many denominational offices. Information on admission requirements may be obtained directly from each theological school.

RABBIS

(D.O.T. 120.108)

Nature of the Work

Rabbis are the spiritual leaders of their congregations and teachers and interpreters of Jewish law and tradition. They conduct daily services, and deliver sermons at services on the Sabbath and on Jewish holidays. Rabbis customarily are available at all times for counsel to members of their congregations, other followers of Judaism, and the community at large. Many of the rabbis' functions—preparing and delivering sermons, performing wedding ceremonies, visiting the sick, conducting funeral services, comforting the bereaved, helping the poor, counseling individuals, supervising religious education programs, engaging in interfaith activities, and assuming community responsibilities—are similar to those performed by clergymen of other faiths.

Rabbis serving large congregations may spend considerable time in administrative duties, working with their staffs and committees. Large congregations frequently have an associate or assistant rabbi in addition to the senior rabbi. Many of the assistant rabbis serve as Educational Directors.

Rabbis serve congregations affiliated with 1 of the 3 wings of Judaism—Orthodox, Conservative, or Reform. Regardless of their particular point of view, all Hebrew congregations preserve the substance of Jewish religious worship. The congregations differ in the extent to which they follow the traditional form of worship—for example, in the wearing of head coverings or in the use of Hebrew as the language of prayer, or in the use of music. The format of the worship service and therefore the ritual that the rabbis use may vary even among congregations belonging to the same wing of Judaism.

Rabbis also may write for religious and lay publications, and teach in theological seminaries, colleges, and universities.

Places of Employment

About 6,000 rabbis served almost 5.9 million followers of the Jewish faith in this country in 1968. Most are Orthodox rabbis; the rest are about equally divided between the Conservative and Reform wings of Judaism. Most rabbis act as spiritual leaders of individual congregations; some serve as chaplains in the Armed Forces, in hospitals, and in other institutions. Others are administrators or teachers in Jewish seminaries, communal schools, and other educational institutions or are employed in religious education work for organizations such

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as the Hillel Foundation. Still others are employed by Jewish social welfare agencies.

Although rabbis serve Jewish communities throughout the Nation, they are concentrated in those States that have large Jewish populations, particularly New York, California, Pennsylvania, New Jersey, Illinois, Massachusetts, Maryland, and the Washington, D.C. metropolitan area.

Training and Other Qualifications

To become eligible for ordination as a rabbi, a student must complete the prescribed course of study for the rabbinate.

Entrance requirements and the curriculum depend upon the branch of Judaism with which the seminary is associated. The Hebrew Union College—Jewish Institute of Religion is the only seminary that trains rabbis for the Reform wing of Judaism. The Jewish Theological Seminary of America is the only seminary that trains rabbis for the Conservative wing of Judaism. Both seminaries require the completion of a 4-year college course, as well as prior preparation in Jewish studies, for admission to the rabbinic program leading to ordination. Although 5 years normally are required to complete the rabbinic course at the Reform seminary, exceptionally well-prepared students can shorten this period of study to a minimum of 3 years. The course at the Conservative seminary can be completed in 4 years by student having a strong background in Jewish studies; for others, the course may take as long as 6 years.

About 15 seminaries train Orthodox rabbis. These schools have programs of various lengths leading to ordination. Two of the larger Orthodox seminaries require the completion of a 4-year college course for ordination. However, students who are not college graduates may spend a longer period at these seminaries and complete the requirements for the bachelor's degree while pursuing the rabbinic course. The other Orthodox seminaries do not require a college degree to qualify for ordination, although students who qualify usually have completed 4 years of college.

In general, the curriculums of Jewish theological seminaries provide students with a comprehensive knowledge of the Bible, Talmud, Rabbinic literature, Jewish history, theology, and courses in education, pastoral psychology, and public speaking. The Reform seminary places less emphasis on the study of Talmud and Rabbinic literature and offers a broad course of study that includes subjects such as human relations and community organization.

Some seminaries grant advanced academic degrees in fields such as Biblical and Talmudic research. All Jewish theological seminaries make scholarships and loans available to students.

Newly ordained rabbis usually begin as leaders of small congregations, assistants to experienced rabbis, directors of Hillel Foundations, teachers in seminaries and other educational institutions, or chaplains in the Armed Forces. As a rule, the pulpits of large and well-established Jewish congregations are filled by experienced rabbis.

The choice of a career as a rabbi, should be made on the basis of a fervent belief in the religious teachings and practices of Judaism, and a desire to serve the religious needs of others. In addition to having high moral and ethical values, the prospective rabbi should have good judgment and be able to write and speak effectively.

Outlook

In 1968, the number of rabbis in this country was inadequate to meet the expanding needs of Jewish congregations and other organizations desiring their services. This situation is likely to persist through the 1970's. Continued growth in Jewish religious affiliation and in the number of synagogues and temples, particularly in the suburbs of cities having large Jewish communiities, together with increasing demands of large congregations for assistant rabbis, are expected to create many new openings. Demand for rabbis to work with social welfare and other organizations connected with the Jewish faith also is expected to increase. Although an increase in the number of students graduating from the Jewish theological seminaries is anticipated, the number of new rabbis probably will not be adequate to fill new openings and to replace the rabbis who retire or die, or leave the rabbinate for other reasons. Immigration, once an important source of rabbis, is no longer significant. In fact, graduates of American seminaries now are in demand for Jewish congregations in other countries.

Sources of Additional Information

Young people who are interested in entering the rabbinate should seek the guidance of a rabbi. Information on the work of a rabbi and allied occupations also is available from many of the local Boards of Rabbis in large communities. Information on admission requirements of Jewish theological seminaries may be obtained directly from each seminary.

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ROMAN CATHOLIC PRIESTS

(D.O.T. 120.108)

Nature of the Work

Roman Catholic priests attend to the spiritual, moral, and educational needs of the members of their church. Their duties include offering the Sacrifice of the Mass; giving religious instructions in the form of a sermon; hearing confessions; administering the Sacraments, including the sacrament of marriage; visiting and comforting the sick; conducting funeral services and consoling relatives and friends; counseling those in need of guidance; and assisting the poor.

Priests spend long hours performing services for the church and the community. Their day usually begins with morning meditation and Mass and may end with the hearing of confessions or an evening visit to a hospital or a home. Many of them serve on church committees or in civic organizations and assist in community projects. Various societies that carry on charitable and social programs also depend upon priests for direction.

Although all priests have the same powers acquired through ordination by a bishop, they are classified in two main categories —diocesan and religious—by reason of their way of life, the type of work to which they are assigned, and the church authority to whom they are immediately subject. Diocesan priests (sometimes called secular priests) generally work as individuals in the parishes to which they are assigned by the bishop of their diocese. Religious priests generally work as members of a religious community in specialized activities, such as teaching or missionary work, assigned to them by the superiors of the religious order to which they belong; for example, Jesuits, Dominicans or Franciscans.

Both religious and diocesan priests hold teaching and administrative posts in Catholic seminaries, universities and colleges, and high schools. Priests attached to religious orders staff a large proportion of the institutions of higher education and many high schools, whereas, diocesan priests are concerned with the parochial schools attached to parish churches and with diocesan high schools. The members of religious orders do most of the missionary work conducted by the Catholic Church in this country and abroad.

Places of Employment

More than 62,000 priests served about 48 million Catholics in the United States in 1968. There are priests in nearly every city and town and in many rural communities; however, the majority are in metropolitan areas, where most Catholics reside. Catholics are concentrated in the Northeast and the Great Lakes regions, with smaller concentrations in California, Texas, and Louisiana. A large number of priests are located in communities near Catholic educational and other institutions. Others travel constantly on missions to local parishes throughout the country. Some priests serve as chaplains with the Armed Forces or in hospitals or other institutions. Many are stationed throughout the world as missionaries.

Training and Other Qualifications

Preparation for the priesthood requires 8 years or more of study beyond high school graduation. More than 450 special schools, called seminaries, offer education to young men who wish to become priests. Study for the priesthood may begin in the first year of high school, at the college level, or in theological seminaries after college graduation.

High school seminaries provide a college preparatory program that emphasizes English grammar, speech, literature, and social studies. Two years of Latin are required and the study of a modern language is encouraged. The seminary college offers a liberal arts program, stressing philosophy and religion; the study of man through the behavioral sciences and history; and the natural sciences and mathematics. In many college seminaries, a student may concentrate in any of these fields.

The course of study in theological seminaries, which provide the remaining four years of preparation required for the priesthood, includes sacred scripture; apologetics; dogmatic, moral, and pastoral theology; homiletics; church history; liturgy; and canon law. Diocesan and religious priests attend different major seminaries, where slight variations in the training reflect the differences in the type of work expected of them as priests. During the later years of his seminary course, the candidate receives from his bishop a succession of orders culminating in his ordination to the priesthood.

Most postgraduate work in theology is given either at Catholic University of America, Washington, D.C. or at the eccelestical universities in Rome. Many priests also do graduate work at other universities in fields unrelated to theology. Priests are commanded by the law of the Catholic Church to continue their studies, at least informally,

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after ordination.

Young men are never denied entry into seminaries because of lack of funds. In seminaries for secular priests, the bishop may make arrangements for student loans. Those in religious seminaries often are financed by contributions of benefactors.

Among the qualities considered most desirable in candidates for the Catholic priesthood are a love of and concern for people, a deep religious conviction, a desire to spread the Gospel of Christ, at least average intellectual ability, capacity to speak and write correctly, and more than average skill in working with people. Candidates for the priesthood must understand that priests are not permitted to marry and are dedicated to a life of chastity.

The first assignment of a newly ordained secular priest is usually that of assistant pastor or curate. Newly ordained priests of religious orders are assigned to the specialized duties for which they are trained. Many opportunities for greater responsibility exist within the hierarchy of the church. Diocesan priests, for example, may rise to positions such as monsignor or bishop. Much of their time at this level is given to administration duties. In the religious orders which specialize in teaching, priests may become heads of departments or assume other positions which include administrative duties.

Outlook

A growing number of priests will be needed in the years ahead to provide for the spiritual, educational, and social needs of the growing number of Catholics in the Nation. Although the number of seminarians has increased steadily in recent years, the number of ordained priests is insufficient to fill the needs of newly established parishes and expanding colleges and other Catholic institutions, and to replace priests who retire or die. Although priests usually continue to work longer than persons in other professions, the varied demands and long hours create a need for young priests to assist the older ones. Also, an increasing number of priests have been serving in many diverse areas—for example, in religious radio, newspaper, and television work, labor-management mediation; and in foreign posts, particularly in countries that have a shortage of priests. Continued expansion of these activities, in addition to the expected further growth of the Catholic population, will require a steady increase in the number of priests through the 1970's.

Sources of Additional Information

Young men interested in entering the priesthood should seek the guidance and counsel of their parish priest. Additional information regarding different religious orders and the secular priesthood, as well as a list of the various seminaries which prepare students for the priesthood, may be obtained from Diocesan Directors of Vocations or from the diocesan chancery office.

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CONSERVATION OCCUPATIONS

Forests, rangelands, wildlife, and water are part of our country's great wealth of natural resources. Conservationists protect, develop, and manage natural resources to assure that they are not needlessly exhausted, destroyed, or damaged, and that future needs for these resources will be met.

Specialized training is generally required to work in conservation occupations. Many positions can be filled only by those having at least a bachelor's degree. For other positions, the desired training may be obtained on the job.

This chapter includes descriptions of three conservation occupations—forester, forestry aid, and range manager. Soil conservationist, a related occupation, is discussed elsewhere is this *Handbook.*

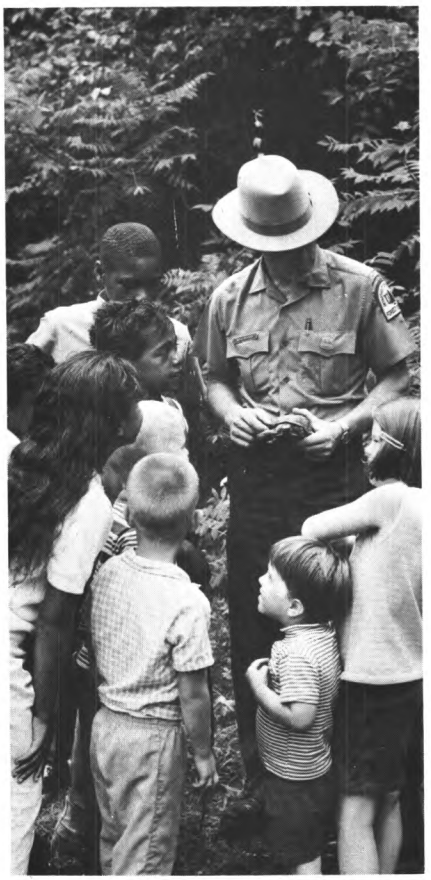
FORESTERS

(D.O.T. 040.081)

Nature of the Work

Forests are one of America's greatest natural resources. They cover more than one-third of the land area of the country. Foresters manage, develop, and protect these valuable lands and their resources—timber, water, wildlife, forage, and recreation areas. They estimate the amount and value of these resources. They plan and supervise the harvesting and cutting of trees, purchase and sale of trees and timber, the processing, utilization and marketing of forest products, and reforestation activities (renewing the forest cover by seeding or planting). Foresters also safeguard forests from fire, destructive animals and insects, and diseases. Other responsibilities of foresters include wildlife protection and watershed management, and the management of camps, parks, and grazing land.

Foresters usually specialize in one area of work, such as timber management, fire control, forest economics, outdoor recreation, watershed management, wildlife management, or range management. Some of these specialized activities are becoming recognized as distinct professions. The profession of range managers, for example, is discussed in a separate statement in this chapter. Foresters also may engage in research activities, extension work (providing forestry information to farmers, logging companies, and the public), forest marketing, and college and university teaching.



Forester explains local wildlife to children.

Places of Employment

An estimated 25,000 persons were employed as foresters in the United States in 1968. About one-third were employed in private industry, mainly by pulp and paper, lumber, logging, and milling companies. Slightly less than one-third were employed by the Federal Government, mainly in the Forest Service of the Department of Agriculture. Other Federal agencies employing significant numbers of foresters were the Departments of the Interior and Defense. Most of the remainder were employed by State and local governments, colleges and universities, and consulting firms. Others were managers of their own lands or were in business for themselves as consultants.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in forestry is the minimum educational requirement for young persons seeking professional careers in forestry. An advanced degree is generally required for teaching and research positions.

Education in forestry leading to a bachelor's or higher degree was offered in 1968 by 48 colleges and universities of which 32 are accredited by the Society of American Foresters. The curriculums in most of these schools include specialized forestry courses in five essential areas: (1) Silviculture (methods of growing and improving forest crops); (2) forest protection (primarily against

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fire, insects, and disease); (3) forest management (the application of business methods and technical forestry principles to the operation of a forest property); (4) forest economics (study of the factors affecting the supply of and the demand for forest products); and (5) forest utilization (the harvesting, processing, and marketing of the forest crop and other forest resources). The curriculums also include related courses in the management of recreational lands, watershed management, and wildlife management, as well as courses in mathematics, science, engineering, economics, and the humanities. Most colleges require that students spend one summer in a field camp operated by the college. Forestry students also are encouraged to work other summers in jobs that will give them firsthand experience in forest or conservation work.

Beginning positions for forestry graduates often involve work in a broad range of relatively routine forestry activities under the supervision of experienced foresters. As they gain experience, foresters may advance to increasingly responsible positions in management of forest lands or related research activities.

Qualifications for success in forestry include an enthusiasm for outdoor work and the ability to meet and deal effectively with people. Many jobs also require physical stamina and a willingness to work in remote areas.

Employment Outlook

Employment opportunities for forestry graduates are expected to be favorable through the 1970's. Among the major factors underlying this anticipated demand are the country's growing population and rising living standards, which will tend to increase the demand for forest products and the use of forests for recreation areas. Forestry and related employment also may be favorably influenced by the growing awareness of the need to conserve and replenish our forest resources.

Private owners of timberland are expected to employ increasing numbers of foresters to realize the higher profitability of improved forestry and logging practices. The forest products industries also will require additional foresters to apply new techniques for utilizing the entire forest crop, to develop methods of growing superior stands of trees over a shorter period of time, and to do research in genetics and fertilization. In addition, competition from metal, plastics, and other materials is expected to stimulate further research to develop new and improved wood products.

The Federal Government is likely to offer increasing employment opportunities for foresters in the years ahead, mainly in the Forest Service of the Department of Agriculture. Among the factors expected to contribute to this expansion are the demands for the use of national forest resources, the trend toward more scientific management of these lands, and expanding research and conservation programs in areas such as outdoor recreation, watershed management, wildlife protection, and range management.

State government agencies also should offer additional employment opportunities for foresters. Forest fire control, protection against insects and diseases, provision of technical assistance to owners of private forest lands, and other Federal-State cooperative programs usually are channeled through State forestry organizations. Growing demands for recreation facilities in forest lands are likely to result in expansion of State parks and other recreational areas.

College teaching and research in areas such as forest genetics, forest disease and insect control, harvesting and reforestration methods, forest products utilization, and fire behavior and control are other avenues of favorable employment opportunity for foresters, but primarily for those having graduate degrees.

In addition to new positions created by the rising demand for foresters, a few hundred openings will arise each year due to retirements, deaths, and transfers out of the profession.

Opportunities for women in outdoor forestry is somewhat limited, largely because of the strenuous physical requirements of much of the work. The few women presently employed in forestry are engaged chiefly in research, administration, and educational work; future opportunities for women also are likely to be primarily in these fields.

Earnings and Working Conditions

In the Federal Government in late 1968, beginning foresters having a bachelor's degree could start at either $5,732 or $6,981 a year, depending on their academic record. Those having 1 or 2 years of graduate work could begin at $6,981 or 8,462; those having the Ph. D. degree, at $10,203 or $12,174. District rangers employed by the Federal Government in 1968 generally earned between $8,462 and $12,174 a year. Foresters in top level positions earned considerably more.

Beginning salaries of foresters employed by State governments vary widely; but, with a few exceptions, they tend to be lower than Federal salaries. Entrance salaries in private industry, according to limited data, are fairly

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comparable to Federal salary levels.

The salaries of forestry teachers are generally the same as those paid other faculty members. (See statement on College and University Teachers.) Foresters in educational institutions sometimes supplement their regular salaries with income from part-time consulting and lecturing and the writing of books and articles.

As part of his regular duties, the forester—particularly in beginning positions—spends considerable time outdoors under all kinds of weather condition. Many foresters work extra hours on emergency duty, such as firefighting.

Sources of Additional Information

General information about the profession of forestry, lists of reading material, as well as lists of schools offering training in forestry is available from:

Society of American Foresters, 1010 16th St. NW., Washington, D.C. 20036

General information also is available from:

American Forest Institute, 1835 K St. NW., Washington, D.C. 20006

A booklet entitled "So You Want to be a Forester" may be obtained from:

American Forestry Association, 919 17th St. NW., Washington, D.C. 20006

Information on forestry careers in the Forest Service is available from:

U.S. Department of Agriculture, Forest Service, Washington, D.C. 20250

RANGE MANAGERS

(D.O.T. 040.081)

Nature of the Work

Rangelands cover more than 1 billion acres in the United States, mostly in the Southern and Western States, including Alaska. Range managers, also called *range conservationists* or *range scientists*, are responsible for the management, development, and protection of these rangelands and their resources. They establish systems and plans for grazing that will yield a high production of livestock while preserving conditions of soil and vegetation necessary to meet other land-use requirements—wildlife grazing, recreation, growing timber, and watersheds. Range managers evaluate forage resources; decide on the number and appropriate type of livestock to be grazed and the best season for grazing; restore deteriorated rangelands

Range manager checks grass growing in "bird cage" as part of test on open range.

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through seeding or plant control; and determine other range conservation and development needs. Range fire protection, pest control, and grazing trespass control also are important activities of this occupation. In addition, multiple use of rangelands often extends the manager's work into such closely related fields as wildlife and watershed management, land classification, forest management, and recreation.

The range manager's activities may include research in range maintenance and improvement, report writing, teaching, providing technical assistance to holders of privately owned grazing lands, or performing technical assignments in foreign countries.

Places of Employment

In 1968, an estimated 4,000 professional range managers were employed in the United States. The majority were employed by Federal Government agencies, primarily in the Forest Service and the Soil Conservation Service of the Department of Agriculture and in the Bureau of Land Management of the Department of the Interior. State governments also employed significant numbers of range managers.

In private industry, range managers are employed by privately owned range livestock ranches. Some are in business for themselves as managers of their own land. Some are self-employed consultants or are employed by consulting firms. Others are employed by manufacturing, sales, and service enterprises, and by banks and real estate firms which need rangeland appraisals. Colleges and universities also employ range managers in teaching and research positions.

Training, Other Qualifications, and Advancement

The bachelor's degree with a major in range management or range conservation is the usual requirement for persons seeking employment as range managers in the Federal Government. A bachelor's degree in a closely related subject-matter field, such as agronomy, forestry, or soil conservation, including courses in range management and range conservation, also is accepted as adequate preparation. Graduate degrees are generally required for teaching and research work.

Training leading to a bachelor's degree with a major in range management was offered in 1968 by 25 colleges and universities, mainly in Western and Southwestern States. Twenty-three of these schools also grant the master's degree, and 15 award the doctorate.

The essential courses for a degree in range management are botany, plant ecology, and plant physiology; zoology; animal husbandry; soils; chemistry; mathematics; and specialized courses in range management, such as identification and characteristics of range plants, range improvement, and range sampling and inventory techniques. Desirable elective courses include economics, statistical methods, physics, geology, watershed management, wildlife management, surveying, and forage crops.

Federal Government agencies —primarily the Forest Service, the Bureau of Land Management and the Soil Conservation Service—hire many college juniors and seniors for summer jobs in range management. This experience helps students qualify for permanent positions as range managers when they complete college.

Because most range managers must meet and deal with other people, individually or in groups, they should be able to communicate their ideas effectively, both in writing and speaking. Many jobs require the stamina to perform vigorous physical activity and a willingness to work in arid and sparsely populated areas.

Employment Outlook

Employment opportunities for graduates having degrees in range management are expected to be good through the 1970's. The demand will be especially good for well-qualified persons having advanced degrees to fill research and teaching positions.

Opportunities will probably be best in Federal agencies. Favorable opportunities also are expected in private industry, since range livestock producers and private timber operators are hiring increasing numbers of range managers to improve their range holdings. A few openings are expected in developing countries of the Middle East, Africa, and South America where range managers are needed to give technical assistance.

Among the major factors underlying the anticipated growth in demand for range managers are population growth, increasing per capita consumption of animal products, and the growing use of rangelands for hunting and other recreational activities. Many openings are expected because of more intensive management of range resources due to increasing emphasis on multiple uses of rangelands. Range managers also

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will be needed to help rehabilitate deteriorated rangelands, improve semiarid lands, and deal with watershed problems.

Opportunities for women in this profession are limited because of the rigorous work generally required and the remote locations of employment. However, a few women, usually with training in botany, work on classification and identification of range plants.

Earnings and Working Conditions

Starting salaries for range managers having the bachelor's degree in the Federal Government in late 1968 were either $5,732 or $6,981 a year, depending upon their college record. Beginning salaries for those having 1 or 2 years of graduate work were $6,981 or $8,462; and for those having the Ph. D., $10,203 or $12,174.

Starting salaries for range managers employed by State governments and private industry in 1968 were about the same as those paid by the Federal Government. In colleges and universities, starting salaries were generally the same as those paid other faculty members. (See statement on College and University Teachers.) Range managers in educational institutions sometimes augment their regular salaries with income from part-time consulting and lecturing and from writing books and articles.

Range managers may spend considerable time away from home working outdoors in remote parts of the range.

Sources of Additional Information

For general information about a career as a range manager as well as a list of schools offering training in the field, write to:

American Society of Range Management, 2120 South Birch Street, Denver, Colo. 80222.

Information about career opportunities in the Federal Government may be obtained from:

Bureau of Land Management, Denver Service Center, Federal Center Building 50, Denver, Colorado 80225.

or

Portland Service Center, 710 N. E. Holladay Street, Portland, Oregon 97208.

Forest Service, U. S. Department of Agriculture, 1621 North Kent Street, Arlington, Virginia 20415.

Soil Conservation Service, U. S. Department of Agriculture, Washington, D. C. 20250.

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COUNSELING

The primary objectives of professional counseling are to help persons understand themselves and their opportunities better so that they can make and carry out decisions and plans that hold potential for a more satisfying and productive life. Whatever the area of counseling—personal, educational, or vocational—counselors need a concern for individuals combined with a capacity for objectivity; and a belief in the worthwhileness and uniqueness of each individual, in his right to make and accept responsibility for his own decisions, and in his potential for development.

This chapter deals in detail with three generally recognized specialties in the field: School counseling, rehabilitation counseling, and employment counseling.

School Counselors are the largest counseling group. They are concerned with the personal and social development of pupils and the planning and achievement of their educational and vocational goals.

Rehabilitation Counselors work with persons who are physically, mentally, or socially handicapped. Their counseling is vocationally oriented but involves personal counseling as well.

Employment Counselors are concerned primarily with career planning and job adjustment. They may work with the young, the old, the able-bodied, and the disabled.

Some people who are identified with other professional occupations also provide counseling services. The occupation most closely related to counselor is counseling psychologist. Many social workers also provide counseling services. These two occupations, as well as others in which workers do some counseling but whose primary work is in teaching, health, law, religion, or other fields, are described elsewhere in the *Handbook*. For information on counseling services provided by college and university staff members and by personnel workers in government and industry, see the statements on College Placement Officers and Personnel Workers.

EMPLOYMENT COUNSELORS

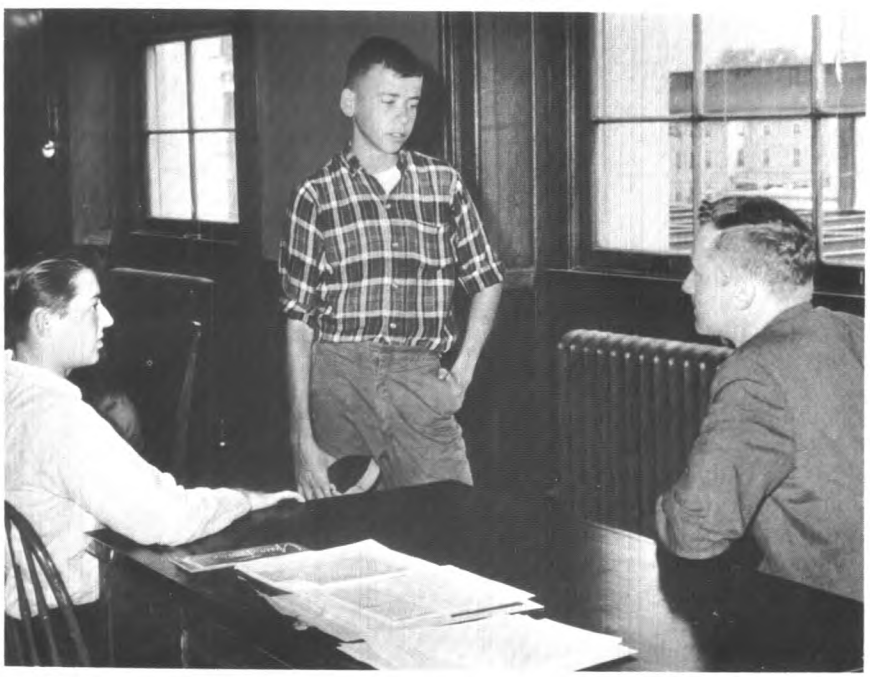
(D.O.T. 045.108)

Nature of the Work

Employment counselors (sometimes called vocational counselors) help people to develop a career goal that will fulfill the individual's potential and bring personal satisfaction. They assist clients by planning with them on how to prepare for, enter, and progress in their careers.

The extent of the counseling assistance available, however, differs among agencies.

Counselors interview the person seeking counsel to obtain vocationally significant information related to his personal traits, interests, training, work experience, and work attitudes. They may assist the individual in filling out questionnaires concerning his personal history and background. Additional data on the person's general intelligence, aptitudes and abilities, physical capacities, knowledge, skills, interests, and values also are obtained from tests and personal inventories which may be administered or recorded by the counselor or a specialist in testing. Further information may be assembled by the counselor or by the client from sources such as former employers, schools, and health or other agencies.



Counselor interviews students for vocational program.

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In subsequent interviews, counselors assist the applicant in evaluating and understanding his own work potential and provide him the information he needs in making plans appropriate to his talents and interests. Job requirements and employment opportunities or training programs are discussed. An employment plan is developed jointly by the counselor and his client, and a training or work program may be developed. In some agencies, a vocational plan may be worked out in a staff conference—which may be attended by supervisors, the psychologist, the testing specialist, and a job market or occupational analyst.

In many cases, the employment counselor will refer the client to another agency for physical rehabilitation or for psychological or other services before, or concurrent with counseling. The employment counselor must be familiar with the services available in the community and be able to recognize what services might be beneficial to a particular client.

Counselor may help the client by suggesting feasible employment sources and appropriate ways of applying for work. In instances where the client needs further support and assistance, the counselors may contact employers, although clients seeking employment usually are sent to placement interviewers following counseling. After job placement or entrance into training, counselors may follow up to determine if additional assistance is needed. The expanding responsibility of public employment counselors for improving the employability of disadvantaged persons has increased their contacts with these persons during training and on the job. It also has led to group counseling and the stationing of counselors in neighborhood and community centers.

Places of Employment

In early 1968, the largest number of employment counselors—about 4,400 full time and more than 900 part time—worked in State employment service offices, located in every large city and in many smaller towns. The next largest number—probably about 2,000—worked for various private or community agencies, primarily in the larger cities. In addition, some worked in institutions such as prisons, training schools for delinquent youths, and mental hospitals. The Federal Government employed a limited number of vocational counselors, chiefly in the Bureau of Indian Affairs and the Veterans Administration. Some people trained in employment or vocational counseling are engaged in research or graduate teaching. About half of all employment counselors are women.

Training, Other Qualifications, and Advancement

The generally accepted minimum educational requirement for employment counselors in State employment service offices is a bachelor's degree, preferably with a major in one of the social sciences, plus 15 semester hours in counseling and related courses. An increasing number of States are adopting a three-level counselor classification system which includes a *counselor intern* or trainee, requiring a bachelor's degree with 15 hours of undergraduate or graduate work in counseling related courses; a *counselor*, requiring a master's degree or 30 graduate hours in counseling related courses; and a *master counselor*, requiring a master's degree and 3 years of experience, 1 of which should be in employment service counseling.

Minimum entrance requirements are not standardized among private and community agencies, but most of them prefer, and many require, a master's degree in vocational counseling or in a related field such as psychology, personnel administration, education, or public administration. Most private agencies prefer to have at least one staff member who has a doctorate in counseling psychology or a related field. For those lacking an advanced degree, employers usually emphasize experience in closely related work such as rehabilitation counseling, employment interviewing, school or college counseling, or teaching.

The public employment service offices in each State provide in-service training programs for their new counselors or trainees. Their experienced counselors frequently are given additional training at colleges and universities, often leading to a master's degree in counseling and guidance. Private and community agencies also often provide in-service training opportunities.

The professional educational curriculum for employment counselors generally includes, at the undergraduate level, a basic foundation in psychology with some emphasis on sociology. At the graduate level, requirements usually include courses in techniques of appraisal and counseling for vocational adjustment, group guidance methods, placement, counseling followup techniques, psychological tests in vocational counseling, educational psychology, psychology of occupations, industrial psychology, job analysis and theories of occupational choice, administration of guidance services, and some course work in research methods and statistics.

Counselor education programs at the graduate level are available

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in about 370 colleges and universities, most frequently in the departments of education or psychology. To obtain a master's degree, students must complete 1 to 2 years of graduate study. All States require counselors in their public employment offices to meet State civil service or merit system requirements that include certain minimum educational and experience standards. They also require a written or oral examination, or both.

Counselors who are well qualified may advance, after considerable experience, to supervisory or administrative positions in their own or other organizations; some may become directors of agencies or of other counseling services, or area supervisors of guidance programs; some may become consultants; and others, may become professors in the counseling field.

Employment Outlook

Employment counselors who have a master's degree, and those who have recognized related experience in the field, will have excellent employment opportunities in both public and private agencies through the 1970's. In addition, college graduates having a bachelor's degree and 15 hours of undergraduate or graduate work in counseling related courses and who are interested in becoming counselor trainees will find many opportunities in State and local employment service offices.

The employment of counselors in State employment service offices is expected to increase very rapidly through the 1970's. Among the factors contributing to the increasing demand for counseling services in these offices are four major Federal laws: the Vocational Education Act, as amended, which provides for vocational guidance and counseling for people who are out of school and seeking employment; the Manpower Development and Training Act, as amended, which provides for counseling in connection with the occupational training or retraining of large numbers of unemployed workers; the Economic Opportunity Act, as amended, which provides for counseling to implement programs such as Job Corps, Neighborhood Youth Corps, Work Training, Work Experience, and Urban and Rural Community Action; and the Social Security Act, as amended, which established the Work Incentive program. State employment service offices also will employ additional counselors to work with returning veterans, older persons, American Indians, and inmates of correctional institutions. Moreover, population growth, particularly the large number of young workers entering the labor force each year, will be reflected in larger numbers seeking employment counseling.

In addition to the counselors needed to take care of growth in the occupation, many more will be needed each year through the 1970's to replace workers who retire, die, or leave the profession for other reasons.

Earnings and Working Conditions

The annual average salary of employment counselors in State employment service offices in 1968 was about $7,500. Salaries often went as high as $10,000 for highly experienced counselors. Trainees for counseling positions in some voluntary agencies in large cities were being hired at about $6,000 a year; annual salaries reported for experienced counselors ranged up to $15,000 or more in early 1969.

Most counselors work about 40 hours a week and have various benefits, including vacations, sick leave, pension plans, and insurance coverage. Counselors employed in community agencies may work overtime.

Sources of Additional Information

General information on employment or vocational counseling may be obtained from:

National Employment Counselors Association, 1607 New Hampshire Ave., NW., Washington, D.C. 20009.

National Vocational Guidance Association, Inc., 1607 New Hampshire Ave., NW., Washington, D.C. 20009.

United States Department of Labor, Manpower Administration, U.S. Training and Employment Service, Branch of Counseling and Testing Services, Washington, D.C. 20210.

Information on entrance requirements for positions in the public employment service offices may be obtained from the State civil service or merit system office in each State capital, or from local employment offices.

A list of private agencies offering employment counseling services that meet professional criteria set forth by the American Board on Counseling Services, Inc., is provided in the *Directory of Approved Counseling Agencies, 1967—68* and *Supplement*, available from the American Personnel and Guidance Association, Inc., 1607 New Hampshire Ave. NW., Washington, D.C. 20009, for $2.50.

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REHABILITATION COUNSELORS

(D.O.T. 045.108)

Nature of the Work

Rehabilitation counselors are primarily concerned with the vocational and personal adjustment of physically, mentally, and socially handicapped persons. The counselor interviews handicapped persons to obtain necessary information about their abilities, interests, and limitations. Information developed in the interviews is used with other medical, psychological, and social data to help the handicapped person evaluate himself in relation to the kind of work that is suitable to his physical and mental capacity, interests, and talents. A plan of rehabilitation then may be worked out jointly by the counselor, the handicapped person, and those providing medical treatment, occupational training, and other special services. The counselor holds regular interviews with the disabled person to discuss the program, check on the progress made, and help resolve problems. When the individual is ready for employment, the counselor assists in finding a suitable job and often makes followup visits to be sure that the placement is satisfactory.

Counselor checks on progress of blind trainee.

An increasing number of counselors specialize in a particular area of rehabilitation; for example, some work almost exclusively with the blind, some with alcoholics, and others with the mentally ill or retarded. Additional specialties are expected to develop as services for other types of difficulties are included in rehabilitation programs.

The time spent in the direct counseling of each individual varies with the person and the nature of his disability, as well as with the counselor's workload. Some rehabilitation counselors are responsible for many persons in various stages of rehabilitation; on the other hand, less experienced or specialized counselors working with the severely handicapped may handle relatively few cases at a time. In addition to working with the handicapped person, the counselor also must maintain close contact with other professional people working with handicapped persons, members of their families, other agencies and civic groups, and private employers who hire the handicapped. The counselor often is responsible for related activities, such as employer education and community publicity for the rehabilitation program.

Places of Employment

About 12,000 rehabilitation counselors were employed in 1968; more than 9,000 were full-time counselors. About three-fourths of all rehabilitation counselors were employed in State and local rehabilitation agencies financed cooperatively with Federal and State funds. The remainder were employed by hospitals, labor unions, insurance companies, special schools, rehabilitation centers, sheltered workshops, and other public and private agen-

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cies that conducted rehabilitation programs and provided job placement services for the disabled. In addition, nearly 350 counseling psychologists in the Veterans Administration provided rehabilitation counseling.

An estimated 20 percent of all rehabilitation counselors are women.

Training, Other Qualifications, and Advancement

A basic educational requirement for entry into this occupation is graduation from a college or university with course credits in counseling, psychology, and related fields. At present, however, uniform requirements have not been established. Most employers prefer to hire people having a master's degree in vocational or rehabilitation counseling or in a related discipline such as psychology, education, or social work; a few require a doctorate in counseling psychology. Employers are placing increasing emphasis on the master's degree as the minimum educational standard for the profession. Work experience in related fields, such as vocational counseling and placement, social work, psychology, education, and other types of counseling, also is given considerable weight by some employers, especially when considering applicants who have only the bachelor's degree. Some agencies assist employees having bachelor's degrees to attain graduate degrees through work-study programs.

Two years usually are required to complete the master's degree in the fields of study preferred for rehabilitation counseling. The curriculum for the master's degree may include a basic foundation in psychology and courses in medical aspects of rehabilitation, cultural and psycho-social aspects of disability, survey of therapeutic care and rehabilitation, legislative aspects of rehabilitation, counseling theories and techniques, occupational and educational information, community resources, placement and follow-up, and tests and measurements.

To earn the doctorate in rehabilitation counseling or in counseling psychology may require a total of 4 to 6 years of graduate study. Intensive training in psychology, other social sciences, and the biological sciences, as well as research methodology, is required for the doctorate.

In the 1968-69 school year, 69 colleges and universities offered financial assistance to a limited number of graduate students specializing in rehabilitation counseling through training grants provided by the U.S. Department of Health, Education, and Welfare, Rehabilitation Services Administration. In these graduate programs, an internship (supervised work in a rehabilitation setting) is required.

In approximately three-fourths of the State Rehabilitation Agencies, applicants are required to comply with State civil service and merit system rules. In most cases these regulations require applicants to pass a written competitive examination, which sometimes is supplemented by an individual interview and evaluation by a board of examiners. A few States require counselors to be residents of the State in which they work.

Counselors having limited experience usually are assigned the least difficult cases; experienced and highly trained counselors are assigned persons having extreme or multiple disabilities that represent difficult rehabilitation problems. After obtaining considerable experience, rehabilitation counselors may be advanced to supervisory positions or to top administrative jobs.

Among the personal qualifications needed for success in this field are an understanding of human behavior, patience, and a capacity for working with people in solving their problems.

Employment Outlook

The outlook for well-qualified rehabilitation counselors is expected to remain excellent through the 1970's. Persons who have graduate work in rehabilitation counseling or in related fields will have the best opportunities for employment. Opportunities also will be available for persons with a bachelor's degree and related work experience.

The supply of qualified rehabilitation counselors was inadequate to meet the counseling needs of the mentally and physically handicapped in 1968. The Rehabilitation Services Administration estimates that at least 3,000 new counselors will be needed annually through the 1970's to staff new and expanding programs and to replace counselors who leave the profession. This annual demand exceeds considerably the number presently being trained at graduate levels and entering the field. Over the next few years, the supply of rehabilitation counselors may be augmented to some extent by people from related fields, such as psychology, social work, and education.

Among the factors contributing substantially to the long-run demand for the services of rehabilitation counselors will be population growth, with related increases in the number of handicapped to be served; the extension of vocational rehabilitation to greater numbers of more severely disabled persons; increas-

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ing support for social welfare in general; and the growing awareness that expenditures for rehabilitation often are returned as savings on the appropriations for custodial care or health and social welfare programs.

Earnings and Working Conditions

According to the U.S. Department of Health, Education, and Welfare the beginning salaries of rehabilitation counselors employed in State agencies generally ranged from $6,000 to $8,500 a year in mid-1968. Counselors having a doctorate in psychology working with the disabled in the Veterans Administration were hired in late 1968 at annual salaries ranging generally from $12,243 to $14,889, depending on the applicant's experience and other qualifications.

Counselors may spend only part of their time counseling in their offices, and the remainder in the field working with prospective employers, training agencies, and the disabled person's family. The ability to drive a car often is necessary for field work.

Rehabilitation counselors generally work a 40-hour week or less with little overtime work required; however, they often attend community and civic meetings in the evenings. They usually are covered by sick and annual leave benefits, and pension and health plans.

Sources of Additional Information

Additional information on rehabilitation counseling as a career may be obtained from:

American Psychological Association, Inc., 1200 17th St. NW., Washington, D.C. 20036.

American Rehabilitation Counseling Association, 1607 New Hampshire Ave. NW., Washington, D.C. 20009.

National Rehabilitation Counseling Association, 1522 K St. NW., Washington, D.C. 20005.

A list of colleges and universities that have received grants to provide rehabilitation traineeships on a graduate level is available from:

U.S. Department of Health, Education, and Welfare, Rehabilitation Services Administration, Washington, D.C. 20201.

SCHOOL COUNSELORS

(D.O.T. 045.108)

Nature of the Work

School counselors are concerned with the educational, vocational, and social development of students. In carrying out their responsibilities, counselors work with students individually and in groups, with their teachers and other school personnel, their parents, and with community agencies.

Counselors in secondary schools obtain information relevant to

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educational and vocational planning from student interviews, school and other records, and tests that assist in estimating a student's chances of success in a given course of study or occupation. The counselor may supervise or administer the tests. The counselor helps the student analyze and interpret the data and develops with him, and sometimes with his parents, a course of study and an educational plan fitting his abilities, interests, and vocational oportunities.

In their work, counselors may provide occupational information, including description of the work, training requirements, earnings, and outlook. They maintain files or libraries of occupational literature for students and parents to use. They also arrange trips to factories and business firms and show vocational films. Many counselors conduct "career day" programs. School counselors also provide information about high school academic and vocational education programs and the various opportunities for education and vocational training beyond high school, including 2- and 4-year colleges; trade, technical and business schools; apprenticeship programs, and programs under the Manpower Development and Training Act of 1962.

Counselors in secondary schools also may help students find part-time work while in school to enable them to stay in school or as part of their vocational preparation. They also may assist students in locating fulltime employment after leaving school or may refer them to community employment services. Some counselors conduct followup studies of recent graduates and dropouts, participate in surveys of local job opportunities, and conduct or cooperate in research concerning the effectiveness of the educational and guidance programs.

Many secondary school counselors help students individually with personal and social problems that are common to adolescence. Counselors also lead discussion groups on topics related to student interests and problems.

Elementary school counselors assist children to make maximum use of their abilities through early identification of their intellectual, emotional, social, and physical characteristics, and diagnosis of learning difficulties. The methods used in counseling elementary school children necessarily differ in many respects from those used with older students. Classroom observation and play activity are among the techniques used on children in the lower grades. Elementary school counselors spend much of their time consulting with teachers and parents. They also work closely with other staff members of the school, including psychologists and social workers.

Some school counselors, particularly in secondary schools, may teach classes in occupational information, social studies, or other subjects in addition to counseling. They also may supervise school clubs or other extracurricular activities, often after regular school hours.

Places of Employment

Approximately 54,000 persons performed some counseling functions in the public secondary schools during the 1968-69 school year. More than 29,000 were full-time counselors. Counseling services in the public elementary schools are being steadily expanded. In 1968-69, about 5,500 persons performed counseling duties at this level. In addition, an increasing number of counselors are being employed in private elementary and secondary schools.

The majority of counselors are in large schools. An increasing number of school districts, however, are providing guidance services to their small schools by assigning more than one school to a counselor.

About one-half of all high school counselors are women.

Training, Other Qualifications, and Advancement

Most States require counselors to have both a counseling and a teaching certificate. (See statement on Elementary and Secondary School Teachers for teaching certificate requirements.) A counseling certificate requires graduate level work and usually from 1 to 5 years of teaching experience. A person planning to counsel should obtain the specific requirements of the State in which he plans to work, since requirements vary considerably among the States and are changing rapidly.

Undergraduate college students interested in becoming school counselors usually enroll in the regular program of teacher education, preferably taking additional courses in psychology and sociology. After graduating from college, they may acquire the teaching or other experience required either before or while studying for their advanced degrees. A few States substitute counseling internship for teaching experience. In some States, teachers who have completed part of the courses required for the master's degree are eligible for provisional certification and may counsel under supervision while taking additional courses. The subject areas of the required graduate level courses usually include individual appraisal, vocational development and informational services, counseling theory, sta-

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tistics and research, group procedures, professional relations and ethics, and program development and management. Supervised field experience or internship is provided in an increasing number of programs. Counselor education programs at the graduate level are available in about 370 colleges and universities, most frequently in the departments of education or psychology. To obtain a master's degree, a student must complete 1 to 2 years of graduate study. School counselors may advance to counselor supervisors or directors of pupil personnel services, or to other administrative positions within the school system.

Employment Outlook

Employment opportunities for well-trained school counselors are expected to be excellent through the 1970's. In 1968, the supply of qualified counselors was inadequate to meet the existing demand, and this imbalance is expected to persist in the years ahead. Job openings for counselors are expected to increase rapidly due to continued strengthening of counseling services and some increase in secondary school enrollments. The average ratio of counselors to students as a whole is still well below generally accepted standards, despite the financial aid which the Federal Government has provided to States for school counseling programs under the National Defense Education Act of 1958, as amended, and other legislation.

In addition to the number of counselors needed to take care of enrollment growth in secondary schools and strengthening of counseling services, many thousands of new counselors also will be required each year to replace those leaving the profession. According to data from the U.S. Office of Education, about 10 percent of all counselors leave the field annually because of family responsibilities, retirement, promotion to administrative jobs, or for other reasons.

Among the factors affecting the employment growth of school counselors is the increasing recognition of counseling as an essential educational service for all pupils—the average, the gifted, the slow, the disadvantaged, and the handicapped. Moreover, recent Federal legislation such as the Elementary and Secondary Education Act amendments of 1966, the National Defense Education amendments of 1966, and the Vocational Education amendments of 1968 has extended support of school counseling services to elementary schools, vocational and technical schools, and junior colleges.

Also contributing to the increased demand for counseling services is the growing public awareness of the value of guidance services in helping students with personal and social problems which, in turn, may help reduce the number of school dropouts. Students also will be seeking advice from school counselors about educational requirements for entry jobs, the job changes caused by automation and other technological advances, college entrance requirements, and places of employment.

Earnings and Working Conditions

According to the U.S. Office of Education, the average annual salary of school counselors was about $8,500 in the 1967-68 school year. Many school counselors had annual earnings higher than those of classroom teachers with comparable educational preparation and experience. (See statements on Kindergarten and Elementary School Teachers and Secondary School Teachers.)

In most school systems, counselors receive regular salary increments as their counseling experience increases, and as they obtain additional education. Some counselors supplement their income by part-time consulting or other work with private or public counseling centers, government agencies, or private industry.

Sources of Additional Information

Information on colleges and universities offering training in guidance and counseling, as well as on the certification requirements of each State, may be obtained from the State department of education at the State capital.

Additional information on this field of work may be obtained from:

American School Counselor Association, 1605 New Hampshire Ave. NW., Washington, D.C. 20009.

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ENGINEERING

Engineers contribute in countless ways to the welfare, technological progress, and defense of the Nation. They develop complex electric power, water supply, and waste disposal systems to meet the problems of urban living. They design industrial machinery and equipment needed to manufacture goods on a mass production basis, and heating, air conditioning, and ventilation equipment for the comfort of man. Also, they develop scientific equipment to help probe the mysteries of outer space and the depths of the ocean, and design and supervise the construction of highways and rapid transit systems for safe and more convenient transportation. In addition, they design and develop consumer products such as automobiles and refrigerators. They also provide the raw materials that make all this possible.

This chapter contains an overall discussion of engineering, followed by separate statements on several branches of the field—aerospace, agricultural, ceramic, chemical, civil, electrical, industrial, mechanical, metallurgical, and mining engineering. Although most engineers specialize in these or other specific branches of the profession, a considerable body of basic knowledge and methodology is common to most areas of engineering. Also, unified curriculums in engineering (without specialty designation) and in engineering science are increasing in popularity. Therefore, young people considering engineering as a career should become familiar with the general nature of engineering as well as with its various branches.

Nature of the Work

Engineers develop methods for converting the raw materials and sources of power found in nature into useful products at a reasonable cost in terms of time and money. They use basic scientific principles to solve the problems involved in designing goods and services and developing methods for their production. The emphasis on the application of scientific principles, rather than on their discovery, is the main factor that distinguishes the work of the engineer from that of the scientist. For example, a physicist may discover that the properties of a gas change when it is converted into a liquid at extremely low temperatures, but it is the engineer who develops uses for the liquid, or economical methods for its production.

In designing or developing a new product, engineers must consider many factors. For example, in designing a space capsule, they must calculate how much heat, radiation, air pressure, and other forces the capsule must withstand during its flight. Experiments must be conducted which relate these factors to various construction materials, as well as to the many possible capsule sizes, shapes, and weights. Equally important are the human needs and limitations of the people who must operate the equipment. In addition, the engineer must take into account the relative cost of the required materials and the cost and time of the fabrication process. Similar factors must be considered by engineers who design and develop a wide variety of products ranging from transistor radios and washing machines to electronic computers and industrial machinery.

Besides design and development, engineers are engaged in many other activities. Many work in inspection, quality control, and other activities related to production in manufacturing industries, mines, and agriculture. Others are in administrative and management positions where knowledge of engineering methods is of great importance. A large number plan and supervise the construction of buildings and highways. Many are employed in sales positions, where they must discuss the technical aspects of a product or assist in planning its installation or use. (See statement on Manufacturers' Salesmen.) Some conduct research aimed at supplying the basic technological data needed for the design and production of new or improved products. Some engineers having considerable experience work as consultants. A relatively small group teach in the engineering schools of colleges and universities.

Most engineers specialize in one of the many branches of the profession. More than 25 engineering specialties are recognized by the profession or in engineering school curriculums. Besides these major branches—10 of which are discussed separately in this chapter—there are many subdivisions of the branches. Structural and highway engineering, for example, are subdivisions of civil engineering. Engineers may also become specialists in the engineering problems of one industry, or in a particular field of technology such as propulsion or guidance systems. Nevertheless, the basic knowledge required for all areas of engineering often makes it possible for engineers to shift from one field of specialization to another, particularly for those beginning their careers.

Engineers within each of the branches may apply their specialized knowledge to engineering problems in many fields. For example, electrical engineers may

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work in the fields of medicine, missile guidance, or electric power distribution. Because engineering problems are usually complex, the work in some applied fields cuts across the traditional branches. Thus, engineers in one field often work closely with specialists in other scientific and engineering occupations.

Places of Employment

Engineering is the second largest professional occupation, exceeded in size only by teaching; for men it is the largest profession. More than 1 million engineers were employed in the United States in 1968.

Manufacturing industries employed more than half of all engineers—about 575,000 in 1968. The manufacturing industries employing the largest numbers of engineers were the electrical equipment, aircraft and parts, machinery, chemicals, ordnance, instruments, primary metals, fabricated metal products and motor vehicles industries. About 300,000 engineers were employed in nonmanufacturing industries in 1968, primarily in the construction, public utilities, engineering and architectural services, and business and management consulting services industries.

Federal, State, and local government agencies employed another large group of engineers—more than 150,000 in 1968. Over half of these were employed by the Federal Government, chiefly by the Department of Defense. Other Federal agencies which employed significant numbers of engineers were the Departments of the Interior and Agriculture, Transportation and the National Aeronautics and Space Administration. Most engineers in State and local government agencies were employed by highway and public works departments.

Educational institutions employed almost 40,000 engineers in 1968, in research as well as in teaching positions. A small number were employed by nonprofit research organizations.

Engineers are employed in every State, in small cities as well as large, and in some rural areas. The profession also offers opportunities for employment overseas. Some branches of engineering are concentrated in particular industries, as indicated in the statements presented later in this chapter.

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Training, Other Qualifications, and Advancement

A bachelor's degree in engineering is the generally accepted educational requirement for entrance into engineering positions. Well-qualified graduates having training in physics, one of the other natural sciences, or in mathematics may qualify for some beginning positions in engineering. Some persons without a degree are able to become engineers after long experience in a related occupation—such as draftsmen or engineering technician—and some college level training.

Advanced training is being emphasized for an increasing number of jobs. Graduate degrees are desirable for beginning teaching and research positions, and are helpful for advancement in most types of work. Furthermore, in some engineering specialties, such as nuclear engineering, training is generally available only at the graduate level.

Education leading to a bachelor's degree in engineering is offered by about 265 colleges, universities, and engineering schools located throughout the country. Although curriculums in the larger branches of engineering are offered in most schools, some of the smaller engineering specialties are taught in relatively few institutions. A student who desires to specialize in one of the smaller branches should, therefore, investigate the curriculums offered by the various schools before selecting his college. For admission to an undergraduate program, engineering schools usually require high school courses in mathematics and the physical sciences and place emphasis on the general quality of the applicant's high school work.

In the typical 4-year engineering curriculum, the first 2 years are spent mainly in studying basic science—mathematics, physics, and chemistry—and the humanities, social sciences, and English. The last 2 years are devoted chiefly to the engineering sciences, and to engineering courses with emphasis on the branch of engineering in which the student is specializing. Some engineering programs offer only general engineering training in the undergraduate curriculum, allowing the student to choose a specialty in graduate school or acquire one through work experience.

Some engineering curriculums require more than 4 years to complete. Approximately 25 institutions have 5-year programs leading to the bachelor's degree. In addition, about 50 engineering schools have arrangements with liberal arts colleges whereby a student spends 3 years in the college and 2 years in the engineering school, receiving a bachelor's degree from each. This type of program usually offers the student an opportunity for greater diversification in his studies.

Some institutions have 5-or 6-year cooperative plans under which students spend alternate periods in engineering school and in employment in industry or government. Under most of these plans, classroom study is coordinated with practical industrial experience. In addition to the practical experience he gains in this type of program, the student is provided an opportunity to finance part of his education.

Engineering graduates usually begin work as trainees or as assistants to experienced engineers. Many large companies have special training programs for their beginning engineers which are designed to acquaint them with specific industrial practices. These programs are valuable in determining the type of work for which the individual is best suited. As they gain experience, engineers may move up to positions of greater responsibility. Those with proven ability are often able to advance to high-level technical and administrative positions, and increasingly large numbers are being promoted to top executive posts.

All 50 States and the District of Columbia have laws providing for the licensing (or registration) of those engineers whose work may affect life, health, or property; or who offer their services to the public. In 1968, about 325,000 engineers were registered under these laws in the United States. Generally, registration requirements include graduation from an accredited engineering curriculum, plus at least 4 years of experience and the passing of a State examination. Examining boards may accept a longer period of experience as a substitute for a college degree.

Employment Outlook

Employment opportunities for engineers are expected to be very good through the 1970's. Engineering has been one of the fastest growing professions in recent years and requirements for engineers are expected to increase very rapidly. However, engineers who are not well grounded in engineering fundamentals and those whose specialization is very narrow could be affected adversely by skill obsolescence caused by shifts in defense activities and by rapidly changing technology. There will probably be an especially strong demand for new engineering graduates who have training in the most recently developed engineering principles and techniques, and for engineers who can apply engineering principles to the medical, biological, and other sciences. New graduates having advanced degrees will have

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excellent opportunities in research and teaching.

Among the factors underlying the anticipated increase in demand for engineers is the growth in population, and the resulting expansion of industry to meet the demand for additional goods and services. The need for engineers probably also will rise as a result of the increasingly larger amount of engineering time required for the development of complex industrial products and processes and the increasing automation of industry.

Another factor which will tend to increase the demand for engineers is the expected continued growth of expenditures for research and development. These expenditures have increased rapidly in past years, and it is likely that they will continue to rise through the 1970's, although somewhat more slowly than in the past. The growth of research activities will result in the expansion of existing fields of work and in the creation of new ones, especially in the fields of automated machinery and computers.

The level of defense expenditures is an important determinant of the demand for engineers because a large proportion (about 30 percent in 1967) of all engineers are engaged in activities related to national defense. The outlook for engineers presented here is based on the assumption that defense activity (as measured by expenditures) will be somewhat higher than the level prior to the Vietnam buildup, approximating the level of the early 1960's. If defense activity should differ substantially from that level, the demand for engineers will be affected accordingly.

In addition to the engineers needed to fill new positions, thousands more will have to be trained to replace those who transfer to other occupations, retire, or die. These losses to the profession are expected to create more than 35,000 job openings annually through the 1970's.

The preceding analysis relates to the outlook for the engineering profession as a whole. The employment outlook in various branches of engineering is discussed in the statements on these branches later in this chapter.

Earnings and Working Conditions

Average starting salary offers for engineering graduates having the bachelor's degree were about $9,200 a year in private industry during the 1967-68 academic year, according to a survey conducted by the College Placement Council. Graduates having the master's degree and no experience received offers averaging almost $11,000 a year, while those having the doctor's degree averaged about $15,000 to start.

Starting salaries for new engineering graduates having the bachelor's degree varied somewhat by branch, as shown in the accompanying tabulation based on the same 1968 survey.

STARTING SALARIES FOR ENGINEERS BY BRANCH, 1968

Branch	*Average*	*Lower decile*[1]	*Upper decile*[2]
Aeronautical Engineering	$9,100	$8,500	$9,700
Chemical Engineering	$9,500	$8,900	$10,000
Civil	$9,000	$8,400	$9,600
Electrical	$9,300	$8,600	$9,900
Industrial	$9,100	$8,400	$9,700
Mechanical	$9,200	$8,600	$9,800
Metallurgical	$9,200	$8,600	$9,700

[1] 90 percent earned more than the amount shown.
[2] 10 percent earned more than the amount shown.

In the Federal Government in late 1968, engineers having the bachelor's degree and no experience could start at $7,456 or $9,078 a year, depending on their college records. Beginning engineers having the bachelor's degree and 1 or 2 years of graduate work could start at $9,078 or $10,154. Those having the Ph. D. degree could begin at $11,563 or $12,580.

In colleges and universities, the salary of beginning engineers with the master's degree averaged about $9,000 a year; and with the Ph. D. degree, $11,500. (Also see statement on College and University Teachers.)

Most engineers can expect an increase in earnings as they gain experience. For example, in industry in 1968, according to an Engineering Manpower Commission Survey the average (median) salary of engineers having 21 to 23 years of experience was about $17,000, 80 percent higher than beginning engineers. Only 10 percent of those having 21 to 23 years of experience earned less than $12,500 a year, and over 10 percent earned $24,000 or more. Some in top-level executive positions had much higher earnings.

Although engineers generally work under quiet conditions found in modern offices and research laboratories, they may be involved in more active work—at a missile site preceding the launching of a space vehicle, in a mine, at a construction site, or at some other out-of-doors location.

Sources of Additional Information

General information on engineering careers—including student selection and guidance, professional training and ethics, and

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salaries and other economic aspects of engineering—may be obtained from:

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

Engineering Manpower Commission, Engineers Joint Council, 345 East 47th St., New York, N.Y. 10017.

National Society of Professional Engineers, 2029 K St., NW., Washington, D.C. 20006.

Information on engineering schools and curriculums and on training and other qualifications needed for entrance into the profession also may be obtained from the Engineers Council for Professional Development. Information on registration of engineers may be obtained from the National Society of Professional Engineers.

In addition to the organizations listed above, other engineering societies represent the individual branches of the engineering profession; some are listed with the branches presented later in this chapter. Each can provide information about careers in the particular branch of engineering. Many other engineering organizations are listed in the following publications available in most libraries.

Engineering Societies Directory, published by Engineers Joint Council.

Scientific and Technical Societies of the United States and Canada, published by the National Academy of Sciences, National Research Council.

Some engineers are members of labor unions. Information on engineering unions may be obtained from:

The American Federation of Technical Engineers (AFL-CIO), 1126 16th St. NW., Washington, D.C. 20036.

AEROSPACE ENGINEERS

(D.O.T. 002.081)

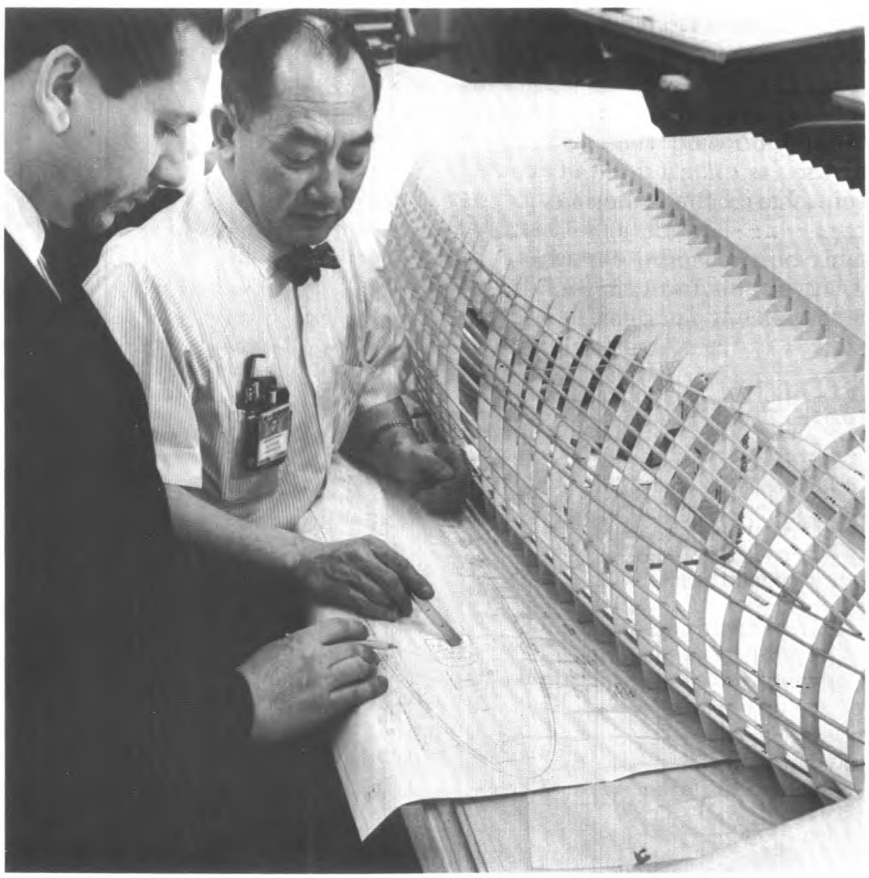
Nature of the Work

Aerospace engineers play a vital role in America's space age activities. Engineers in this branch of the profession work on all types of aircraft and spacecraft including missiles, rockets, and conventional propeller-driven and jet-powered planes. They are concerned with all phases of the development of aerospace products from the initial planning and design to the final manufacture and testing.

Aerospace engineers usually specialize in a particular area of work, such as structural design, guidance and control, instrumentation, propulsion, materials, testing, or production methods. They also may specialize in a particular type of aerospace product such as passenger planes, jet-powered military aircraft, rockets, satellites, or manned space capsules. Engineers working in the aircraft field are usually called aeronautical engineers. Those in the field of missiles, rockets, and spacecraft often are referred to as astronautical engineers.

Places of Employment

Nearly 65,000 aerospace engineers were employed in 1968, mainly in the aircraft and parts industry. Some worked for Federal Government agencies, primarily the National Aeronautics and Space Administration and the Department of Defense. Small numbers worked for commercial



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airlines, consulting firms, and colleges and universities.

Employment Outlook

Employment opportunities for aerospace engineers are expected to be favorable through the 1970's. Continuing developments in supersonic, subsonic, and vertical lift aircraft, and advancement in space and missile activities should result in a moderate increase in requirements for aerospace engineers. Additional job opportunities also will rise from the need to replace engineers who transfer to other fields of work, retire, or die. However, engineers who are not well grounded in engineering fundamentals, and those whose specialization is very narrow, could be affected adversely by skill obsolescence caused by shifts in defense activities and by rapidly changing technology.

The outlook for aerospace engineers presented here is based on the assumption that defense activity (as measured by expenditures) will be somewhat higher than the level prior to the Vietnam buildup, approximating the level of the early 1960's. If defense activity should differ substantially from that level, the demand for aerospace engineers will be affected accordingly. (See introductory section of this chapter for discussion on training requirements and earnings. See also chapter on Occupations in Aircraft, Missile, and Spacecraft Manufacturing.)

Sources of Additional Information

American Institute of Aeronautics and Astronautics, Inc., 1290 Avenue of the Americas, New York, N.Y. 10019.

AGRICULTURAL ENGINEERS

(D.O.T. 013.081)

Nature of the Work

Agricultural engineers use basic engineering principles and concepts to develop machinery, equipment and methods to improve the efficiency and economy of the production, processing, and distribution of food and other agricultural products. They are concerned primarily with the design of farm machinery, equipment, and structures; the utilization of electrical energy on farms and in food and feed processing plants; the conservation and management of soil and water resources; and the design and operation of processing equipment to prepare agricultural products for market. They usually specialize in a particular area of work, such as research and development, design, testing and application, production, sales, or management.

Places of Employment

Most of the estimated 12,000 agricultural engineers in 1968 were employed in private industry, especially by manufacturers of farm equipment and specialized lines of field, barnyard, processing, and household equipment; electrical service companies; and distributors of farm equipment and supplies. Some worked for engineering consultants who supply technical or management services to farmers and farm related industries; others were independent consultants.

The Federal Government employs about 700 agricultural engineers—chiefly in the Soil Conservation Service and Agricultural Research Service of the Department of Agriculture. Some are employed by colleges and universities and a few are employed by State and local governments.

Employment Outlook

Employment of agricultural engineers is expected to grow moderately through the 1970's. Among the factors which will contribute to a greater demand for these engineers are the growing mechanization of farm operations, increasing emphasis on conservation of resources, expanding population—with a corresponding demand for food and fibre—and the broadening use of agricultural products and wastes as industrial raw materials. Additional engineers will be needed to work on problems concerning the enormous energy and power requirements of farms. (See introductory section of this chapter for discussion on training requirements and earnings. See also chapter on Occupations in Agriculture.)

Sources of Additional Information

American Society of Agricultural Engineers, P.O. Box 229, Joseph, Mich. 49085.

CERAMIC ENGINEERS

(D.O.T. 006.081)

Nature of the Work

Ceramic engineers develop methods for processing clay, silicates, and other nonmetallic minerals into a wide variety of ceramic products, ranging from glassware, cement, and bricks, to coatings and refractories for missile

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nose cones. They may also design and supervise the construction of the plant and equipment used in the manufacture of these products. Many ceramic engineers are engaged in research and development work. Some are employed in administration, production, and sales; others work as consultants or teach in colleges and universities.

Ceramic engineers usually specialize in one or more products—for example, products of refractories (fire- and heat-resistant materials, such as firebrick); whiteware (such as porcelain and china dinnerware or high voltage electrical insulators); structural materials (such as brick, tile, and terra cotta); electronic ceramics (such as ferrites for memory systems and microwave devices); protective and refractory coatings for metals; glass; abrasives; and fuel elements for atomic energy.

Places of Employment

Most of the estimated 10,000 ceramic engineers in 1968 were employed in manufacturing industries—primarily in the stone, clay, and glass industries. Others worked in the iron and steel, electrical equipment, aerospace, and chemical industries which produce or use ceramic products. Some were employed by educational institutions, independent research organizations, and the Federal Government.

Employment Outlook

The outlook is for moderate growth in the employment of ceramic engineers through the 1970's. Although ceramic engineering is a small field and the number of openings in any one year will be small compared with those in the large branches of engineering, the number of graduates having degrees in ceramic engineering also is small. Thus, opportunities for new graduates should be excellent.

The growth of programs related to nuclear energy, electronics, and space exploration will provide many of the opportunities for ceramic engineers. Ceramic materials which are corrosion-resistant, and capable of withstanding radiation and extremely high temperatures are becoming increasingly important in the development of nuclear reactors and space vehicles. Increasing use of the more traditional ceramic products, such as whiteware and abrasives, for consumer and industrial use also will require additional ceramic engineers to improve and adapt these products to new requirements. The growing use of structural clay and tile products in construction will add to employment opportunities in the production of these items. Furthermore, the development of new glasses of unusual properties and the expanding use of conventional glasses in the construction and container field probably will create additional openings for ceramic engineers. (See introductory section of this chapter for discussion on training requirements and earnings.)

Sources of Additional Information

American Ceramic Society, 4055 North High St., Columbus, Ohio 43214.

CHEMICAL ENGINEERS

(D.O.T. 008.081)

Nature of the Work

Chemical engineers design the chemical plants and equipment required to manufacture chemicals and chemical products. They also determine the best combination of chemical operations that will result in the most efficient manufacturing process. They often test their work by designing and operating pilot plants.

The work in this branch of engineering is so diversified and complex that chemical engineers frequently become specialists in a particular type of chemical operation such as oxidation, polymerization, distillation, or hydrogenation. Others specialize in the manufacture of a specific product such as plastics, paper, or rubber. Chemical engineers may be engaged in research and development, production, plant operation, design, sales, management or teaching.

Chemical engineer checks water quality.

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Places of Employment

Approximately four-fifths of the more than 50,000 chemical engineers in the United States in 1968 were employed in manufacturing industries—primarily in the chemicals industry. Some were employed by government agencies and by colleges and universities. A small number worked for independent research institutes or engineering consulting firms, or as independent consulting engineers.

Employment Outlook

The outlook is for rapid growth of employment in chemical engineering through the 1970's. The major factors underlying this expected growth are expansion of industry—the chemicals industry in particular—and continued high levels of expenditures for research and development, in which a large portion of chemical engineers are employed. The growing complexity of chemical processes and the automation of these processes, will require additional chemical engineers for work related to designing, building, and maintaining the necessary plants and equipment. Chemical engineers also will be needed in many relatively new areas of work, such as the design and development of nuclear reactors and nuclear fuel processing for industrial use, and research aimed at developing new and better solid and liquid fuels for rockets. Furthermore, the development of new chemicals for use in the manufacture of consumer goods such as fertilizers, drugs, and paints will probably create additional openings for chemical engineers. (See introductory section of this chapter for discussion on training requirements and earnings. See also the statement on Chemists and chapter on Occupations in the Industrial Chemical Industry.)

Sources of Additional Information

American Institute of Chemical Engineers, 345 East 47th St., New York, N.Y. 10017.

CIVIL ENGINEERS

(D.O.T. 005.081)

Nature of the Work

Civil engineers design and supervise the construction of roads, harbors, airfields, tunnels, bridges, water supply and sewage systems, buildings, and many other types of structures. Civil engineering is so broad that many specialties have developed within it—among them are structural, highway, hydraulic, sanitary engineering, and soil mechanics.

Many civil engineers are in supervisory or administrative positions, ranging from site supervisor of a construction project or city engineer to top-level executive positions. Some are engaged in design, planning, research, inspection, or maintenance activities. Others teach in colleges and universities or work as consultants.

Places of Employment

Approximately 180,000 civil engineers were employed in the United States in 1968. The majority were employed by Federal, State, and local government agencies and the construction industry. Large numbers were employed by consulting engineering and architectural firms, or worked as independent consulting engineers. Some were employed by public utilities, railroads, and educational institutions. Others worked in the iron and steel industries and other major manufacturing industries.

Civil engineer measures model for one of its structural elements.

Civil engineers work in all parts of the country, in every State and city—usually in or near the major industrial and commercial centers. However, since these engineers are frequently called upon to work at construction sites, they are sometimes stationed in remote areas of the United States

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or in foreign countries. Furthermore, civil engineers in some positions often are required to move from place to place to work on different projects.

Employment Outlook

The outlook in civil engineering—one of the largest and oldest branches of the profession—is for continued growth through the 1970's.

The expanding employment opportunities for civil engineers will result from the growing needs for housing, industrial buildings, and highway transportation systems created by an increasing population and expanding economy. Work related to the problems of urban environment, such as water and sewage systems, air and water pollution, and giant urban redevelopment projects, may also require additional civil engineers.

Large numbers of civil engineers will also be needed each year to replace those who retire or die. The number of civil engineers needed annually to fill these vacancies—estimated to be about 3,400 in 1968—will probably rise slowly in the future. (See introductory section of this chapter for discussion on training requirements and earnings.)

Sources of Additional Information

American Society of Civil Engineers, 345 East 47th St., New York, N.Y. 10017.

ELECTRICAL ENGINEERS

(D.O.T. 003.081, .151, and .187)

Nature of the Work

Electrical engineers design, develop, and supervise the manufacture of electrical and electronic equipment—including electric motors and generators; communications equipment; electronic apparatus such as television, radar, computers, and missile guidance systems; and electrical appliances of all kinds. They also design and participate in the operation of facilities for generating and distributing electric power.

Electrical engineers usually specialize in a major area of work such as electronics, electrical equipment manufacturing, communications, or power. Many specialize in subdivisions of these broad areas; for example, electronics engineers may specialize in computers or in missile guidance and tracking systems.

A large number of electrical engineers are engaged in research, development, and design activities. Another large group is employed in administrative and management positions. Others are employed in various manufacturing operations or in technical sales or teaching positions.

Places of Employment

Electrical engineering is the largest branch of the profession. It is estimated that approximately 230,000 electrical engineers were employed in the United States in 1968. They were employed chiefly by manufacturers of electrical and electronic equipment, aircraft and parts, business machines, and professional and scientific equipment. Many were employed by telephone and telegraph and electric light and power companies. Sizable numbers were employed by government agencies and by colleges and universities. Others worked for construction firms, for engineering consultants, or as independent consulting engineers.

Employment Outlook

Employment opportunities for electrical engineers are expected to increase very rapidly through the 1970's. An increased demand for electrical equipment to automatically control production processes, using such items as computers and sensing devices, is expected to be among the major factors contributing to this growth. The anticipated growing demand for electrical and electronic consumer goods also is expected to create many job openings for electrical engineers.

The outlook for electrical engineers presented here is based on the assumption that defense activity (as measured by expenditures) will be somewhat higher than the level prior to the Vietnam build-up, approximating the level of the early 1960's. If defense activity should differ substantially from that level, the demand for electrical engineers would be affected accordingly.

In addition to those needed to fill new positions, many electrical engineers will be required to replace personnel lost to the profession because of retirement or death. The number needed to fill these vacancies, estimated to be about 2,400 in 1968, will probably rise slowly in the future. (See introductory section of this chapter for discussion of training requirements and earnings. See also chapter on Occupations in Electronics Manufacturing.)

Sources of Additional Information

Institute of Electrical and Electronic Engineers, 345 East 47th St., New York, N.Y. 10017.

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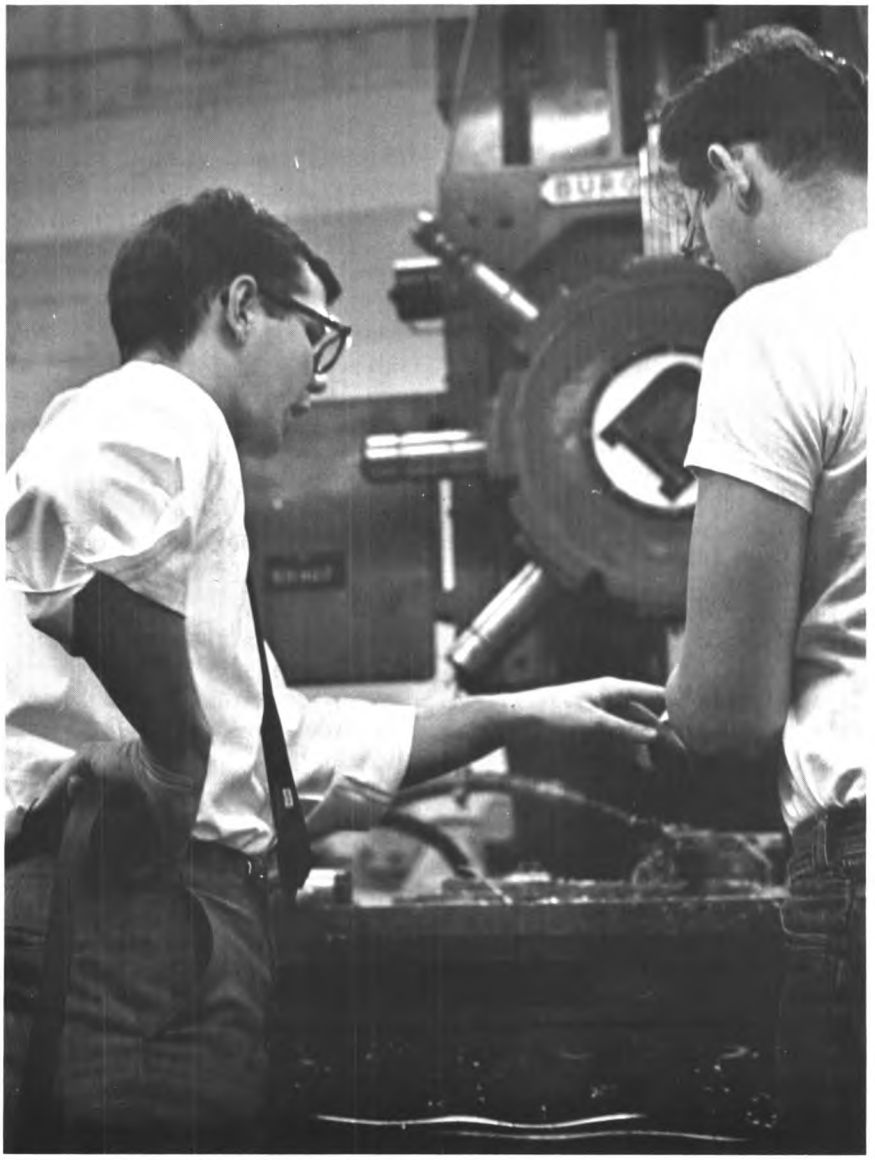
INDUSTRIAL ENGINEERS

(D.O.T. 012.081, .168 and .188)

Nature of the Work

Industrial engineers determine the most effective methods of using the basic factors of production—manpower, machines, and materials. They are concerned with people and "things," in contrast to engineers in other specialties who generally are concerned more with developmental work in subject fields, such as power, mechanics, structures, or materials.

They may design systems for data processing and apply operations research techniques to complex organizational, production, and related problems. Industrial engineers also develop management control systems to aid in financial planning and cost analysis; design production planning and control systems to insure coordination of activities and to control the quality of products; and may design and improve systems for the physical distribution of goods and services. Other activities of industrial engineers include plant location surveys, where consideration is given to sources of raw materials, availability of a work force, financing, and taxes; and the development of wage and salary administration and job evaluation programs.



Industrial engineer works with machine tool operator to set up production job.

Places of Employment

More than two-thirds of the estimated 120,000 industrial engineers employed in early 1968 were in manufacturing industries. They were more widely distributed among manufacturing industries than were those in other branches of engineering. Some worked for insurance companies, construction and mining firms, and public utilities. Others were employed by retail organizations and other large business enterprises to improve operating efficiency. Still others worked for government agencies and educational institutions. A few were independent consulting engineers.

Employment Outlook

The outlook is for continued rapid growth of employment in this branch of the profession through the 1970's. The increasing complexity of industrial operations and the expansion of automated processes, coupled with the continued growth of the Nation's industries, are among the major factors expected to increase the demand for industrial engineers. Growing recognition of the importance of scientific management and safety engineering in reducing costs and increasing

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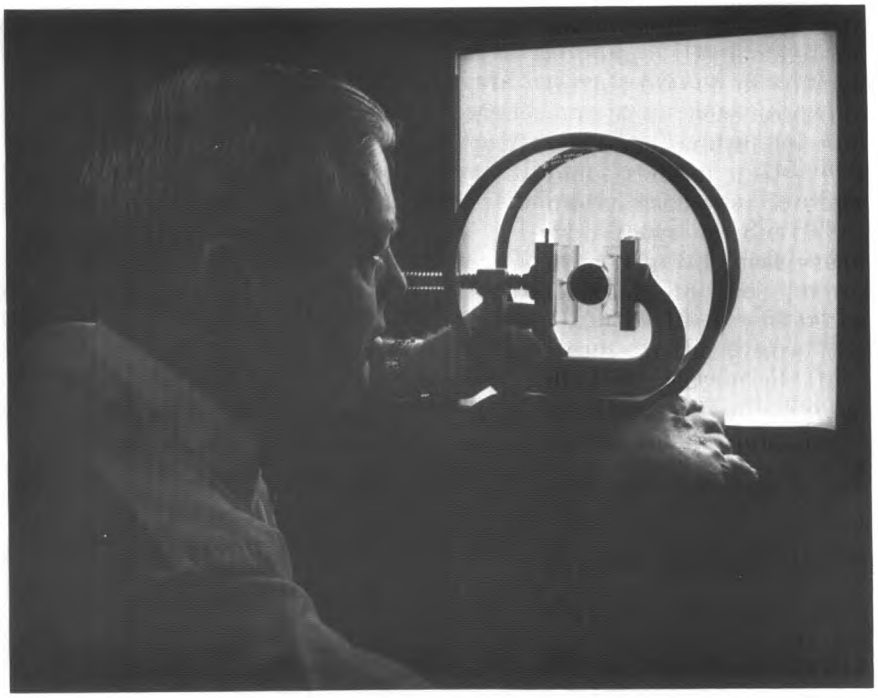
productivity also is expected to stimulate the demand for persons in this branch of engineering.

Besides those needed to fill new positions, additional numbers of industrial engineers will be required each year to replace those who retire or die. The number needed to fill these vacancies, estimated to be approximately 1,300 in 1968, will probably rise slowly in the future. (See introductory section of this chapter for discussion on training requirements and earnings.)

Sources of Additional Information

American Institute of Industrial Engineers, Inc., 345 East 47th St., New York, N.Y. 10017.



Mechanical engineer examines model of ball bearing.

MECHANICAL ENGINEERS

(D.O.T. 007.081, .151, .168, .181, and .187; 011.081; and 019.187)

Nature of the Work

Mechanical engineers are concerned with the production, transmission, and use of power. They design and develop machines which produce power, such as internal combustion engines, steam and gas turbines, jet and rocket engines, and nuclear reactors. They also design and develop a great variety of machines which use power—refrigeration and air-conditioning equipment, elevators, machine tools, printing presses, steel rolling mills, and many others.

Many specialized areas of work have developed within mechanical engineering. Among these specialties are those concerned with motor vehicles, marine equipment, railroad equipment, rocket engines, steam-power, heating, ventilating and air conditioning, hydraulics or fluid mechanics, instrumentation, ordnance, and machines for specialized industries, such as petroleum, rubber and plastics, and construction.

Large numbers of mechanical engineers are engaged in research, development, and design. Many also are employed in administrative and management activities. Others work in maintenance, sales, and activities related to production and operations in manufacturing industries. Some teach in colleges and universities or work as consultants.

Places of Employment

About 215,000 mechanical engineers were employed in the United States in 1968. Nearly all manufacturing and nonmanufacturing industries employed some members of the profession. However, nearly three-fourths of all mechanical engineers were employed in manufacturing industries—mainly in the primary and fabricated metals, machinery, transportation equipment, and electrical equipment industries. Others were employed in government agencies, educational institutions, and consulting engineering firms. Some worked as independent consulting engineers.

Employment Outlook

The outlook in mechanical engineering—the second largest branch of the profession—is for rapid growth through the 1970's. The expected expansion of industry with the consequent demand for industrial machinery and machine tools, and the increasing technological complexity of industrial machinery and processes will be among the major factors contributing to greater employment. Continued growth of expenditures for research and de-

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velopment also will be a factor in the growth of this branch of the profession. Moreover, newer areas of work, such as atomic energy and aerospace development, will probably provide additional openings for large numbers of mechanical engineers.

Besides those needed to fill new positions, large numbers of mechanical engineers will be required each year to replace those who retire or die. The number needed to fill these vacancies, estimated to be about 3,000 in 1968 probably will rise slowly in the future. (See introductory section of this chapter for discussion on training requirements and earnings.)

Sources of Additional Information

The American Society of Mechanical Engineers, 345 East 47th St., New York, N.Y. 10017.

METALLURGICAL ENGINEERS

(D.O.T. 011.081)

Nature of the Work

Metallurgical engineers develop methods of processing and converting metals into useful products. These engineers usually work in 1 of 2 main branches of metallurgy—extractive or physical. Extractive metallurgy involves the extraction of metals from ores and their refining to obtain pure metal. Physical metallurgy deals with the properties of metals and their alloys, and with methods of converting refined metals into useful final products. Scientists working in this field are known as metallurgists, but the distinction between scientists and engineers in this field is small. Persons working in the field of metallurgy are sometimes referred to as either materials scientists or materials engineers.

Places of Employment

The metal working industries —primarily the iron and steel and nonferrous metals industries —employed over one-half of the estimated 5,000 to 10,000 metallurgical engineers in 1968. Many metallurgical engineers worked in the machinery, electrical equipment, and aircraft and parts industries. Others were employed in the mining industry, government agencies, consulting firms, independent research organizations, and educational institutions.

Employment Outlook

Employment in this small branch of the profession is expected to grow rapidly through the 1970's. Increasing numbers of metallurgical engineers will be needed by the metal-working industries to work on problems involving the development of new metals and alloys as well as the adaption of current ones to new needs. For example, the development of such products as supersonic jet aircraft, missiles, satellites, and spacecraft has brought about a need for lightweight metals capable of withstanding both extremely high and extremely low temperatures. Metallurgical engineers also will be needed to solve metallurgical problems connected with the efficient use of nuclear energy. Furthermore, as the supply of high-grade ores diminishes, more metallurgical engineers will be needed to find ways of processing low-grade ores now regarded as unprofitable to mine. (See introductory section of this chapter for discussion on training requirements and earnings. Also see chapter on Occupations in the Iron and Steel Industry.)

Sources of Additional Information

The Metallurgical Society of the American Institute of Mining, Metallurgical, and Petroleum Engineers, 345 East 47th St., New York, N.Y. 10017.

American Society of Metals, Metals Park, Ohio 44073.

MINING ENGINEERS

(D.O.T. 010.081 and .187)

Nature of the Work

Mining engineers are responsible for the finding and extraction of minerals from the earth and for the preparation of minerals for use by manufacturing industries. They design the layouts of mines, supervise the construction of mine shafts and tunnels in underground operations, and devise methods of transporting extracted minerals to processing plants. Mining engineers are responsible for the efficient operation of mines and mine safety, including ventilation, water supply, power, communications, and maintenance of equipment. Some mining engineers work with geologists, locating and appraising new ore deposits. Others conduct research to develop new mining equipment and to devise improved methods of processing extracted minerals.

Mining engineers frequently specialize in the extraction of specific metal ores or coal and other non-metallic minerals. Engineers who specialize in the ex-

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traction of petroleum and natural gas are usually considered members of a separate branch of the engineering profession—Petroleum Engineering.

Places of Employment

Most of the estimated 5,000 mining engineers were employed in the mining industry in 1968. Some worked in colleges and universities or government agencies, or as independent consultants. Others worked for firms producing equipment for the mining industry.

Mining engineers are usually employed at the location of mineral deposits, often near small communities. However, those engaged in research, teaching, management, consulting, or sales are often located in large metropolitan areas.

In addition to mining engineers, many other engineers in different branches also are employed in the mining industry.

Employment Outlook

Employment opportunities for mining engineers are expected to be favorable through the 1970's. The number of new graduates in mining engineering entering the industry is expected to be fewer than the number needed to provide for the anticipated growth in requirements and to replace those who retire, transfer to other fields of work, or die.

Exploration for minerals is increasing, both in the United States and in other parts of the world. Easily mined deposits are being depleted, creating a growing need for engineers to mine newly discovered mineral deposits and to devise more efficient methods for mining low-grade ores. Additional employment opportunities for mining engineer in the future. (See inment of new alloys and discovery of new uses for metals increases the demand for less widely used ores. Recovery of metals from the sea and the development of oil shale deposits could present major challenges to the mining engineer in the future. (See introductory section to chapter for discussion on training requirements and earnings. See also chapter on Mining.)

Sources of Additional Information

The Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers, 345 East 47th St., New York, N.Y. 10017.

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HEALTH SERVICE OCCUPATIONS

Almost everyone knows something about the professional services provided by doctors, dentists, and pharmacists. Many people also have some firsthand knowledge of the duties performed by nurses, attendants, and other workers who take care of patients in hospitals. Less well known, but also of great importance to the public health, is the work of large numbers of people employed behind the scenes in other health service occupations, such as laboratory or X-ray technician. Altogether, about 3.5 million people were employed in health related occupations in 1968. Employment in this field has increased rapidly in recent years.

Nurses, physicians, pharmacists, and dentists constituted the largest professional health occupations in 1968, and ranged from nearly 100,000 dentists to about 660,000 registered nurses. Other professional health occupations are dietitian, veterinarian, optometrist, chiropractor, osteopathic physician, and hospital administrator. Other health service workers include technicians of various types, such as medical technologist, medical X-ray technician, dental hygienist, and dental laboratory technician. Large numbers—more than 1.1 million—worked as practical nurses and auxiliary nursing workers, including orderlies, nursing aids, hospital attendants, and psychiatric assistants.

Workers in the health field are employed in hospitals, clinics, laboratories, pharmacies, nursing homes, industrial plants, public health agencies, mental health centers, private offices, and patients' homes. Those employed in health occupations work mainly in the more heavily populated and prosperous sections of the Nation.

Many women are employed in the health field. Nursing, the largest of the major health service occupations, is second only to teaching as a field of professional employment for women. Other health service occupations in which women predominate are practical nurse, radiologic technologist, medical technologist, dietitian, physical therapist, occupational therapist, speech pathologist and audiologist, dental hygienist, dental assistant, and medical record librarian. On the other hand, most dentists, optometrists, physicians, veterinarians, pharmacists, hospital administrators, and sanitarians are men.

The educational and other requirements for work in the health field are as diverse as the health occupations themselves. For example, professional health workers—physicians, dentists, pharmacists, and others—must complete a number of years of preprofessional and professional college education and pass a State licensing examination. On the other hand, some health service occupations can be entered with little specialized training.

A continued rapid expansion of employment in the health field is expected through the 1970's, although the rates of growth will differ considerably among individual health ocupations. The factors that are expected to contribute to an increase in the demand for health care are the following: The country's expanding population; rising standards of living; increasing health consciousness; growth of coverage under prepayment programs for hospitalization and medical care, including Medicare; rapid expansion of expenditures for medical research; and increasing expenditures by Federal, State, and local governments for health care and services. In addition, many new workers will be needed each year to replace those who retire, die, or—particularly for women—leave the field for other reasons. Thus, many opportunities will be available for employment in the health services.

PHYSICIANS

(D.O.T. 070.101 and .108)

Nature of the Work

Physicians diagnose diseases and treat people who are ill or in poor health. In addition, they are concerned with preventive medicine and with the rehabilitation of people who are injured or ill.

Physicians generally examine and treat patients in their own offices and in hospitals, but they also visit patients at home when necessary. Some physicians combine the practice of medicine with research or teaching in medical schools. Others hold full-time research or teaching positions or perform administrative work in hospitals, professional associations, and other organizations. A few are primarily engaged in writing and editing medical books and magazines.

About one-third of the physicians engaged in private practice are general practitioners; the other two-thirds are specialists in 1 of the 33 fields recognized by the medical profession. In recent years, there has been a marked trend toward specialization. Among the largest specialties are internal medicine, surgery, obstetrics and gynecology, psychiatry, pediatrics, radiology,

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anesthesiology, ophthalmology, and pathology.

Places of Employment

Nearly 295,000 physicians—of whom 7 percent were women—were professionally active in the United States in early 1968. The great majority—about 190,000—were engaged in private practice. Approximately 45,000 were interns or residents in hospitals. About 37,000 held full-time staff positions in hospitals, nearly three-fifths of whom were in government hospitals. The remainder were employed in private industry, State and local health departments, medical schools, research foundations, and professional organizations.

In 1968, more than 40 percent of all physicians were in five States: New York, California, Pennsylvania, Illinois, and Ohio. In general, the Northeastern States have the highest ratio of physicians to population and the Southern States, the lowest. General practitioners are much more widely distributed geographically than specialists, who tend to be concentrated in large cities.

Training and Other Qualifications

A license to practice medicine is required in all States and the District of Columbia. To qualify for a license, a candidate must graduate from an approved medical school, pass a licensing examination, and—in 32 States and the District of Columbia—serve a 1-year hospital internship. As of 1968, 18 States permitted a physician to be licensed immediately after graduation from medical school, but even in these States, an internship is always necessary for full acceptance by the profession. Twenty-three States and the District of Columbia require candidates to pass an examination in the basic sciences to become eligible for the medical licensing examination.

Licensing examinations are given by State boards. The National Board of Medical Examiners also gives an examination which is accepted by 46 States and the District of Columbia as a substitute for State examinations. Although physicians licensed in one State usually can obtain a license to practice in another without further examination, some States limit this reciprocity.

In 1968, there were 88 approved schools in the United States in which students could begin the study of medicine. Eighty-four awarded the degree of Doctor of Medicine (M.D.) to those completing the 4-year course; 4 offered 2-year programs in the basic medical sciences to students who could then transfer to regular medical schools for the last 2 years of study. Five additional new schools were enrolling medical students, but had not yet graduated a class. Because the number of people applying to medical schools exceeds the beginning enrollment capacity, preference is given to the most highly qualified applicants.

Most medical schools require applicants to have completed at

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least 3 years of college education for admision to their regular programs, and some require 4 years. A few medical schools allow selected students having exceptional qualifications to begin their professional study after completing 2 years of college. The great majority of students entering medical schools have a bachelor's degree.

Premedical study must include undergraduate courses in English, physics, biology, and inorganic and organic chemistry in an accredited college. Students should acquire a broad general education by taking courses in the humanities, mathematics, and the social sciences. Other factors considered by medical schools in selecting students include the individual's college record; the standing of the college where his premedical work was taken; and his scores on the Medical College Admission Test, which is taken by almost all applicants. Consideration also is given to the applicant's character, personality, and leadership qualities, as shown by personal interviews, letters of recommendation, and extracurricular activities in college. In addition, many State-supported medical schools give preference to residents of their particular States and, sometimes, those of nearby States.

The first 2 years of medical training are spent in laboratories and classrooms, learning basic medical sciences, such as anatomy, biochemistry; physiology, pharmacology, microbiology, and pathology. During the last 2 years, students spend most of their time in hospitals and clinics under the supervision of experienced physicians. They learn to take case histories, perform examinations, and recognize diseases.

New physicians increasingly are acquiring training beyond the 1-year hospital internship. Those who plan to be general practitioners often spend an additional year or two as interns or residents in a hospital. To become recognized as specialists, physicians must pass specialty board examinations. To qualify for these examinations, they must spend from 2 to 4 years—depending on the specialty—in advanced hospital training as residents, followed by 2 years or more of practice in the specialty. Some doctors interested in teaching and research take graduate work leading to the master's or Ph. D. degree in a field such as biochemistry or microbiology.

Many graduates of foreign medical schools serve as hospital interns and residents in this country. In early 1968, this group numbered about 14,000 foreign citizens and 1,400 U.S. citizens. To be appointed to approved internships or residencies in U.S. hospitals, however, these graduates (citizens of foreign countries as well as U.S. citizens) must pass the American Medical Qualification Examination given by the Educational Council for Foreign Medical Graduates.

Medical training is very costly because of the long time required to earn the medical degree. However, the Health Professions Educational Assistance Act of 1963, as amended, provides Federal funds for loans and scholarships of up to $2,500 a year to help needy students pursue full-time study leading to the degree of Doctor of Medicine.

Among the personal qualifications needed for success in this profession are a strong desire to become a physician, above-average intelligence, and an interest in science. In addition, prospective physicians should possess good judgment, be able to make decisions in emergencies, and be emotionally stable.

The majority of newly qualified physicians open their own offices. Those who have completed their internships and enter active military duty initially serve as captains in the Army or Air Force or as lieutenants in the Navy; those who choose the military as a career advance to higher ranks. Graduates of accredited medical schools are eligible for commissions as senior assistant surgeons (equivalent to lieutenants in the Navy) in the U.S. Public Health Service, as well as for Federal Civil Service professional medical positions.

Employment Outlook

Excellent opportunities are anticipated for physicians through the 1970's. Because the number of new physicians being trained is restricted by the present limited capacity of medical schools, the employment of physicians is expected to grow only moderately, despite a steady increase in the demand for their services. However, some expansion in medical school facilities is expected because of recent Federal legislation which provides Federal funds to assist in the construction of new training facilities for physicians. Nonetheless, any increase in the supply of physicians resulting from the implementation of this legislation may not be significant until the late 1970's.

The expected increase in demand for physicians' services will result from factors such as the anticipated population growth; the rising health consciousness of the public; and the trend toward higher standards of medical care. The demand for physicians also will increase because of the extension of prepayment programs for hospitalization and medical care, including Medicare and Medicaid; continued Federal Government provision of medical care for members of the Armed

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Forces, their families, and veterans; and the continuing growth in the fields of public health, rehabilitation, industrial medicine, and mental health. In addition, more physicians will be needed for medical research and to teach in medical schools.

In addition to those needed to fill new openings, many newly trained doctors will be required to replace those who retire or die. The number needed to fill vacancies caused by losses to the profession is estimated at about 7,000 each year through the 1970's.

To some extent, the rise in the demand for physicians' services will be offset by developments that are enabling physicians to care for more patients. For example, increasing numbers of medical technicians are assisting physicians; new drugs and new medical techniques are shortening illnesses; and growing numbers of physicians are able to use their time more effectively by engaging in group practice. In addition, fewer house calls are being made by physicians because of the growing tendency to treat patients in hospitals and physicians' offices. However, these developments are not expected to offset the overall need for more physicians.

Earnings and Working Conditions

New graduates serving as interns in 1968 had an average annual salary of $4,893 in hospitals affiliated with medical schools and $5,030 in other hospitals. Residents during 1968 earned average annual salaries of $4,755 in hospitals affiliated with medical schools and $5,532 in nonaffiliated hospitals, according to the American Medical Association. Many hospitals also provided full or partial room, board, and other maintenance allowances to their interns and residents.

Graduates employed by the Federal Government in late 1968 could expect to receive an annual starting salary of about $13,300 if they had completed their internship, and about $15,800 if they had completed 1 year of residency or demonstrated superior achievement during their internship.

Newly qualified physicians who establish their own practice must make a sizable financial investment to open and equip a modern office. It is estimated that during the first year or two of independent practice, physicians probably earn little more than the minimum needed to pay the expenses for maintaining their offices. As a rule, however, their earnings rise rapidly as their practice develops.

The net income of physicians in private practice was generally between $23,000 and $31,000 in 1968, according to the limited information available. Earnings of physicians depend on factors such as the region of the country in which they practice; the patients' income level; and the physician's skill, personality, and professional reputation, as well as his length of experience. Physicians engaged in private practice usually earn more than those in salaried positions, and specialists usually earn considerably more than general practitioners. Many physicians have long working days and irregular hours. Most specialists work fewer hours each week than general practitioners. As doctors grow older, they may not accept new patients and tend to work fewer hours. However, many continue in practice well beyond 70 years of age.

Sources of Additional Information

Persons wishing to practice in a given State should find out about the requirements for licensure directly from the board of medical examiners of that State. Lists of approved medical schools, as well as general information on premedical education and medicine as a career, may be obtained from:

Council on Medical Education, American Medical Association, 535 North Dearborn St., Chicago, Ill. 60610.

Association of American Medical Colleges, 2530 Ridge Ave., Evanston, Ill. 60201.

OSTEOPATHIC PHYSICIANS

(D.O.T. 071.108)

Nature of the Work

Osteopathic physicians diagnose, prescribe remedies, and treat diseases of the human body, paying particular attention to impairments in the musculoskeletal system. They emphasize manual manipulative therapy, but in most States, they also use surgery, drugs, and all other accepted methods of medical care. Most osteopathic physicians are "family doctors" who engage in general practice. These physicians usually see patients in their offices, make house calls, and treat patients in osteopathic and some city and county hospitals. A few doctors of osteopathy are engaged primarily in research, teaching, or writing and editing scientific books and journals. In recent years, there has been an increase in specialization. The specialties include: Internal medicine, neurology and psychiatry, ophthalmology and otorhinolaryngology, pediatrics, anesthesiology, physical medicine and rehabilitation, dermatology, obstetrics and gynecology, pathology, proctology, radiology, and surgery.

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Places of Employment

More than 12,000 osteopathic physicians were practicing in the United States in early 1968. Nearly all of them were in private practice. Less than 5 percent had full-time salaried positions, mainly in osteopathic hospitals and colleges. A few were employed by private industry or government agencies.

Osteopathic physicians are located chiefly in those States which have osteopathic hospital facilities. In 1968, about half of all osteopathic physicians were in five States: Michigan, Pennsylvania, Ohio, Missouri, and Texas. Twenty-four States and the District of Columbia each had fewer than 50 osteopathic physicians. More than half of all general practitioners are located in towns and cities having less than 50,000 people; specialists, however, practice mainly in large cities.

Training and Other Qualifications

A license to practice as an osteopathic physician is required in all States. In early 1968, licensed osteopathic physicians were qualified to engage in all types of medical and surgical practice in 42 States and the District of Columbia. The remaining States limit in varying degrees the use of drugs or the type of surgery that can be performed by osteopathic physicians.

To obtain a license, a candidate must be a graduate of an approved school of osteopathy and pass a State board examination. In 22 States and the District of Columbia, the candidate must pass an examination in the basic sciences before he is eligible to take the professional examination; 31 States and the District of Columbia also require a period of internship after graduation from an osteopathic school. All States except Alaska, California, Florida, and Mississippi grant licenses without further examination to properly qualified osteopathic physicians already licensed by another State.

Although 3 years of preosteopathic college work is the minimum requirement for entry to schools of osteopathy, 4 years is often preferred. Osteopathic colleges require successful completion of 4 years of professional study for the degree of Doctor of Osteopathy (D.O.). Preosteopathic education must include courses in chemistry, physics, biology, and English. During the first 2 years of professional training, emphasis is placed on basic sciences such as anatomy, physiology, pathology and on the principles of osteopathy; the last 2 years are devoted largely to work with patients in hospitals and clinics.

After graduation, almost all doctors of osteopathy serve a 12-month internship at 1 of the 80 osteopathic hospitals which the American Osteopathic Association has approved for intern training. Those who wish to become specialists must have 2 to 5 years of additional training, followed by 2 years of supervised practice in the specialty.

The osteopathic physician's training is very costly because of the length of time it takes to earn the degree of Doctor of Osteopathy. However, the Health Professions Educational Assistance Act of 1963, as amended, provides Federal funds for loans and scholarships of up to $2,500 a year to help needy students pursue full-time study leading to the degree.

Every year, more young people apply for admission to the five approved schools of osteopathy than can be accepted. In selecting students, these colleges consider grades received in preprofessional education, scores on medical aptitude tests, and the amount of preosteopathic college work completed. In 1968, 95 percent of the students entering osteopathic colleges had bachelor's degrees. The applicant's desire to serve as an osteopathic physician rather than as a doctor trained in other fields of medicine is a very important qualification. The colleges also give considerable weight to a favorable recommendation by an osteopathic physician familiar with the applicant's background.

Newly qualified doctors of osteopathy usually establish their own practice. A few work as assistants to experienced physicians or become associated with osteopathic hospitals. In view of the variation in State laws regulating the practice of osteopathy, the osteopathic physician should study carefully the professional and legal requirements of the State in which he plans to practice. The availability of osteopathic hospitals and clinical facilities also should be considered when choosing a location.

Employment Outlook

Opportunities for osteopathic physicians are expected to be excellent through the 1970's. Greatest demand for their services probably will continue to be in States where osteopathy is a widely accepted method of treatment, such as Pennsylvania and a number of Midwestern States. Generally, prospects for beginning a successful practice are likely to be best in rural areas, small towns, and city suburbs, where the young doctor of osteopathy may encounter less competition and therefore establish his professional reputation more easily than in the centers of large cities.

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The demand for the services of osteopathic physicians is expected to grow through the 1970's because of factors such as the anticipated population growth, the extension of prepayment programs for hospitalization and medical care including Medicare and Medicaid, and the trend toward higher standards of health care. Furthermore, there is a likelihood of greater public acceptance of osteopathy, liberalization of certain State restrictions on the use of drugs and surgery by osteopathic physicians, and the establishment of additional osteopathic hospitals.

Despite the expected growth in demand, the employment of osteopathic physicians is expected to increase only moderately because the number of new osteopathic physicians being trained is restricted by the limited capacity of osteopathic colleges. Approximately half of all graduates expected each year through the 1970's probably will be needed to replace osteopathic physicians who retire, die, or leave the profession for other reasons; hence the number of new graduates will be barely sufficient to maintain the present ratio of osteopathic physicians to population. Although some expansion in osteopathic college facilities is anticipated because of recent Federal legislation, which provides Federal funds to assist in the construction of new teaching facilities for osteopathic physicians, no significant increase in graduates is expected through the 1970's.

Women osteopathic physicians will find good opportunities not only in private practice but also on faculties of osteopathic colleges and on the staffs of hospitals and clinics. Approximately 7 percent of all osteopathic physicians are women. Women students, however, represented only about 3 percent of the total enrollment in osteopathic colleges in 1968, although men and women are equally eligible for admission.

Earnings and Working Conditions

In osteopathy, as in many of the other health professions, incomes usually rise markedly after the first few years of practice. Earnings of individual practitioners are determined mainly by such factors as ability, experience, the income level of the community served, and geographic location. The average income above business expenses of general practitioners, in early 1968, ranged from $18,000 to $25,000, according to the limited data available. Specialists usually had higher incomes than general practitioners.

Many osteopathic physicians work more than 50 and 60 hours a week. Those in general practice work longer and more irregular hours than specialists.

Sources of Additional Information

Persons wishing to practice in a given State should find out about the requirements for licensure directly from the board of examiners of that State. A list of State boards, as well as general information on osteopathy as a career, may be obtained from:

American Osteopathic Association, 212 East Ohio St., Chicago, Ill. 60611.

DENTAL HYGIENISTS

(D.O.T. 078.368)

Nature of the Work

Dental hygienists work under the supervision of a dentist; they clean teeth by removing stains and calcium deposits, polish teeth, and massage gums. While performing this work (oral prophylaxis), they chart conditions of decay and disease for diagnosis by the dentist. They also may take and develop X-rays, mix filling compounds, apply solutions to the teeth for the control of dental decay, administer prescribed medicaments, sterilize instruments, and act as chairside assistants to the dentists. Hygienists provide dental health education, including the techniques of mouth care and proper diet.

Dental hygienists working in school systems promote dental health by examining children's teeth, assisting dentists in determining the dental treatment needed, and reporting their findings to parents. They also perform oral prophylaxes and give instruction on correct care and brushing of teeth. Some help to develop classroom projects or assembly programs on oral health. Dental hygienists employed by health agencies work on dental health projects or perform clinical duties. A few assist in research projects. Those having advanced training may teach in schools of dental hygiene.

Places of Employment

Approximately 16,000 dental hygienists were employed in 1968; most of them were women. Many work part time. The large majority of all dental hygienists were employed in private dental offices; others worked for public health agencies, school systems, industrial plants, clinics, hospitals, dental hygiene schools, and as civilian employees of the Armed Forces.

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Training and Other Qualifications

Dental hygienists must pass an examination to be licensed by the State in which they wish to practice. In all States except Alabama and Georgia, eligibility for a license is limited to graduates of accredited dental hygiene schools. In 1968, candidates in 44 States could complete part of the State licensing requirements by passing a written examination given by the National Board of Dental Examiners. Upon being licensed, a hygienist becomes a Registered Dental Hygienist (R.D.H.). In order to practice in a different State, a licensed dental hygienist must pass that State's examination.

In 1968, 67 schools of dental hygiene in the United States were accredited or provisionally accredited by the Council on Dental Education of the American Dental Association. Most of these schools provide a 2-year certificate or associate degree program. Some have 4-year programs leading to the bachelor's degree in dental hygiene and others offer both programs. Programs leading to a master's degree are offered in three schools.

For dental hygienists interested in practicing in a private dental office, completion of the 2-year program generally is sufficient. In order to work in research, teaching, and in public or school health programs, the completion of a 4-year program usually is required.

The minimum requirement for admission to a school of dental hygiene is graduation from high school. Several schools which offer the bachelor's degree admit students to the dental hygiene program only after they have completed 2 years of college. Many schools also require that applicants take aptitude tests conducted by the American Dental Hygienists' Association.

The curriculum at a school of dental hygiene consists of courses in the basic sciences, dental sciences, and liberal arts. These schools offer laboratory work, clinical experience, and classroom instruction in subjects such as anatomy, chemistry, histology, pathology, pharmacology, and nutrition. The ability to work well with people, patience, manual dexterity, and attentiveness to detail are essential in this field.

Employment Outlook

Employment opportunities for dental hygienists are expected to be very good through the 1970's. Despite an anticipated rise in the number of graduates from schools of dental hygiene, the demand is expected to be greater than the number available for employment.

The demand for hygienists is expected to increase as a result of the expanding population and the growing awareness of the importance of regular dental care. Increasing interest in dental care programs for children will lead to more employment opportunities. Increased participation in dental prepayment plans and more group practice among dentists also may result in new jobs for dental hygienists. In addition, a great number of job openings will be created by young women leaving their jobs for marriage and family responsibilities.

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Mature women who wish to return to the field, and those who desire part-time positions can expect to find very good opportunities for employment.

Earnings and Working Conditions

Earnings of dental hygienists are affected by the type of employer, education, and experience of the individual hygienist, and the area where the job is located. Dental hygienists working in private dental offices usually are salaried employees, although some are paid a commission for work performed or a combination of salary and commission. Those employed in research, administrative, supervisory, or teaching positions generally earn higher salaries.

Salaries of dental hygienists employed full time in private offices averaged about $6,700 a year in 1968, according to a survey conducted by the American Dental Association. The annual beginning salary for a dental hygienist employed by the Federal Government was either $5,145 or $5,732 in late 1968, depending on education and experience.

Dental hygienists employed full time in private offices usually work between 35 and 40 hours a week. They may work on Saturdays or during evening hours. Some hygienists work for two or more dentists.

Most dental hygienists are employed in clean, well-lighted offices but may have to stand for long periods of time. Regular medical checkups and strict adherence to established procedures for using X-ray equipment and for disinfection are important health protections for persons in this occupation.

A paid vacation of 2 or 3 weeks is common among hygienists who work full time in dental offices. Dental hygienists employed by school systems, health agencies, and the Federal or State governments have the same hours, vacation, sick leave, and retirement benefits as other workers in these organizations.

Sources of Additional Information

Information about approved schools and the educational requirements needed to enter this occupation may be obtained from:

American Dental Hygienists' Association, 211 East Chicago Ave. Chicago, Ill. 60611.

Other material on opportunities for dental hygienists is available from:

Division of Dental Health, Public Health Service, U.S. Department of Health, Education, and Welfare, Washington, D.C. 20201.

Information concerning licensing requirements can be obtained from the State Board of Dental Examiners in each State.

DENTISTS

(D.O.T. 072.108)

Nature of the Work

Dentists look for and fill cavities in the teeth, straighten teeth, take X-rays of the mouth, and treat gum diseases. Dentists also extract teeth and substitute artificial dentures especially designed for the individual patient. In addition, they clean teeth and examine the mouth for diseases. They spend most of their time with patients, but some time may be devoted to laboratory work such as making dentures and inlays. Many dentists, however—particularly in large cities—send most of their laboratory work to commercial firms. Some dentists employ dental hygienists to clean patients' teeth. (See statement on Dental Hygienists.) They also employ other assistants who perform office work and assist in "chairside" duties.

Most dentists are general practitioners who provide many types of dental care; only about 9 percent are recognized as specialists. About half of these specialists are orthodontists, who straighten teeth. The next larger number, oral surgeons, perform operations in the mouth and jaws. The remainder specialize in periodontology (treating the tissues that support the teeth), prosthodontics (making artificial teeth or

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dentures), pedodontics (dentistry for children), oral pathology (diseases of the mouth), endodontic (root canal therapy), and public health dentistry.

About 3 percent of all dentists are employed primarily in work that does not involve "chairside" practice, such as teaching and research. Many dentists in private practice, however, do this work on a part-time basis.

Places of Employment

Approximately 100,000 dentists were at work in the United States in 1968. About 9 of every ten were in private practice. Of the remainder, about 6,800 served as commissioned officers in the Armed Forces; about 1,300 had other types of Federal Government positions—chiefly in the hospitals and clinics of the Veterans Administration and the Public Health Service; and somewhat less than 2,000 held full-time positions in schools, hospitals, or State and local health agencies. Women dentists represented only about 2 percent of the profession.

Dentists tend to be concentrated in large cities and in populous States. In early 1968, about a third of all dentists were located in the four States of New York, California, Pennsylvania, and Illinois.

Training, Other Qualifications, and Advancement

A license to practice dentistry is required in all States and the District of Columbia. To qualify for a license, a candidate must be a graduate of an approved dental school and pass a State board examination. In 1968, 46 States and the District of Columbia recognized the examination given by the National Board of Dental Examiners as a substitute for the written part of the State board examinations. One State, Delaware, also requires new graduates to serve 1 year of hospital internship. Most State licenses permit dentists to engage in both general and specialized practice. In 10 States, however, a dentist cannot be licensed as a "specialist" unless he has 2 or 3 years of graduate education, several years of specialized experience, and passes a special State examination. Few States permit dentists licensed in other States to practice in their jurisdictions without further examination.

The minimum education requirements for graduation from an approved dental school is 2 years of predental college work followed by 4 years of professional dental school training; 12 of the 51 dental schools in operation in the United States in 1968 required 3 years of predental study. Predental education must include at least a half-year course in organic chemistry and full-year courses in English, biology, physics, and inorganic chemistry.

In dental college, the first 2 years are usually devoted to classroom instruction and laboratory work in basic sciences such as anatomy, bacteriology, and pharmacology. The last 2 years are spent chiefly in the school's dental clinic, treating patients. The degree of Doctor of Dental Surgery (D.D.S.) is awarded by most dental colleges. An equivalent degree, Doctor of Dental Medicine (D.M.D.) is conferred by a few schools.

Competition is keen for admittance to dental schools. In selecting students, schools give considerable weight to college grades and amount of college education; more than half of the students enrolling in dental schools have bachelor's degrees. In addition, all dental schools participate in a nationwide aptitude testing program, and scores earned on these tests are considered along with information gathered about the applicant through recommendations and interviews. Many State-supported dental schools also give preference to residents of their particular States.

Dentists interested in research or teaching, or in becoming specialists, often take graduate work. Graduate training may be obtained at most schools of dentistry, or by serving an internship or residency at 1 of the 270 approved hospitals that offer these programs.

Dental education is very costly because of the length of time required to earn the dental degree. However, the Health Professions Educational Assistance Act of 1963, as amended, provides Federal funds for loans and scholarships up to $2,500 a year to help needy students pursue full-time study leading to the degree.

The profession of dentistry requires both manual skills and a high level of intelligence. Dentists should have good visual memory, excellent judgment of space and shape, delicacy of touch, and a high degree of manual dexterity, as well as scientific ability. A liking for people and a good business sense are helpful in achieving success in private practice.

The majority of newly qualified dentists open their own offices or purchase established practices. Some start in practice with established dentists, to gain experience and to save the money required to equip an office; others may enter residency or internship training programs in approved hospitals. Dentists entering the Armed Forces are commissioned as captains in the Army and Air Force and as lieutenants in the Navy, and may progress to higher ranks. Graduates of recognized dental

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schools are eligible for Federal Civil Service positions and for commissions (equivalent to lieutenants in the Navy) in the U.S. Public Health Service.

Employment Outlook

Opportunities for dentists are expected to be very good through the 1970's. The demand for dental services is expected to increase along with an expanding population; the growing awareness of the importance of regular dental care; and the development of prepayment arrangements which make it easier for people of moderate means to obtain dental service. Expanded dental research activities will require more trained personnel; dental public health programs will need qualified administrators; and dental colleges will need additional faculty members. Many dentists will continue to serve in the Armed Forces.

Improved dental hygiene and fluoridation of community water supplies may prevent some tooth and gum disorders, but such measures—by preserving teeth that might otherwise be extracted—may tend to increase rather than decrease the demand for dental care. Other new techniques, equipment, and drugs, as well as the more extensive use of dental hygienists, assistants, and laboratory technicians may permit individual dentists to care for more patients. However, these developments are not expected to offset the need for more dentists.

Newly trained dentists will be needed not only to fill new openings, but also to replace dentists who retire or die. The number needed to fill vacancies caused by losses to the profession is estimated at about 2,000 each year through the 1970's.

Despite the favorable outlook for dentists, the number of men and women who will be able to enter this field will be restricted by the present limited capacity of dental schools. However, opportunities to obtain dental training are expected to increase because of recent Federal legislation which provides Federal funds to assist in the construction of additional training facilities for dentists.

Earnings and Working Conditions

During the first year or two of practice, dentists often earn little more than the minimum needed to cover expenses, but their earnings usually rise rapidly as their practice develops. Specialists generally earn considerably more than general practitioners. Average income above expenses for all self-employed dentists in 1968 was estimated at about $25,000 a year. In the Federal Government, new graduates of dental schools could expect to receive starting yearly salaries, depending on college records and other qualifications, ranging from $10,203 to $12,174.

Location is one of the major factors affecting the income of dentists who open their own offices. For example, in high-income urban areas dental services are in great demand; however, a practice can be developed most quickly in small towns where new dentists easily become known and where there may be less competition with established practitioners. Although the income from practice in small towns may rise rapidly at first, over the long run the level of earnings, like the cost of living, may be lower than that in larger communities.

Most dental offices are open 5 days a week and some dentists have evening hours. Dentists usually work between 40 and 50 hours a week, although many spend more than 50 hours a week in the office. Dentists often work fewer hours as they grow older, since the hours of work are usually determined by the dentist himself. A considerable number continue in part-time practice well beyond the usual retirement age.

Sources of Additional Information

People wishing to practice in a given State should get the requirements for licensure from the board of dental examiners of that State. Lists of State boards and of accredited dental schools, as well as information on dentistry as a career, may be obtained from:

American Dental Association, Council on Dental Education, 211 East Chicago Ave., Chicago, Ill. 60611.

American Association of Dental Schools, 211 East Chicago Ave., Chicago, Ill. 60611.

REGISTERED NURSES

(D.O.T. 075.118 through .378)

Nature of the Work

Nursing care plays a major role in the treatment of persons who are ill. Registered nurses, in carrying out the medical treatment plan prescribed by physicians, administer medications and treatments; observe, evaluate, and record symptoms, reactions, and progress of patients; assist in the education and rehabilitation of patients; help maintain a physical and emotional environment that promotes patient recovery; instruct auxiliary personnel or students; and perform other duties concerned with the care of the sick and injured, prevention of illness, and promotion of good health.

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Nurses also engage in other activities such as research and serving on the staffs of nursing and community organizations.

Hospital nurses are the largest group of registered nurses. Most are staff nurses, who perform skilled bedside nursing such as caring for a patient after an operation, assisting with blood transfusions and intravenous feedings, and giving medications. They also supervise auxiliary nursing workers. Hospital nurses usually work in a specialty area such as operating room, recovery room, intensive care unit, coronary care unit, emergency room, medical-surgical ward, obstetrics, or orthopedics. Others limit their work to nursing children, the elderly, or the mentally-ill. Still others are engaged primarily in administrative work.

Private duty nurses give individual nursing care to patients needing constant attention. In hospitals, one private duty nurse may sometimes take care of several patients who require special nursing care but not full-time attention.

Office nurses assist physicians, dental surgeons, and occasionally dentists in the care of patients in private practice or clinics. Sometimes, they perform routine laboratory and office work.

Public health nurses care for patients in clinics or visit them in their homes. Their duties include instructing patients and families, and giving periodic nursing care as prescribed by a physician. They instruct groups of patients in proper diet and arrange for immunizations. These nurses work with community leaders, teachers, parents, and physicians in community health education programs. Some public health nurses work in schools.

Nurse educators teach students the principles and skills of nursing, both in the classroom and in direct patient care. They also may conduct refresher and in-service courses for registered nurses.

Occupational health or industrial nurses provide nursing care to employees in industry and government, and along with physicians are responsibile for promoting employee health. As prescribed by a doctor, they treat minor injuries and illnesses occurring at the place of employment, provide for the needed nursing care, arrange for further medical care if necessary, and offer health counseling. They also may assist with health examinations and inoculations to help prevent or control diseases.

Places of Employment

Nearly 660,000 registered nurses were employed in the United States in early 1968. More than two-thirds worked in hospitals, nursing homes, and related institutions. Approximately 60,000 were private duty nurses who cared for patients in hospitals and private homes, and more than 50,000 were office nurses. Public health nurses in government agencies, schools, visiting nurse associations, and clinics numbered more than 40,000; nurse educators in nursing schools accounted for about 25,000; and occupational health nurses in industry, approximately 20,000. Most of the others were staff members of professional nurse and other organizations, State boards of nursing, or were employed by research organizations.

More than one-fourth of all nurses employed in 1968 worked on a part-time basis. About 1 percent of all employed registered nurses are men.

Training, Other Qualifications, and Advancement

A license is required to practice professional nursing in all States and in the District of Columbia. To obtain a license, a nurse must have graduated from a school approved by a State board of nursing and pass a State board examination. A nurse may be licensed in more than one State, either by examination or endorsement of a license issued by another State.

Graduation from high school is required for admission to all schools of nursing. Three types of educational programs—diploma, baccalaureate, and associate degree—offer the basic education required for careers in registered nursing. Diploma programs are conducted by hospital and independent schools and usually require 3 years of training; bachelor's degree programs usually require 4 years of study in a college or university, although a few require 5 years; associate degree

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programs in junior and community colleges require approximately 2 years of nursing education. In late 1968, about 1,300 programs of these three types were offered in the United States. In addition, more than 60 colleges and universities offered master's and doctoral degree programs in nursing.

Programs of nursing include classroom instruction and supervised nursing practice. Students take courses in anatomy, physiology, microbiology, nutrition, psychology, and basic nursing care. Under close supervision, in hospitals and health facilities, they are given clinical experience in the care of patients who have different types of health problems. Students in colleges offering bachelor's degree programs and in some of the other schools are assigned to public health agencies to learn how to care for patients in clinics and in the patients' homes. General education is combined with nursing education in baccalaureate and associate degree programs and in some diploma programs.

Qualified students in need of financial aid may obtain a nursing educational opportunity grant or a low-interest loan under the Nurse Training Act of 1964. Up to 50 percent of the amount of the loan may be cancelled at the rate of 10 percent for each year of full-time employment in nursing after graduation. The Nurse Training Act also provides traineeship funds to cover tuition, fees, and a stipend and allowances for nurses seeking advanced training for positions as administrators, supervisors, nursing specialties, and nurse educators.

Desired personal qualifications for young people considering a nursing career include dependability, good judgment, patience, good physical and mental health, and a desire to care for the sick and injured.

Hospital nursing usually begins with staff positions from which experienced nurses may be advanced to progressively more responsible supervisory positions, such as head nurse, supervisor, assistant director, and director of nursing service. A master's degree, however, often is required for supervisory and administrative positions, as well as for positions in nursing education, clinical specialization, and research. In public health agencies, advancement opportunities are usually limited for nurses without degrees in public health nursing.

Employment Outlook

Employment opportunities for registered nurses are expected to be very good through the 1970's. For nurses who have had graduate education, the outlook is excellent for obtaining positions as administrators, teachers, clinical specialists, public health nurses, and for work in research.

The principal factors underlying the anticipated rise in the demand for nurses include the country's rising population; improved economic status of the population; extension of prepayment programs for hospitalization and medical care, including Medicare and Medicaid; expansion of medical services as a result of new medical techniques and drugs; and increased interest in preventive medicine and rehabilitation of the handicapped. In addition to the number of nurses required for new positions, large numbers will be needed to replace those who leave the field each year because of marriage and family responsibilities.

Nurses wishing to return to work will find very good employment opportunities, either full- or part-time.

Earnings and Working Conditions

Annual starting salaries of registered nurses employed by hospitals in 1968 averaged about $6,400, according to limited data available. Salaries of industrial nurses averaged $127.50 a week in early 1968, according to a survey conducted by the Bureau of Labor Statistics (BLS).

Fees for private duty nurses generally were between $22 and $37 for a basic 8-hour day in early 1968, according to the American Nurses' Association (ANA). Average hourly earnings of nonsupervisory nurses in nongovernmental nursing homes were $3.04, according to an early 1968 BLS survey.

Average (median) annual salaries of public health nurses employed by local government agencies were $7,225 in 1968, as indicated by a National League for Nursing study. Nurse educators and administrators earned an average (median) salary of $8,820 a year in schools of professional nursing, according to a survey by the American Nurses' Association.

In late 1968, the Veterans Administration offered inexperienced nurses, who had either a diploma or an associate degree, an annual salary of $6,321; and baccalaureate graduates were offered $7,330. In other Federal Government agencies, graduates of associate programs having 1 year of experience or those having a diploma or baccalaureate degree entered at $5,732. The beginning salary, in late 1968, for nurse officers (second lieutenants and ensigns) in military service was $5,715 including allowances. Those having bachelor's degrees who were commissioned in the U.S. Public Health Service received salary and allowances totaling $6,507 a year.

The majority of hospital nurses receive extra pay for work on eve-

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ning or night shifts. Nearly all are provided at least 2 weeks of paid vacation after 1 year of service. Most hospital nurses receive from 5 to 13 paid holidays a year and also some type of health and retirement benefits.

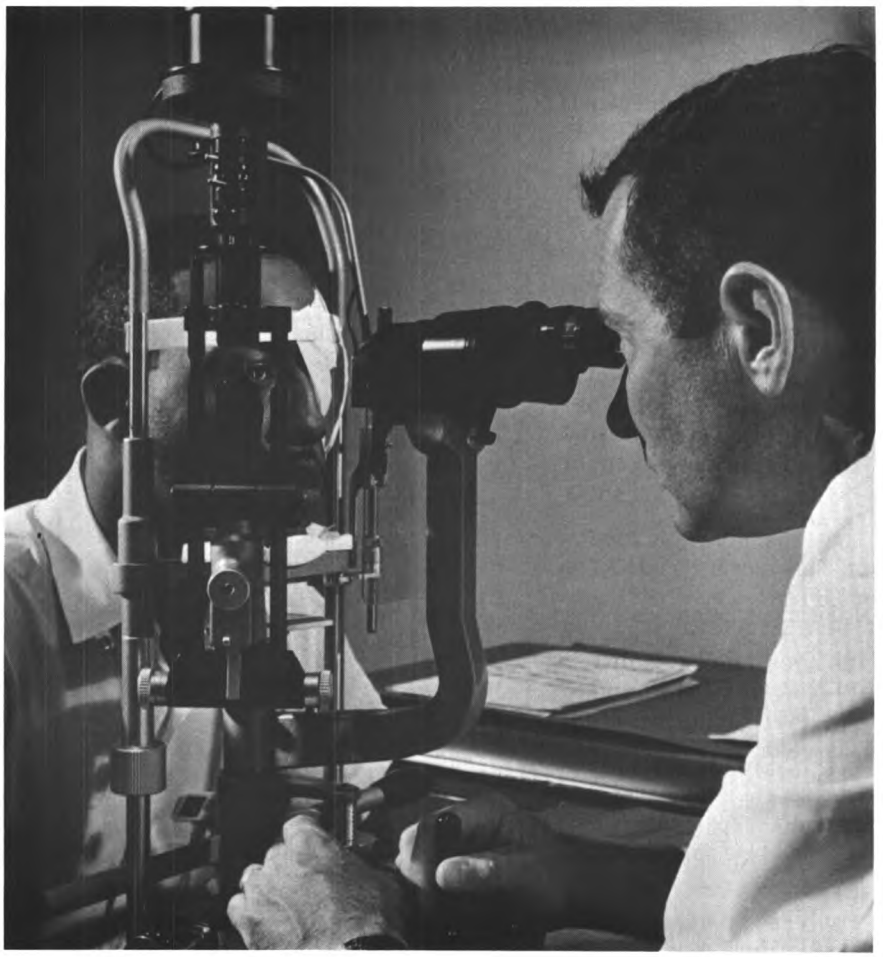
Sources of Additional Information

Information on approved schools of nursing, nursing careers, loans, scholarships, salaries, working conditions, and employment opportunities may be obtained from:

ANA-NLN Committee on Nursing Careers, American Nurses' Asciation, 10 Columbus Circle, New York, N.Y. 10019.

Information about employment opportunities in the Veterans Administration is available from:

Department of Medicine and Surgery, Veterans Administration, Washington, D.C. 20420.



OPTOMETRISTS

(D.O.T. 079.108)

Nature of the Work

Optometrists help people improve and protect their vision. They examine eyes, make tests to determine defects in vision, and, when needed, prescribe eyeglasses, contact lenses, corrective eye exercises, or other treatment that does not require drugs or surgery. Most optometrists supply the eyeglasses prescribed, and sometimes do minor repair work such as straightening eyeglass frames. Some optometrists specialize in work such as treating visual problems of children; fitting partially sighted persons with microscopic and telescopic lenses or other high-magnification aids; and analyzing lighting and other conditions that affect the efficiency of workers. A few are engaged in teaching, research, or a combination of the two.

Optometrists should not be confused with either ophthalmologists, sometimes referred to as oculists, or with dispensing opticians. Ophthalmologists are physicians who specialize in eye diseases and injuries, perform eye surgery, and prescribe drugs or other treatment, as well as lenses. Dispensing opticians fit and adjust eyeglasses according to prescriptions written by ophthalmologists or optometrists; they do not examine eyes or prescribe treatment. (See statement on Dispensing Opticians.)

Places of Employment

Approximately 17,000 optometrists were in practice in the United States in 1968. More than nine-tenths of all optometrists were self-employed. Several hundred served in the Armed Forces and some taught in colleges of optometry. The remainder worked for established practitioners, health clinics, hospitals, optical instrument manufacturers, or government agencies.

About 4 out of 10 optometrists are located in five States—California, Illinois, New York, Pennsylvania, and Ohio. Many small

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towns and rural areas, especially in the South, have no optometrists.

Training, Other Qualifications, and Advancement

A license is required to practice optometry in all States and the District of Columbia. Applicants for licenses must be graduates of an accredited school of optometry and pass a State board examination. In some States, only graduates of certain schools of optometry are admitted to these examinations. A student planning to become an optometrist should, therefore, choose a school approved by the Board of Optometry in the State where he expects to practice. There were 10 schools of optometry in the country in 1968. Applicants having the necessary qualifications have an excellent chance for admission to these schools. Needy students may obain loans and scholarships up to $2,500 a year to pursue full-time study leading to a degree in optometry from Federal funds provided by the Health Professions Educational Assistance Act of 1963, as amended.

At least 6 years of college are needed to become an optometrist —2 years of preopometry education in an approved college, followed by 4 years of training in an optometry school. Preoptometry courses include mathematics, physics, biology, and chemistry, as well as English and other liberal arts courses. Students in schools of optometry have classroom and laboratory work and obtain professional experience in the out-patient clinics operated by the schools. All schools award the degree of Doctor of Optometry (O.D.). Optometrists who wish to specialize often take graduate training. A master's or Ph. D. degree in physiological optics or in a related field is usually required for teaching and research work.

A prospective optometrist should have a liking for mathematical and scientific work, the ability to use delicate precision instruments, mechanical aptitude, and good vision. In addition, to become a successful practitioner, he must be able to deal with people tactfully.

Many beginning optometrists either set up a new practice or purchase an established one. Some take salaried positions to obtain experience and the necessary funds to enter their own practice.

Employment Outlook

Employment opportunities for new optometry graduates are expected to remain favorable through the 1970's. The demand for optometric services is expected to increase, but the total number of new graduates will probably be little more than the number needed to replace optometrists who retire, die, or stop practicing for other reasons.

Opportunities to establish a new practice will be best generally in small towns and in residential areas of cities, where the new optometrist can become known easily. Communities, especially in the South, that have no optometric services available also will offer opportunities for new graduates. A good office location is of major importance for a successful practice. The optometrist should consider the number of optometrists and ophthalmologists in the vicinity in relation to the size, occupations, age, and income level of the population in the area.

Among the factors underlying the expected increase in demand for eye care services are a growing population having larger numbers of older people and white collar workers, the groups most likely to need glasses; the wider recognition of the importance of good vision for efficiency at work and in school; and the greater acceptance of the use of eyeglasses and contact lenses to counteract eye strain and visual defects. Although expanded demand will be met in part by opthalmologists, optometrists will continue to supply a substantial proportion of all eye care services.

Earnings and Working Conditions

New optometry graduates who go into practice for themselves generally have a low income during the first few years. They usually earn less than new optometrists who take salaried positions. After a few years of experience, the situation is usually reversed, since the income of independent practitioners generally exceeds the earnings of salaried optometrists.

In early 1968, starting salaries of new optometry graduates ranged from about $8,000 to $10,000 a year, according to the limited information available. The average net income of experienced optometrists was about $19,000. Incomes varied greatly, depending on location, specialization, and other factors.

Most optometrists work 40 to 49 hours a week, regardless of whether they practice in a small town, medium-size city, or large city. Since the work is not strenuous, optometrists can often continue to practice after the normal retirement age.

Sources of Additional Information

Additional information on optometry as a career is available from:

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American Optometric Association, 7000 Chippewa St., St. Louis, Mo. 63119.

Information on required preoptometry courses may be obtained by writing to the optometry school in which the prospective student wishes to enroll. The Board of Optometry in the capital of the State in which the student plans to practice will provide a list of optometry schools approved by that State, as well as licensing requirements.

PHARMACISTS

(D.O.T. 074.181)

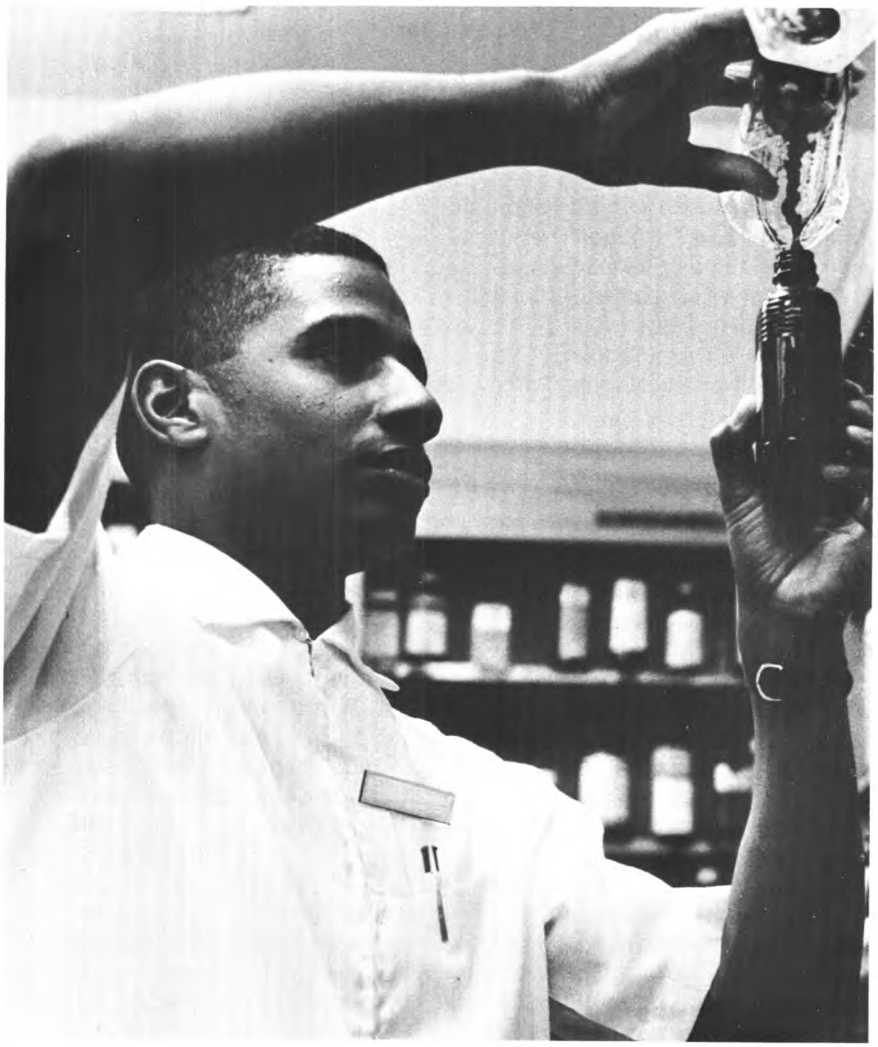
Nature of the Work

Pharmacists dispense drugs and medicines and provide information on their use to help protect people's health. They dispense prescriptions ordered by physicians and other medical practitioners, and supply and advise people on the use of many medicines that can be obtained without prescriptions. Pharmacists must understand the use, composition, and effect of drugs and be able to test them for purity and strength. Compounding—the actual mixing of ingredients to form powders, tablets, capsules, ointments, and solutions—is only a small part of present-day pharmacists' work, since many drugs now are produced by manufacturers in the form used by the patient.

Many pharmacists in drugstores or community pharmacies have sales and managerial as well as professional duties. Besides dispensing drugs, these pharmacists buy and sell other merchandise, hire and supervise store personnel, and oversee the general operation of the store. Some pharmacists, however, operate prescription pharmacies that sell only drugs, medical supplies, and health accessories. Pharmacists in hospitals dispense prescriptions and advise the medical staff on the selection and effects of drugs; they also may make sterile solutions, buy medical supplies, teach in schools of nursing, and perform administrative duties. An increasing number of hospital pharmacists are "clinical pharmacists", who work in patient care areas as active members of the medical team. Some pharmacists, employed as medical sales representatives or "detail men" by drug manufacturers and wholesalers, sell medicines to pharmacies and inform practicing pharmacists, doctors, dentists, and nurses about new drugs. Others teach in colleges, perform research, supervise the manufacture of pharmaceuticals, develop new drugs, edit or write articles for pharmaceutical journals, or do administrative work.

Places of Employment

Of the more than 121,000 licensed pharmacists working in 1968, about 103,000 were in retail pharmacies. Of these retail pharmacists, almost half had their



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own pharmacies or owned them in partnership; the others were salaried employees. Most of the salaried pharmacists were employed by hospitals, pharmaceutical manufacturers, and wholesalers. Others were civilian employees of the Federal Government, working chiefly in hospitals and clinics of the Veterans Administration and the U.S. Public Health Service. Some served as pharmacists in the Armed Forces, taught in colleges of pharmacy, or worked for State and local government agencies.

Nearly every town has at least one drugstore with one or more pharmacist in attendance. Most pharmacists, however, practice in or near cities, and in those States which have the greatest populations.

Women, who represent about 8 percent of all pharmacists, are employed in all branches of the profession. Women students are accepted by all colleges of pharmacy. In 1968 they constituted almost one-sixth of undergraduate enrollments.

Training, Other Qualifications, and Advancement

A license to practice pharmacy is required in all States and the District of Columbia. To obtain a license, one must be a graduate of an accredited pharmacy college, pass a State Board examination and, in most States, also have 1 year of practical experience or internship under the supervision of a registered pharmacist. In 1968, 28 States required that part or all of this experience be acquired after graduation. All States except California, Florida, and Hawaii grant a license without examination to qualified pharmacists already licensed by another State.

In 1968, there were 74 accredited colleges of pharmacy. Some of these were not filled to capacity and qualified applicants usually could expect to be accepted. Needy students may obtain loans or scholarships up to $2,500 a year to pursue full-time study leading to a degree in pharmacy from Federal funds provided by the Health Professions Educational Assistance Act of 1963, as amended. Several scholarships are awarded annually by drug manufacturers, chain drug stores, and State and National pharmacy associations.

To graduate from a college of pharmacy, one must have at least 5 years of study beyond high school. Two colleges that require 6 years award a Ph. D. degree in pharmacy at the completion of the program. A few colleges admit students directly from high school and offer all the education necessary for graduation. Most provide 3 or 4 years of professional instruction and require all entrants to have completed their prepharmacy education in an accredited junior college, college, or university. A prepharmacy curriculum usually emphasizes mathematics and basic sciences, such as chemistry and biology, but also includes courses in the humanities and social science.

The bachelor's degree in pharmacy is the minimum educational qualification for most positions in the profession. However, the master's or doctor's degree in pharmacy or a related field—such as pharmaceutical chemistry, pharmacology (study of the effects of drugs on the body), pharmacognosy (study of the drugs derived from plant or animal sources), or pharmacy administration—usually is required for research work or college teaching. Graduate study also is desirable for pharmacists planning to work in hospitals. Those interested in becoming hospital pharmacists can sometimes secure 1- or 2-year internships which combine graduate or advanced professional study and practical experience in a hospital pharmacy.

Prospective pharmacy students should have a good high school background in mathematics and science. Orderliness and a liking for detail are desirable qualities. In addition, for those planning to become community pharmacists, the ability to deal with people and perform managerial duties is of special importance.

Pharmacists often begin as employees in community pharmacies. After obtaining some experience and the necessary funds, they may become owners of pharmacies. A pharmacist who gains experience in a chain drugstore may advance to managerial positions and, later, to a higher executive position within the company. Hospital pharmacists having the necessary training and experience may advance to chief pharmacist or to other administrative positions.

Employment Outlook

Most new pharmacy graduates will find employment readily available through the 1970's. From 3,500 to 4,000 openings will arise each year as pharmacists retire, die, or transfer out of the profession. These openings, together with the anticipated gradual increase in new positions for pharmacists, are expected to provide enough employment opportunities to absorb each year's graduates.

Some employment growth for pharmacists will result from the establishment of new pharmacies, particularly in residential areas or suburban shopping centers; the country's expanding population; and the rising standard of medical care. Many community pharmacies may hire additional pharmacists because of a trend towards

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shorter working hours. Employment in hospitals probably will rise with the construction of additional facilities and the more extensive use of pharmacists for hospital work. Continued expansion in the manufacture of pharmaceutical products and in research are expected to provide more opportunities for pharmacists in production, research, distribution, and sales. Pharmacists in production, research, will be needed for college teaching and laboratory research.

Earnings and Working Conditions

Beginning pharmacists generally received salaries ranging from $7,800 to $13,000 a year in 1968, according to the American Pharmaceutical Association. The entrance salary in the Federal Civil Service in late 1968 for new graduates of 5-year pharmacy programs was $8,462; graduates of 4-year programs began at $6,981.

Experienced pharmacists practicing in community pharmacies in 1968 generally were paid annual salaries of between $10,000 and $14,000, according to limited data available. Owners and managers earned an average of $15,900 a year.

Community pharmacists generally work more than the standard 40-hour workweek. Drugstores often are open in the evenings and on weekends, and all States require a registered pharmacist to be in attendance during store hours. Despite the general trend toward shorter hours, 48 hours is still the basic workweek for many salaried retail pharmacists, and some work 50 hours or more a week. Self-employed pharmacists often work more hours than those in salaried positions. Those who teach or work for industry, government agencies, or hospitals have shorter workweeks. Salaried pharmacists usually receive paid vacations, health insurance, and other fringe benefits.

Sources of Additional Information

General information on pharmacy as a career can be obtained from:

American Pharmaceutical Association, 2215 Constitution Ave. NW., Washington, D.C. 20037.

Information about student financial aid and chain drug stores may be obtained from:

National Association of Chain Drug Stores, 1625 Eye St. NW., Washington, D.C. 20006.

Information about retail pharmacies may be obtained from:

National Association of Retail Druggists, 1 East Wacker Dr., Chicago, Ill. 60601.

A list of accredited colleges may be obtained from:

American Council on Pharmaceutical Education, 77 West Washington St., Chicago, Ill. 60602.

Current requirements for licensure in a particular State may be obtained from the Board of Pharmacy of that State or from:

National Association of Boards of Pharmacy, 77 West Washington St., Chicago, Ill. 60602.

Information on college entrance requirements, curriculums, and financial aid is available from the dean of any college of pharmacy.

PODIATRISTS

(D.O.T. 079.108)

Nature of the Work

Podiatrists (sometimes called *chiropodists*) diagnose and treat diseases and deformities of the feet. They perform foot surgery, use drugs and physical therapy,

prescribe proper shoes, and fit corrective devices. To help in diagnoses, they take X-rays of the feet and perform blood and other tests. Among the conditions podiatrists treat are corns, bunions, calluses, ingrown toenails, skin and nail diseases, deformed toes, and arch disabilities. They refer patients to medical doctors whenever they observe symptoms in the feet that may be evidence of medical disorders—such as arthritis or heart or kidney trouble.

As a rule, podiatrists provide complete foot care. Some, however, specialize in orthopedics (bone, muscle, and joint disorders), podopediatrics (children's diseases), or foot surgery.

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Places of Employment

Approximately 8,500 podiatrists were actively engaged in the profession in 1968; less than 4 percent were women. Nearly all podiatrists were self-employed. The few who had full-time salaried positions worked mainly in hospitals, podiatric colleges, or for other podiatrists. Small numbers were employed by the Veterans Administration or were commissioned officers in the Armed Forces.

Podiatrists practice mainly in large cities. In 1968, nearly half were in four of the most heavily populated States—New York, Pennsylvania, Illinois, and California. In many small towns and rural areas, especially in the South and the Northwest, there were no podiatrists.

Training, Other Qualifications, and Advancement

All States and the District of Columbia require a license for the practice of podiatry. To qualify for a license, an applicant must be a graduate of an accredited 4-year program in a college of podiatry and must pass a State board examination. In addition, three States—Michigan, New Jersey, and Rhode Island—require applicants to serve a 1-year internship in a hospital or clinic after graduation from a podiatric college; the State of Oklahoma requires 1 year of practice under the direct supervision of an experienced podiatrist. Three-fourths of the States grant licenses without further examination to podiatrists already licensed by another State.

The five colleges of podiatric medicine in the United States will admit only students who have already completed at least 2 years of college. This education must include courses in English, chemistry, biology or zoology, and, in some instances, also physics and mathematics.

The first 2 years of podiatry education are devoted chiefly to classroom instruction and laboratory work in such basic sciences as anatomy, bacteriology, chemistry, pathology, and physiology. During the final 2 years, students spend most of their time obtaining clinical experience. The degree of Doctor of Podiatric Medicine (D.P.M.) is awarded upon graduation. Additional education and experience are generally necessary in order to qualify for work in a specialized area of podiatry. Needy students may obtain loans and scholarships up to $2,500 a year to pursue full-time study leading to a degree in podiatry from Federal funds provided by the Health Professions Educational Assistance Act of 1963, as amended.

Among the personal qualifications considered desirable for a career in this profession are scientific aptitude, manual dexterity, and a good business sense. The ability to get along well with people also is important.

Most newly licensed podiatrists set up their own practices. Some purchase established practices. Others begin by obtaining salaried positions to gain experience and to save the money needed to establish their own practices.

Employment Outlook

The employment outlook for podiatrists is expected to be good through the 1970's. Although podiatrists are a relatively small occupational group, the number of new graduates in podiatry also is small. Opportunities for new graduates to establish their own practices, as well as to enter salaried positions, should continue to be favorable.

The demand for podiatrists' services is expected to grow with the demand for other health services. An important factor underlying this anticipated growth is an expanding population with a greater number of older people. This age group, the one needing most foot care, is entitled to certain podiatrists' services under Medicare. Furthermore, the trend toward providing preventive foot care for children is increasing.

Earnings and Working Conditions

In podiatry, as in many of the other professions, incomes usually rise markedly after the first years of practice. Earnings of individual podiatrists are determined mainly by such factors as ability, experience, the income level of the community served, and location. Starting salaries of new podiatrists ranged from $8,000 to $10,000 in 1968, according to limited information available. The average net income of experienced podiatrists was about $17,500. Income was generally higher in large cities.

Podiatrists generally work 40 hours a week. They may set their hours to suit their practice.

Sources of Additional Information

Applicants for licenses to practice podiatry in a particular State may obtain information on the requirements for licensure from the State board of examiners in the State capital. Information on entrance requirements, curriculums, and scholarships is available from the colleges of podiatric medicine.

Additional information on podiatry as a career, as well as a list of colleges, may be obtained from:

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American Podiatry Association, 3301 16th Street, NW., Washington, D.C. 20010.

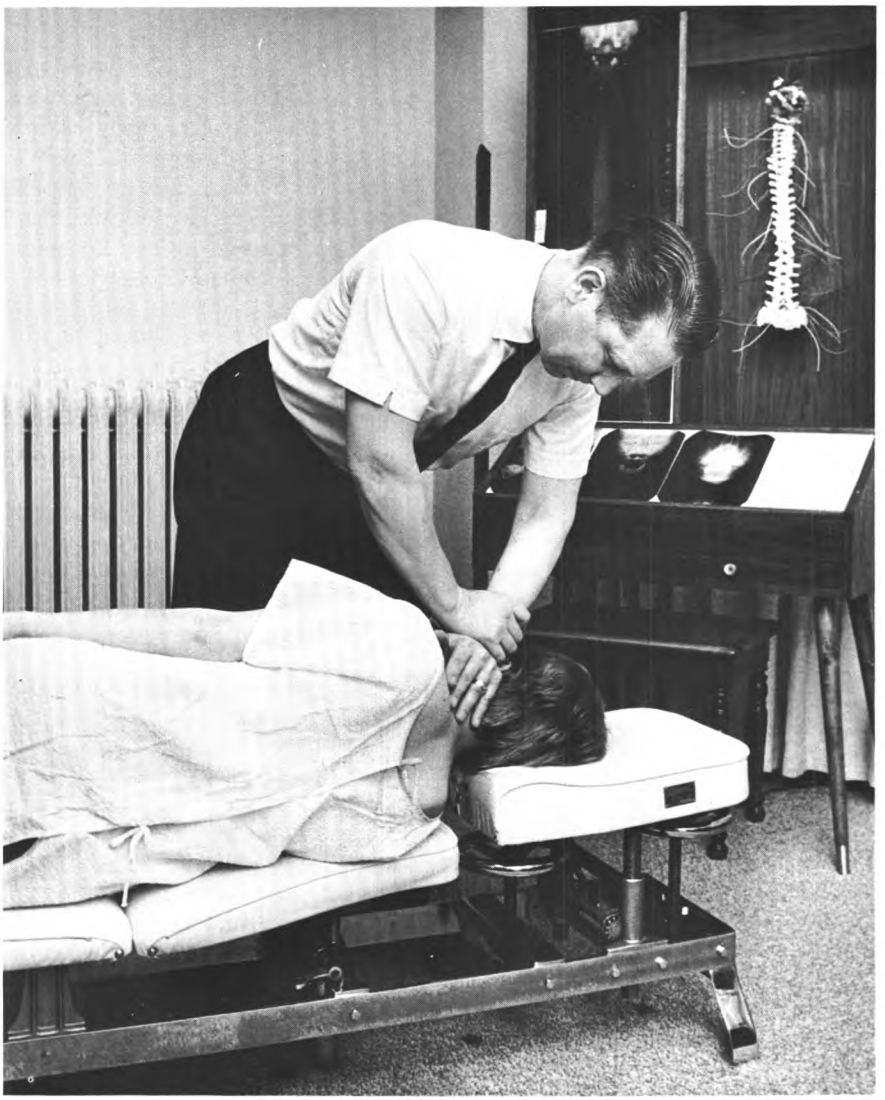
CHIROPRACTORS

(D.O.T. 079.108)

Nature of the Work

Chiropractic is a system of treatment based on the principle that a person's health is determined largely by his nervous system, and that interference with this system impairs his normal functions and lowers his resistance to disease. Chiropractors treat their patients primarily by manual manipulation of parts of the body, especially the spinal column.

Because of the emphasis of the importance of the spine and its position, most chiropractors use X-ray extensively to aid in locating the source of patients' difficulties. Many also use such supplementary measures as water, light, and heat therapy, and prescribe diet, exercise, and rest. Some State laws restrict the type of supplementary treatment permitted in chiropractic. Chiropractic as a system for healing does not include the use of drugs or surgery.



Chiropractor treats patient's spine.

Places of Employment

About 16,000 chiropractors were employed in the United States in 1968; about 9 percent were women. Most chiropractors were engaged in independent private practice. Some were salaried assistants of established practitioners or worked for chiropractic clinics and industrial firms. Others taught or conducted research at chiropractic colleges. About 45 percent of all chiropractors were located in California, New York, Texas, Missouri, and Pennsylvania.

Training, Other Qualifications, and Advancement

Most States and the District of Columbia regulate the practice of chiropractic and grant licenses to chiropractors who meet certain educational requirements and pass a State board examination. The type of practice permitted and the educational requirements for licensure vary considerably from one State to another. In 1968, the States of Louisiana and Mississippi did not regulate the practice of chiropractic nor issue licenses to chiropractors.

Most States require the successful completion of a 4-year chiropractic course following high school graduation. About one-half of the States also require 1 or 2 years of preparatory college work before chiropractic training. About half the States also require

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that chiropractors pass a basic science examination. Chiropractors licensed in one State generally may obtain a license in another State without further examination.

Some of the 11 chiropractic colleges in the United States in 1968 emphasized courses in manipulation and spinal adjustments, while the others offered a broader curriculum including such subjects as chiropractic physiotherapy and nutrition. In most chiropractic colleges, the first 2 years of the 4-year curriculum are devoted chiefly to classroom and laboratory work in subjects such an anatomy, physiology, and biochemistry. The last 2 years are spent in obtaining practical experience in the colleges' clinics. The degree of Doctor of Chiropractic (D.C.) is awarded to students completing 4 years of chiropractic training.

Chiropractic requires considerable hand dexterity but does not call for unusual strength or endurance. Among the personal qualities considered desirable for a chiropractor is the ability to understand people sympathetically.

Most newly licensed chiropractors either set up a new practice or purchase an established practice. Some start as salaried chiropractors to acquire experience and funds necessary to establish their own practice. A moderate financial investment is usually necessary to open and equip an office.

Employment Outlook

The employment outlook for chiropractors is expected to be favorable through the 1970's. Only a slight increase in the demand for chiropractic services is expected. However, the anticipated small number of new graduates of chiropractic colleges probably will be insufficient to fill openings created by growth, as well as to replace chiropractors who retire, die, or stop practicing for other reasons. In view of the trend in many States toward raising educational requirements for chiropractic practice, opportunities may be best for those having the most thorough training.

Opportunities for new graduates to begin their own practice are likely to be best in those parts of the country where chiropractic is most fully accepted as a method of treatment. Opportunities also should be good for those who wish to enter salaried positions in chiropractic clinics, chiropractic colleges, and other organizations employing chiropractors.

The expected slight growth in demand for chiropractors' services will be related to an expanding population and its increasing demand for various types of health care, including chiropractic treatment.

Women are expected to have good opportunities in chiropractic, since some women and children prefer to be treated by women chiropractors. All chiropractic colleges accept women as students.

Earnings and Working Conditions

In chiropractic, as in other types of independent practice, earnings are relatively low in the beginning but rise after the first few years. Incomes of chiropractors vary widely. Experienced chiropractors generally had average yearly incomes ranging from $12,000 to $25,000 in 1968, according to the limited data available.

Sources of Additional Information

Information on State licensing requirements may be obtained from the State Board of licensing in the capital of the State in which the individual plans to practice.

General information on chiropractic as a career may be obtained from:

American Chiropractic Association, American Building, 2200 Grand Ave., P.O. Box 1535, Des Moines, Iowa 50306.

International Chiropractors Association, 741 Brady St., Davenport, Iowa 52805.

OCCUPATIONAL THERAPISTS

(D.O.T. 079.128)

Nature of the Work

Occupational therapists plan and direct educational, vocational, and recreational activities designed to help mentally and physically disabled patients become self-sufficient. They work as members of a medical team which, in addition to physicians, may include physical therapists, vocational counselors, nurses, social workers, and other specialists.

About one-third of the total number of occupational therapists work with emotionally handicapped patients, and the rest with persons having physical disabilities. These patients represent all age groups and varying degrees of illness.

The treatment or training goals for patients referred for occupational therapy may include regaining physical, mental or emotional stability; developing maximum self-sufficiency in the routine of daily living (such as eating, dressing, writing, and using a

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telephone); and, in the latter stage of treatment, performing jobs in a practical work situation for eventual return to employment.

As part of the treatment program for adults, occupational therapists teach manual and creative skills, such as weaving, clay modeling, and leatherworking, as well as business and industrial skills such as typing, operating some business machines, and using power tools. In programs for children, they initiate and direct activities appropriate to the child's maturation level. Therapists may design and make special equipment or splints to aid some disabled patients in performing their activities.

Duties other than patient care include supervising student therapists, occupational therapy assistants, volunteer workers, and auxilary nursing workers. The chief occupational therapist in a hospital may teach medical and nursing students the principles of occupational therapy. Many occupational therapists have administrative duties such as directing occupational therapy programs, coordinating patient activities, or acting as consultants to local and State health departments and mental health authorities. Some occupational therapists are faculty members at colleges and universities offering programs in occupational therapy.

Places of Employment

About 7,000 occupational therapists were employed in 1968; more than 9 out of 10 were women. About three-fifths of all occupational therapists work in hospitals. Most of the remainder are employed in rehabilitation centers, custodial care and nuring homes, schools, out-patient clinics, community mental health centers, and research centers. Some work in special workshops, sanitariums, camps for handicapped children, and in State health departments. Others are employed in home-care programs for patients unable to attend clinics or workshops. Still others are members of the Armed Forces.

Training, Other Qualifications, and Advancement

The minimum requirement for entry into the profession is a degree or certificate in occupational therapy. In 1968, 32 colleges and universities in the United States offered programs in occupational therapy which were accredited by the American Medical Association and the American Occupational Therapy Association. All of these schools offer a bachelor's degree program for high school graduates or transfer students who have completed 2 years of college. Some of the schools also offer shorter programs leading to a certificate in occupational therapy for students having a bachelor's degree in another field.

The academic work in a 4-year program emphasizes the physical, biological, and behavioral sciences and the application of occupational therapy skills. In addition to the academic work, the training includes 6 to 9 months of supervised clinical experience in hospitals or health agencies. Some programs give part of the

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clinical experience during the summer or during part of the senior year. The Armed Forces offer programs whereby graduates of approved schools of occupational therapy, who meet the requirements to become commissioned officers, may receive the clinical part of their training while in the service.

Upon graduation and the completion of the clinical practice period, therapists are eligible to take the examination given by the American Occupational Therapy Association. Those who pass this examination may use the initials O.T.R. (Occupational Therapist Registered).

Eight universities offer a program for occupational therapists leading to a master's degree in occupational therapy. The master's degree also is offered at six universities as the first professional degree for persons holding a baccalaureate degree in related fields. A graduate degree often is required for teaching, research, or administrative work.

Newly graduated occupational therapists generally begin as staff therapists. After several years on the job, they may qualify as senior therapists. Experienced therapists may become directors of occupational therapy programs in large hospitals or clinics, or may become teachers. Some high-level positions, such as program coordinators and consultants, also are available in large institutions and agencies.

Personal qualifications needed in this profession include emotional stability and a sympathetic but objective approach to illness and disability. An ability to teach, ingenuity, and imagination also are needed.

Employment Outlook

Employment opportunities for occupational therapists are expected to be excellent through the 1970's. Despite anticipated increases in the number of graduates of occupational therapy programs, the demand for therapists is expected to exceed the supply as public interest in the rehabilitation of disabled persons and the success of established occupational therapy programs increases. Many occupational therapists will be needed to staff the growing number of community health centers and extended care facilities. There will continue to be numerous opportunities to children, and aged persons, as work with psychiatric patients, well as with persons suffering from cerebral palsy, tuberculosis, and heart disease. In addition to openings that will result from growth, many openings will arise because of the need to replace the high proportion of young women who leave the field for marriage and family responsibilities. Opportunities for experienced women who wish to return to work part time after rearing their children should be excellent.

Earnings and Working Conditions

Annual salaries of staff occupational therapists ranged from $6,500 to $13,000 in 1968, according to the American Occupational Therapy Association. Directors of services, coordinators, consultants, and others in top administrative positions generally earned annual salaries of $15,000 or more in 1968.

In the Federal Government, the beginning annual salary for inexperienced occupational therapists was $6,321 in late 1968. About two-fifths of all occupational therapists in the Federal Government earned $8,500 or more a year.

Most occupational therapists work an 8-hour day, 40-hour week, including some evening work required in a few organizations. Vacation leave usually ranges from 2 to 4 weeks a year, and many positions offer health and retirement benefits.

Sources of Additional Information

American Occupational Therapy Association, 251 Park Avenue South, New York, N.Y. 10010.

PHYSICAL THERAPISTS

(D.O.T. 079.378)

Nature of the Work

Physical therapists help persons with muscle, nerve, joint, and bone diseases or injuries to overcome their disabilities. They evaluate and treat patients who are referred to them by physicians through the use of exercises, mechanical apparatus, massage, and appplications of heat or cold, light, water, or electricity. Most of their patients are accident victims, crippled children, and disabled older persons.

To obtain information needed to develop programs for treatment, physical therapists perform muscle, nerve, and other functional tests. They also keep records of their patients' progress during treatments and attend conferences with physicians and other medical personnel to discuss this progress. In many instances, they help disabled persons to accept their physical handicaps and learn how to adjust to them. Therapists teach patients how to perform exercises and to use and care for braces, crutches, and artificial limbs. They also may show members of

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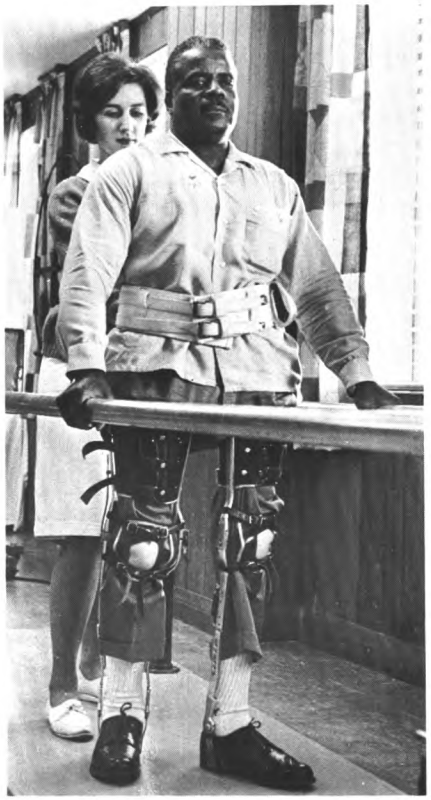

the patients' families how to continue treatments at home.

Physical therapists are members of a health care team that is directed by a physician and may include a nurse, clinical social worker, occupational therapist, psychologist, vocational counselor, and other specialists. Although qualified physical therapists may treat many types of patients, some specialize in caring for children, or for patients having amputations, arthritis, or paralysis. They also may instruct physical therapy students, as well as students of related professions and other health workers.

Places of Employment

Approximately 14,000 licensed physical therapists were employed in 1968. Nearly three-fourths of all therapists were women.

About four-fifths of all physical therapists work in general hospitals; in hospitals that specialize in the care of pediatric, orthopedic, psychiatric, or chronically ill patients; and in nursing homes.

Most of the remainder are employed by rehabilitation or treatment centers, schools or societies for crippled children, and public health agencies. Most of these organizations provide treatment for patients having chronic diseases, and some have home visiting programs.

Some therapists work in physicians' offices or clinics, teach in schools of physical therapy, or work for research organizations. Others serve as consultants in government and voluntary agencies. In addition, a few hundred are members of the Armed Forces.

Training, Other Qualifications, and Advancement

A license is required to practice physical therapy in 48 States and the District of Columbia. To obtain a license, an applicant must have a degree or certificate from a school of physical therapy and pass a State board examination. In the remaining two States (Texas and Missouri), employers require a degree or certificate from an approved school of physical therapy. In 1968, 48 schools of physical therapy (including the Army Medical Service School) were approved by the American Medical Association and the American Physical Therapy Association. Most of the schools are part of large universities; a few are operated by hospitals, which usually have university affiliations.

Most of the approved schools of physical therapy offer bachelor's degree programs. Some schools provide 1- to 2-year programs for students who have completed some college courses. Other schools accept those who already have a bachelor's degree and give a 12- to 16-month course leading to a certificate in physical therapy. Many schools offer both degree and certificate programs.

Among the courses included in a physical therapy program are anatomy, physiology, pathology, clinical medicine, psychology, electrotherapy, hydrotherapy, massage, therapeutic exercise, and administration. In addition to classroom instruction, students are assigned to a hospital or treatment center for supervised clinical experience in the care of patients.

Several universities offer the master's degree in physical therapy. A graduate degree, combined with clinical experience, increases the opportunities for advancement to positions of responsibility in teaching, research, and administration, as well as in the treatment area of physical therapy.

Because an important function of a therapist's job is to help patients and their families understand the treatments and adjust to their handicaps, therapists must have patience, tact, resourcefulness, and emotional stability. In addition, physical therapists should have manual dexterity and physical stamina. For those who wish to determine whether they have the personal qualities needed for this occupation, summer or part-time work as a volunteer in the physical therapy department of a hospital or clinic may prove helpful.

Employment Outlook

Employment opportunities for physical therapists are expected to be excellent through the 1970's. The demand for qualified workers

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is likely to continue to exceed the supply.

The demand for physical therapists is expected to increase very rapidly through the 1970's as the result of increased public recognition of the importance of rehabilitation. Many new positions for physical therapists are expected to be created as programs to aid crippled children and rehabilitation activities are expanded to serve the increasing number of disabled people who require physical therapy. Rapid growth in the number of nursing homes also should result in the need for many more physical therapists to work as staff members. In addition, many openings will continue to arise each year to replace the large number of women who leave the profession for marriage and family responsibilities.

Part-time positions will continue to be available in many communities. These positions are particularly attractive to married women who wish to work on a part-time basis.

Increased demands for physical therapy services also will result in greater opportunities for physical therapy assistance who generally obtain their training in junior colleges or on the job in hospitals and other instiitutions.

Earnings and Working Conditions

New physical therapy graduates received starting salaries ranging between $6,500 and $7,500 in 1968, according to the American Physical Therapy Association. Annual salaries of experienced therapists generally ranged from $8,500 to $11,000. Physical therapists in consultative, educational, or administrative positions earned salaries of $12,000 or more.

In late 1968, beginning therapists employed by the Federal Government received annual starting salaries of $6,321; those having high academic standing, however, were offered $6,981. More than one-fourth of all physical therapists employed by the Federal Government were earning salaries of $9,300 or more a year.

Most physical therapists work 40 hours a week. Almost all receive 2 weeks of vacation or more, and the majority receive sick leave and other fringe benefits.

Sources of Additional Information

American Physical Therapy Association, 1740 Broadway, New York, N.Y. 10019.

SPEECH PATHOLOGISTS AND AUDIOLOGISTS

(D.O.T. 079.108)

Nature of the Work

The inability to speak or hear clearly is a severe hardship to persons of all ages. Children who have difficulty speaking or hearing are usually unable to play freely with others or to participate fully in normal classroom activities. Adults suffering from speech or hearing impairments often face problems of job adjustment. Speech pathologists and audiologists help people having such disorders by identifying and evaluating their problems and by providing treatment. In addition, they may conduct research in the speech and hearing field. Some are engaged in training programs in speech pathology

Speech pathologist works with cerebral palsy youngster.

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and audiology at colleges and universities.

Speech pathologists are concerned primarily with speech and language disorders and audiologists with hearing problems. Speech and hearing, however, are so interrelated that to be competent in either of these occupations, one must have a familiarity with both. The speech pathologist works with children and adults who have speech, language and voice problems resulting from brain injury, cleft-palate, mental retardation, emotional problems, foreign dialect, or other causes. The audiologist also works with children and adults, but concerns himself primarily with the assessment and treatment of hearing problems such as those caused by certain otological or neurological disturbances.

The duties performed by speech pathologists and audiologists vary with their education, experience, and employment setting. In a clinical capacity, they identify and evaluate speech and hearing disorders using various diagnostic procedures. This is followed by an organized program of therapy, with the cooperation of other specialists, such as physicians, psychologists, social workers, physical therapists, counselors, and teachers. Some perform research work, which may consist of investigating communicative disorders and their causes and improving methods for clinical services. Others may supervise clinical activities or perform other administrative work.

Speech pathologists and audiologists working in colleges or universities provide instruction in the principles and bases of communication, communication disorders, and clinical techniques. Many also participate in educational programs for physicians, nurses, teachers, and other professional personnel. In addition, they may work in university clinics and conduct research, usually at university centers.

Places of Employment

Approximately 18,000 persons were employed as speech pathologists and audiologists in 1968. Women represented about three-fourths of total employment. The majority of speech pathologists and audiologists work in public school systems. Colleges and universities employ the next largest number of these specialists in classrooms, clinics, and research centers. The remainder are distributed among hospitals, rehabilitation and community speech and hearing centers, State and Federal Government agencies, industry, and private practice.

Training and Other Qualifications

Most States require a master's degree in speech pathology or audiology or its equivalency for a beginning job as a speech pathologist or audiologist. In other States, the bachelor's degree is required for entry positions.

Undergraduate training in speech pathology and audiology should include course work in anatomy, biology, physiology, physics, and in other related areas such as linguistics, semantics, and phonetics. Some specialized course work in speech and hearing, as well as in child psychology and mental hygiene, also is helpful. This training is usually available at colleges and universities offering a broad liberal arts program.

Graduate education in speech pathology and audiology was offered at 189 colleges and universities in 1968. Professional preparation at the graduate level involves extensive training in the fundamental areas of speech and hearing, including anatomy and physiology, acoustics, and psychological aspects of communication; the nature of speech and hearing disorders; and the assessment, evaluation, and analysis of speech production, langauge abilities, and auditory processes; as well as familiarity with various research methods used in studying speech and hearing. Persons who wish to work in public schools should complete not only the education and other requirements necessary for a teacher's certificate in the State in which they wish to work, but also may have to fulfill special requirements, prescribed by some States, for people who are going to work with handicapped children.

Many scholarships, fellowships, assistantships, and traineeships are available in colleges and universities; however, most of these are at the graduate level. The U.S. Rehabilitation Services Administration, the Children's Bureau, the U.S. Office of Education, and the National Institutes of Health allocate funds for teaching and training grants to colleges and universities offering graduate study in the field of speech and hearing. The Veterans Administration provides stipends for a predoctoral training program.

Speech pathologists and audiologists should have an interest and liking for people, and the ability to approach problems with objectivity. To work effectively with persons having speech and hearing disorders, one must be sensitive, patient, and have emotional stability.

Employment Outlook

Employment opportunities for well-qualified speech pathologists and audiologists are expected to be good through the 1970's. In-

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dividuals who have completed graduate study in speech pathology and audiology will have the best employment opportunities. Opportunities for part-time employment also will be good. Although employment will be available for individuals having only the bachelor's degree and some professional experience, increasing emphasis is being placed on the master's degree as the minimum educational standard for the profession.

Many speech pathologists and audiologists will be needed annually through the 1970's to staff new and expanding programs in schools, clinics, colleges and universities, and hospitals. In addition, many will be needed to replace those who die, retire, or leave the profession for other reasons.

Several factors are expected to increase demand for the services of speech pathologists and audiologists during the 1970's: Population growth, which will result in an increase in the absolute number of persons having speech and hearing problems; a lengthening life span, which will increase the number of persons having speech and hearing problems that are common to later life; a rapid expansion in expenditures for medical research; the growing public interest and awareness of the serious problems connected with speech and hearing disorders, as illustrated by the 1966 Title VI Amendment to the Elementary and Secondary Education Act of 1965, which provides for the education of handicapped children; and expanded Federal programs such as Medicare and Medicaid.

Earnings and Working Conditions

Median salaries of speech pathologists and audiologists employed in colleges and universities ranged from $8,300 to $15,000 for a 9-to 10-month contract period in 1968, according to the American Speech and Hearing Association. Median salaries may be as much as $3,000 higher for an 11- to 12-month contract. Many experienced speech pathologists and audiologists in educational institutions supplement their regular salaries by incomes from consulting, special research projects, and writing books and articles.

The average annual salary for speech pathologists and audiologists in elementary and secondary schools in 1968 was about $8,900, according to an American Speech and Hearing Association survey of members employed in these schools.

In late 1968, the annual starting salary in the Federal Government for speech pathologists and audiologists who had completed all requirements for the master's degree was $8,462. Those having doctoral degrees were eligible to start at $12,243.

Most speech pathologists and audiologists work 40 hours a week; however, personnel engaged in research may work longer hours. Almost all employment situations provide fringe benefits such as paid vacations, sick leave, and retirement progams.

Sources of Additional Information

Information on certification requirements for persons wishing to work in public schools can be obtained from the State department of education at the State capital.

General career information and a list of colleges and universities that have received grants to provide traineeships at the graduate level may be obtained from:

American Speech and Hearing Association, 9030 Old Georgetown Rd., Washington, D.C. 20014.

MEDICAL LABORATORY WORKERS

(D.O.T. 078.128; .168; .281; and .381)

Nature of the Work

Laboratory tests play an important part in the detection, diagnosis, and treatment of cancer, tuberculosis, diabetes, meningitis, and other diseases. Medical laboratory workers, often called clinical laboratory workers, include three levels of workers; medical technologists, technicians, and assistants. They perform these tests under the direction of pathologists (physicians who specialize in diagnosing the causes and nature of disease) or other physicians or scientists specializing in clinical chemistry, microbiology, or the other biological sciences. Medical laboratory workers analyze the blood, tissue, and fluids of the human body using precision instruments, such as microscopes, automatic analyzers, electronic counters, and spectrophotometers. Findings of such tests help physicians treat patients.

Medical technologists, who require 4 years of post-secondary training, perform the more complicated chemical, microscopic, and bacteriological tests and procedures. These tests may include chemical tests to determine blood cholesterol level, or microscopic examination of the blood to detect the possibility of leukemia. Other body fluids may be examined microscopically; cultured to determine the presence of bacteria, parasites, or other micro-organisms; and analyzed for chemical content or reaction.

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Medical technologist dilutes serum sample.

Technologists also may type and cross-match blood samples.

Technologists who work in small laboratories often perform many types of tests. Those employed in large laboratories usually specialize in making several kinds of related tests in areas such as microbiology, parasitology, biochemistry, blood banking, hematology (the study of blood cells), histology (tissue preparation), cytology (analysis of body cells), and nuclear medical technology (the use of radioactive isotops to help detect diseases).

Most medical technologists conduct tests related to the examination and treatment of patients. However, some do research on new drugs or on the improvement of laboratory techniques. Others teach or perform adminstrative duties.

Medical laboratory assistants, who generally do not require college training, assist the medical technologist by performing simple, routine tests and related work that can be learned in a relatively short time.

Medical laboratory assistants employed in large laboratories may concentrate in one of the several areas of laboratory work. Laboratory assistants working in bacteriology, serology, and parasitology prepare and stain slides for study, apply sensitivity disc to culture plates and record results; and prepare specimens for microscopic studies. Those working in hematology collect and perform blood counts and perform tests to determine bleeding time, coagulation time, sedimentation rate, and prothrombin time. In clinical chemistry, assistants analyze samples of body fluids to assist in the diagnosis and treatment of diseases. Assistants working in the blood bank carry out slide and test tube procedures to identify blood groups and keep blood-bank records. They assist in such laboratory techniques as centrifuging urine samples, preparing the samples for microscopic study, and examining stained and unstained sediment. In basal metabolism and electrocardiography work, they prepare patients for tests as well as operate and maintain testing equipment. In small laboratories, medical laboratory assistants generally work in many areas.

In addition to performing routine laboratory tests, assistants may store and label plasma; clean and sterilize laboratory equipment, glassware, and instruments; prepare solutions following standard laboratory formulas and procedures; keep records of tests; and identify specimens.

Medical laboratory technicians having various combinations of education and experience perform tasks that require, in general, a higher level of skill than is required for certain routine work done by assistants but which do not involve the technical knowledge of the highly trained technologists. Like technologists and assistants, they may function as generalists in several areas of the

Technician examines slides.

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laboratory or may specialize in one or more fields.

Places of Employment

An estimated 100,000 medical laboratory workers were employed in 1968—two-fifths were medical technologists. Approximately 80 to 90 percent of all medical laboratory workers were women. However, the number of men in the field has been increasing in recent years.

About three-fourths of all medical laboratory workers are employed in hospitals. Other places of employment include independent laboratories, physicians' offices, clinics, public health agencies, pharmaceutical firms, and research institutions.

The Federal Government employed about 1,600 medical technologists and about 3,000 medical laboratory technicians and assistants in 1968 mostly in the hospitals and laboratories of the Veterans Administration. The remainder were employed largely by the Armed Forces and the U.S. Public Health Service.

Training, Other Qualifications, and Advancement

The usual minimum educational requirement for beginning medical technology approved by of college plus completion of a specialized training program in medical technology approved by the American Medical Association. Undergraduate work must include courses in chemistry, biological science, and mathematics. Such studies give the technologist a broad understanding of the scientific principles underlying laboratory work. The specialized training usually requires 12 months of study and includes extensive laboratory work. In 1968, such training was given in nearly 800 hospitals and schools, most of which were affiliated with colleges and universities. A bachelor's degree is often awarded upon completion of the college affiliated program. A few schools require a bachelor's degree for entry into the program.

About 30 universities also offer advanced degrees in medical technology and related subjects for technologists who plan to specialize in the laboratory or in teaching, administration, or research.

Medical laboratory technicians employed in 1968 had obtained their training in a variety of educational settings. Many had received one or more years of postsecondary education in junior or 4-year colleges and universities. Some technicians have attended private schools, which offer 12 to 18-month programs to high school graduates. Some technicians have gained experience in the Armed Forces. The Navy, for example, conducts a 14-month program to train clinical laboratory and blood bank technicians and the Army has a 50 week "senior medical laboratory specialist" program. A few technicians received training in non-profit vocational and technical schools.

Most medical laboratory assistants employed in 1968 obtained received their training on the job. In recent years, however, an increasing number have received their training in academic programs conducted by hospitals or by vocational schools and junior colleges in cooperation with hospitals. In the future, academic training probably will be required by most employers. Hospitals offer the greatest number of training programs, some of which were established under the Manpower Development and Training Act and the Vocational Education Act. For entry into these programs, graduation from high school with courses in science and mathematics is required generally. The programs last a year and include classroom instruction and practical training in the laboratory. These programs often begin with a general orientation to the clinical laboratory and are followed by courses in bacteriology, serology, parasitology, hematology, clinical chemistry, blood banking, urinalysis, basal metabolism, and electrocardiography.

Medical laboratory assistant programs in junior colleges usually last about 2 years. Students spend the first 9 months in a liberal arts curriculum. During the next year they take courses in clinical laboratory procedures, including practical laboratory experience.

Certification examinations, administered by the Board of Medical Technologists of the American Society of Clinical Pathologists (ASCP), are available to graduates of AMA approved schools. Such registration is important because it indicates that a graduate has maintained educational standards recognized by the medical profession. ASCP-registered medical laboratory personnel are preferred by most employers.

In California, Florida, Hawaii, Tennessee, New York City, and Puerto Rico, medical technologist and technicians also must be licensed.

Technologists may be promoted to supervisory positions in certain areas of laboratory work or, after several years' experience, to chief medical technologists in a large hospital. Graduate education in one of the biological sciences or chemistry usually speeds advancement in all areas. Technicians and Assistants may have difficulty advancing to medical technologists unless they continue their education and ob-

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tain a bachelor's degree in biology or chemistry, or a degree or certificate in medical technology.

Personal characteristics important for medical laboratory work include accuracy, dependability, and the ability to work under pressure. Manual dexterity and the ability to discriminate colors accurately are highly desirable.

Young people interested in a medical laboratory career should select a training program with considerable care. Information should be obtained about the kinds of jobs obtained by graduates, educational costs, the length of time the training program has been in operation, instructional facilities, and faculty qualifications.

Employment Outlook

Employment opportunities for medical laboratory workers are expected to be excellent through the 1970's. New graduates having a bachelor's degree in medical technology will be sought for entry technologist positions in hospitals. A particularly strong demand is anticipated for technologists having graduate training in biochemistry, microbiology, immunology, and virology. Employment opportunities for medical laboratory technicians and assistants also are expected to be very favorable.

Employment opportunities for medical laboratory personnel are expected to expand as physicians increasingly depend upon laboratory tests in routine physical checkups as well as in the diagnosis and treatment of disease. Also, the construction of additional hospital and medical facilities will increase the demand for these workers. Other factors affecting growth in this field include the country's expanding population; rising standards of living; increasing health consciousness; expanding medical services resulting from new medical techniques and drugs; expanding medical research activities; and extension of prepayment programs for medical care, including Medicare.

Advances in technology in general are expected to stimulate the demand for workers in this occupation. Many new technological developments permit greater numbers and more varieties of tests to be performed. Newly developed automated equipment is not expected to limit the growth of medical technologists. However, the development of new automated equipment that reduces the need for personnel to do simple repetitive tasks may tend to partially offset the growth in demand for the services of medical laboratory assistants.

In addition to medical laboratory workers who will be needed to fill openings resulting from the rapid growth of this field, large numbers also will be needed as replacements because many workers are young women who may leave their jobs for marriage and family responsibilities. Opportunities for part-time employment will continue to be available. Opportunities also should be good for qualified older workers and handicapped persons.

Earnings and Working Conditions

Salaries of medical laboratory workers vary by employer and geographic location of employment. In general, medical laboratory workers employed on the West Coast and in large cities received the highest salaries.

The average starting salary for medical technologists was about $6,600 in 1968, according to limited data available. Beginning salaries for medical laboratory assistants generally ranged from $150 to $200 a month less than those paid medical technologists. Technicians received salaries ranging between those paid technologists and assistants.

Newly graduated medical technologists at the baccalaureate level employed by the Federal Government in late 1968 received $5,732. Those having experience, superior academic achievement, or a year of graduate study entered at $6,981. About one-fourth of all technologists in Federal Government agencies earned annual salaries of $8,462 or more. Depending on the amount and type of education and experience, medical laboratory assistants and technicians in the Federal Government earned starting salaries ranging from $4,231 to $5,145 a year in late 1968.

Medical laboratory personnel generally work a 40-hour week. In hospitals, they can expect some night or weekend duty. Hospitals generally provide vacation and sick leave benefits; some have retirement plans.

Laboratories are in general well lighted and clean. Although unpleasant odors and specimens of many kinds of diseased tissue often are present, few hazards exist if proper methods of sterilization and handling of specimens, materials, and equipment are used.

Sources of Additional Information

Information about education and training for medical technologists, technicians, and laboratory assistants meeting standards recognized by the medical profession and the U.S. Office of Education as well as career information on these fields of work may be obtained from:

Registry of Medical Technologists of the American Society of Clinical Pathologists, 710 S.

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Wolcott Ave., Chicago, Ill. 60612.

American Society of Medical Technologists, Suite 1600, Hermann Professional Bldg., Houston, Tex. 77025.

Information about technician training programs offered in private schools may be obtained from:

American Medical Technologists, 710 Higgins Road, Park Ridge, Ill. 60068.

International Society of Clinical Laboratory Technologists, 805 Ambassador Building, 411 North Seventh St., St. Louis, Mo. 63101.

Information about employment opportunities in government clinical and research hospitals may be obtained from the Department of Medicine and Surgery, Veterans Administration, Washington, D.C. 20421, and the Clinical Center, National Institutes of Health, Bethesda, Md., 20014.

MEDICAL RECORD LIBRARIANS

(D.O.T. 100.388)

Nature of the Work

Medical records contain medical and surgical information on each patient, including case histories of illnesses or injuries, physical examination findings, reports on X-rays and laboratory tests, physicians' orders and notes, and nurses' notes. These records are necessary for correct and prompt diagnosis and treatment. In addition, they are used for research, insurance claims, legal actions, evaluation of treatment and medications prescribed, and for instruction in the training of medical, nursing, and related personnel. The medical information found in hospital records is also useful in planning community health centers and programs and in hospital and health care administration.

Medical record librarians plan, prepare, maintain, and analyze records and reports on patients' illness and treatments. They assist medical staff members in research projects; develop auxiliary records (such as indexes of physicians, diseases treated, and operations performed); compile statistics; make summaries or "abstracts" of medical records; develop systems for documenting, storing and retrieving medical information; direct the activities of the medical record department; and train auxiliary personnel. They usually represent their department at hospital staff meetings and may be called to testify in court.

The size and type of institution employing medical record librarians will affect the duties and amount of responsibility assigned to these workers. In large hospitals, chief medical record librarians supervise other medical record librarians, medical record technicians, and clerical workers. In small hospitals, they may be the only employee in the medical record department and may perform clerical as well as professional duties.

Medical record librarians should not be confused with the medical librarians who work chiefly with books, periodicals,

Medical record librarian analyzes microfilm of patient's record.

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and other publications. (See statement on Librarians.)

Places of Employment

More than 12,000 medical record librarians were employed in 1968. Of these, about 3,800 were Registered Record Librarians, according to the American Association of Medical Record Librarians. In addition, about 25,000 other medical record personnel were working in this field. Most medical record librarians were employed in hospitals. The remainder worked in clinics, medical research centers, nursing homes or other extended care facilities, the medical departments of insurance companies and industrial firms, and in local and State health departments. Although most medical record librarians are women, the number of men in the occupation is growing.

Training, Other Qualifications, and Advancement

In 1968, 26 schools approved by the American Medical Association offered training in medical record library science or medical record administration. These schools are located in colleges and universities and in hospitals. The specialized academic training program, about 1 year in length, has about the same curriculum wherever offered. Prerequisites, however, range from 2 to 4 years of college-level work, the latter being increasingly preferred. A certificate is granted upon completion of the 1-year specialized training, except when it has been taken for credit as part of a 4-year undergraduate program leading to a bachelor's degree in medical record science.

The specialized curriculum includes both theoretical instruction and practical experience. The required courses include anatomy, physiology, fundamentals of medical science, medical terminology, medical record science, ethics, management, hospital organization and adminstration, statistics, and data processing. Practical experience involves hospital admitting and discharging procedures; standard indexing and coding practices; compilation of statistical reports; analysis of medical data from clinical records; and knowledge of medical record systems for the X-ray, pathology, outpatient, and other hospital departments.

Graduates of approved schools in medical record science are eligible for the national registration examination, given by the American Association of Medical Record Librarians. Upon passing this examination, they receive professional recognition as Registered Record Librarians.

Medical record librarians must be accurate and interested in detail. They also must be able to communicate clearly in speech and writing. Because medical information is of a confidential nature, they must be especially discreet in processing and releasing it. Those in administrative and supervisory positions must be able to organize and analyze work procedures and to work effectively with other hospital personnel.

Medical record librarians frequently occupy supervisory or administrative positions. They may serve as assistant director or director of a single department or become the coordinator of medical record departments of several hospitals. Others may advance to faculty positions in collegiate or university programs for medical record librarians.

Employment Outlook

Employment opportunities for medical record librarians are expected to be excellent through the 1970's. In addition to the positions created by growth, many openings will occur as young women leave the field for marriage and family responsibilities. High school gradautes will have many opportunities to become medical record technicians to assist librarians.

The increasing number of hospitals and the volume and complexity of hospital records will contribute to a growing demand for medical record librarians.

The importance of medical records will continue to grow rapidly, owing partly to the increased demand for clinical data necessary for research on diseases, the use of new drugs, and other methods of treatment. Special interest in the health care of the aged has necessitated recording data on the conditions of persons in nursing homes and home care programs. More consultants also will be needed to help standardize records in these and other areas where medical record librarians are not available. The increasing use of computers to store and retrieve medical information should permit a greater use of medical records and, in turn, tend to increase the demand for medical record librarians.

Earnings and Working Conditions

The salaries of medical record librarians are influenced by the location, size, and type of employing institution, as well as by the duties and responsibility of the position. The average salary for chief medical record librarians (registered) in 1968 was $7,900 a year, according to the American Association of Medical Record Librarians.

Newly graduated medical record librarians employed by the Federal Government generally

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started at $5,732 a year in late 1968; those having bachelor's degrees and high academic records were eligible to begin at $6,981. More than one-fourth of all medical record librarians in the Federal Government had annual salaries of $9,300 or more in late 1968.

Medical record librarians usually work a regular 40-hour week and receive paid holidays and vacations.

Sources of Additional Information

Information about approved schools and employment opportunities may be obtained from:

The American Association of Medical Record Librarians, 211 East Chicago Ave., Chicago, Ill. 60611.

DIETITIANS

(D.O.T. 077.081 through .168)

Nature of the Work

Dietitians plan nutritious and appetizing meals to help people maintain or recover good health. Their work includes planning general and modified menus that meet nutritional requirements for health or for medical treatment, supervising the personnel who prepare and serve the meals, managing purchases and accounts, and providing guidance on good eating habits. Administrative dietitians form the largest group in this occupation; the others are therapeutic dietitians, teachers, or research workers.

Administrative dietitians apply the principles of nutrition and sound management to large-scale meal planning and preparation, such as that done in hospitals, universities, schools, and other institutions. They supervise the preparation of meals; select, train, and direct food-service supervisors and workers; arrange for the buying of food, equipment, and supplies; enforce sanitary and safety regulations; and prepare records and reports. Dietitians who are directors of a dietary department also formulate departmental policy; coordinate dietary service with the activities of other departments; and are responsible for the development and management of the dietary department budget, which in large organizations may amount to millions of dollars annually.

Dietitian checks patient's meal.

Therapeutic dietitians plan and supervise the service of meals to meet the nutritional needs of patients. They discuss food likes and dislikes with patients and note their intake of food. Other duties of therapeutic dietitians include calculating modified diets, conferring with doctors regarding patients' diets, instructing patients and their families on the requirements and importance of their diets, and suggesting ways to help them stay on these diets after leaving the hospital. In a small institution, one person may serve as both the administrative and therapeutic dietitian.

Some dietitians, particularly those in hospitals affiliated with medical centers, teach dietetic, medical, dental, and nursing students such subjects as dietetics, foods and nutrition, and diet therapy. A few dietitians act as consultants to commercial enterprises, including food processors, equipment manufacturers, and utility companies.

Other members of the profession, called public health nutritionists, conduct studies or surveys of food and nutrition. They also take part in research projects, such as those concerned with the nutritional needs of the aging, persons having chronic diseases, or space travelers.

Places of Employment

About 30,000 dietitians were employed in 1968—less than 10 percent were men. About two-thirds of all dietitians worked in hospitals and related institutions, including about 1,100 who were employed by the Veterans Administration and the U.S. Public Health Service. A sizable number were employed by colleges, universities, and school systems as teachers or as dietitians in food-service programs. Most of the remainder worked for public health agencies, restaurants or cafeterias, and large companies that operate food-service programs for their employees. Some dietitians were commissioned officers in the Armed Forces.

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Training, Other Qualifications, and Advancement

The minimum educational requirement for dietitians is a bachelor's degree with a major in foods and nutrition or institution management. This degree can be obtained in about 350 colleges and universities. Undergraduate work should include courses in foods and nutrition, institution management, chemistry, bacteriology, and physiology, and such related courses as mathematics, psychology, sociology, and economics.

To qualify for professional recognition, The American Dietetic Association recommends the completion of internship programs lasting 12 or 18 months or 3 years of pre-planned experience. The programs and experience must be approved by the Association. Many employers prefer to hire dietitians who have completed an internship. An important phase of the intern's education is clinical experience; the remainder of the internship is devoted to classroom study of menu planning, budgeting, management, other advanced subjects, and to special projects. In 1968, 65 internship programs were approved by The American Dietetic Association—56 for hospitals, 8 for business firms or colleges and universities, and 1 for a food clinic.

Experienced dietitians may be advanced to assistant director or director of a dietary department in a large hospital or other institution. Graduate education is usually required for advancement to higher level positions in teaching and research. Those interested in becoming public health nutritionists must usually earn a graduate degree in this field. Graduate study in institutional or business administration is valuable to those interested in administrative dietetics.

Qualifications needed for work in this field are an interest in and an aptitude for the sciences, particularly chemistry and mathematics. Ability to organize and manage work programs and to work well with others also is important.

Employment Outlook

Opportunities for qualified dietitians are expected to be excellent through the 1970's. The supply of trained dietitians is expected to be considerably less than the demand for them. Employment opportunities are expected to be favorable for full-time and part-time employment.

The major factors expected to contribute to increasing opportunities for dietitians include the expansion of hospital and nursing home facilities, more widespread use of hospitals and medical services by an increasing population, and the growth of community health programs. An increasing number of dietitians also will be needed to direct food services for schools, industrial plants, and commercial eating places, and to engage in food and nutrition research programs. In addition, since many women select this field because of their interest in food and homemaking and then leave the profession for marriage and family responsibilities, replacement needs probably will continue to be high.

The number of men employed as dietitians has been growing slowly but steadily. Men are likely to find increasing employment opportunities, especially as administrative dietitians in college and university food services, hospitals, and commercial eating places.

In an effort to provide the dietetic services demanded, employers increasingly are hiring workers to assist dietitians. Opportunities will be favorable in these positions for college graduates who have majored in fields such as chemistry or the life sciences.

Earnings and Working Conditions

In 1968, hospitals offered new graduates of approved internship programs annual salaries averaging $7,500, according to The American Dietetic Association. New graduates without internship generally received lower starting salaries. Experienced dietitians in hospitals were paid between $7,500 and $15,000 a year. Staff dietitians employed by college and school food services received annual salaries ranging from $6,500 to $9,000.

The entrance salary in the Federal Government in late 1968 for those who had completed internship was $6,981 a year. Beginning dietitians who had a master's degree could start at $8,462 a year. Most experienced dietitians employed by the Federal Government earned between $9,500 and $14,000 a year; a few earned over $15,000. Dietitians employed by State and local governments in 1968 received yearly salaries ranging from about $7,900 to $10,200, according to a survey made by the U.S. Department of Health, Education, and Welfare.

Most dietitians are employed on a weekly work schedule of 40 hours; however, dietitians in hospitals may sometimes work on weekends, and those in commercial food service have somewhat irregular hours. Some hospitals provide laundry service and meals in additon to salary. Paid vacations, holidays, and health and retirement benefits are usually received.

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Sources of Additional Information

Information on approved dietetic internship programs, scholarships, and employment opportunities, and a list of colleges providing training for a professional career in dietetics, may be obtained from:

The American Dietetic Association, 620 North Michigan Ave., Chicago, Ill. 60611.

The U.S. Civil Service Commission, Washington, D.C. 20415, has information on the requirements for dietetic interns and dietitians in Federal Government hospitals.

HOSPITAL ADMINISTRATORS

(D.O.T. 187.118)

Nature of the Work

Hospital administrators have the highest executive position in a hospital, directing all administrative activities. They usually receive general guidance from a governing board with whom they work closely in developing plans and policies.

The day-to-day work of administrators involves the direction of the many and varied activities of the hospital. They work closely with the medical and nursing staffs and make available to them the necessary personnel, equipment, and auxiliary services. They are responsible for hiring and training personnel; preparing and administering the budget; establishing accounting procedures; planning current and future space needs; insuring the proper maintenance of buildings and equipment; purchasing supplies and equipment; and providing for laundry, mail, telephone, information, and other services for the patients and staff.

In small hospitals, typically located in rural or suburban areas, the administrator generally assumes all management functions. In large hospitals, he is assisted by specialists trained in hospital administration or in specialized managerial skills.

Under the direction of the governing board, administrators may carry out large projects to expand or develop the hospital's services. For example, they may organize fund-raising campaigns or plan new building or research programs.

Hospital administrator confers with hospital board.

Administrators meet regularly with their staff to discuss progress, make plans, and solve problems concerning the functioning of the hospital. In cooperation with the medical staff and department heads, they also may develop and maintain teaching programs for nurses, interns, and other hospital staff members. They may address community gatherings, organize community health campaigns, represent their hospitals at meetings, and participate in planning community health care programs.

Places of Employment

About 15,000 hospital administrators were employed in hospitals and related institutions in 1968. About two-thirds of them worked in non-profit or private hospitals and institutions, and the remainder generally worked in Federal, State, and local government hospitals. Of those employed by the Federal Government, most were in Veterans Administration, Armed Forces, and Public Health Service hospitals. About one-fifth of the total number of hospital administrators and their assistants are women; many are members of religious orders.

Training, Other Qualifications, and Advancement

Educational requirements for hospital administrators vary from one institution to another. Most employers prefer persons having at least a master's degree in hospital administration. Others look for individuals having formal training in social or behavioral sciences, industrial engineering, or business administration, and also extensive experience in the health field. A few require their administrators to be physicians or registered professional nurses. Specialized hospitals (such as

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mental or orthopedic hospitals) may prefer administrators to be physicians whose medical specialty is the same as that of the hospital. Hospitals run by religious groups may seek administrators of the same faith.

In 1968, master's degree programs in hospital administration were offered in 27 colleges and universities in the United States. To enter these programs, applicants must have a bachelor's degree, including courses in the natural sciences, psychology, sociology, statistics, accounting, and economics. The programs usually consist of a year of academic study followed by a year of administrative residency in a selected hospital or health agency; some require 2 years of academic study. The curriculum may include courses such as hospital organization and management, accounting and budget control, personnel administration, public health administration, and the economics of health care. The residency involves an orientation to all hospital activities under the supervision of the administrator or his assistant. A Ph. D. in hospital administration, which is offered in three universities, is especially helpful for those interested in teaching and research.

The American College of Hospital Administrators provides financial loans and scholarships to a limited number of students for graduate work in hospital administration. The U.S. Public Health Service also gives a few awards for graduate work in this field.

New graduates having a master's degree in hospital administration usually enter the field as assistant administrators or department heads and occasionally as administrators in small hospitals. Some persons without a master's degree in hospital administration enter the field by working in one of the specialized administrative areas such as personnel, records, budget and finance, or data processing. With this experience and some graduate work, they may be promoted to department head, assistant administrator, and eventually to administrator. The position of hospital administrator, especially in a large hospital, represents a career goal, and these positions generally are filled by transfers from smaller hospitals or by promotion from within.

Personal qualifications needed for success as a hospital administrator include good health and vitality, as well as interest in helping the sick. Skills in working with people, organizing and directing large-scale activities, and public speaking are important assets.

Employment Outlook

Employment opportunities for new graduates having the master's degree in hospital administration are expected to be excellent. Applicants without graduate training will find it increasingly difficult to enter this field. Some positions as administrator are likely to continue to be filled by physicians, nurses, or persons experienced in a specialized administrative area.

The number of positions in hospital administration is expected to grow rapidly through the 1970's. As health facilities and health services are expanded to take care of the increasing population, more positions are likely to be created for hospital administrators, assistants, and department heads. Graduates of programs of hospital administration also will find increasing employment opportunities outside of hospitals in nursing homes and other long-term care institutions, rehabilitation facilities, public health centers, health care planning agencies, and hospitalization and health insurance programs.

Earnings and Working Conditions

Salaries of hospital administrators depend on factors such as the size, type, and geographical location of the hospital, and the size of its administrative staff and budget. Starting salaries for new hospital administration graduates in private hospitals generally ranged from $8,500 to $10,000 a year in 1968; salaries of experienced administrators generally ranged from $11,000 to $25,000, according to the limited data available. New graduates employed in Veterans Administration hospitals started at $8,462 a year in late 1968; a few experienced VA hospital administrators, most of whom are physicians, earned $28,000 a year.

Commissioned officers in the Armed Forces working as hospital administrators hold ranks ranging from second lieutenant to colonel or from ensign to captain. Commanding officers of large Armed Forces hospitals are physicians, and they may hold higher ranks. Hospital administrators in the U.S. Public Health Service are physicians. They are commissioned officers, holding the rank equivalent to captain in the Navy.

Hospital administrators often work long hours. Since hospitals operate on a round-the-clock basis, the administrator may be called upon to settle emergency problems at any time of the day or night. Fringe benefits usually include paid vacations and holidays, sick leave, and pension and insurance coverage.

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Sources of Additional Information

Additional information about hospital administration and a list of colleges and universities offering this training may be obtained from:

American College of Hospital Administrators, 840 North Lake Shore Dr., Chicago, Ill. 60611.

Association of University Programs in Hospital Administration, 1642 East 56th St., Chicago, Ill. 60637.

Information on Federal Government awards for graduate training in hospital administration may be obtained from:

Bureau of Health Professions Education and Manpower Training, National Institute of Health, Bethesda, Md. 20014.

SANITARIANS

(D.O.T. 079.118)

Nature of the Work

Sanitarians are specialists in environmental health. To safeguard the cleanliness and safety of the food people eat, the liquids they drink, and the air they breathe, sanitarians perform a broad range of duties. They inspect food manufacturing and processing plants, dairies, water supplies, hotels and restaurants, hospitals and schools, waste disposal plants, swimming pools and other recreation facilities, housing, and other places for health hazards. They seek compliance with local regulations and with State and Federal laws relating to public health. They also plan and conduct sanitation programs, administer environmental health programs, and promote the enactment of health regulations and laws.

Sanitarian tests pool for bacteria.

Sanitarians entering the profession usually begin in public health or agriculture departments. They inspect facilities and may collect samples of food, air, and water to test for safety. When necessary, they recommend corrective action according to health laws and regulations. As they progress to more responsible investigational work, they frequently are required to give advice on more complex individual and industrial sanitation problems.

Sanitarians having supervisory duties analyze reports of inspections and investigations made by other environmental health specialists, and advise on difficult or unusual sanitation problems. They also may conduct investigations and give evidence in court cases involving public health regulations. In addition, they promote health laws and engage in health education activities, sometimes teaching classes in hygiene and speaking before student assemblies, civic groups, and other organizations. Those in top management positions are involved with the planning and administration of environmental health programs and their coordination with programs of other agencies. Other duties may include advising government officials on environmental health matters and drafting health laws and regulations.

Public health sanitarians work closely with other health specialists in the community (such as the health officer, sanitary engineer, and public health nurse) to investigate and prevent outbreaks of disease, plan for civil defense and emergency disaster aid, make public health surveys, and conduct health education programs.

In large local and State health or agriculture departments, and in the Federal Government, sanitarians may specialize in a particular area of work, such as milk and other dairy products, food sanitation, refuse and other waste control, air pollution, occupational health, housing, institutional sanitation, and insect and rodent control. In rural areas and small cities, they may be responsible for a wide range of environmental health activities.

The professional sanitarian may be assisted by a sanitarian technician during investigations to determine compliance or lack of compliance with health regulations and laws. The technician takes samples for testing and often performs the required tests.

Increasing numbers of sanitarians are being employed outside government agencies. Many work in industry to prevent or minimize contamination hazards and see that clean, healthful, and safe working conditions exist. For example, in a food processing plant, the sanitarian is concerned with the proper disposal of refuse; the cleaning of plant equipment; the control of micro-organisms; and the proper maintenance of buildings, equipment, and employee facilities.

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Where Employed

An estimated 8,000 of the approximately 10,000 professional sanitarians employed in 1968 worked for Federal, State, and local governments. Most of the remainder worked for manufacturers and processors of food products; a small number were teachers in colleges and universities; a few were consultants; others worked for trade associations, in hospitals, or for other organizations. Probably less than 1 percent of all sanitarians are women.

Sanitarians are employed by public health departments in every State, and by private industry in most States. About half of them work in 10 States: California, Florida, Illinois, Indiana, New York, Ohio, Pennsylvania, Texas, Virginia, and Wisconsin.

In addition to professional sanitarians, about 5,000 sanitarian technicians and aides were employed in 1968.

Training, Other Qualifications, and Advancement

A bachelor's degree in environmental health is the preferred preparation for a beginning job as a professional sanitarian, although a bachelor's degree in a basic science generally is acceptable. High level positions usually require a graduate degree in some aspect of public health. In some cases, sanitarian technicians having 2 years of college and work experience can advance to professional sanitarian positions. However, rising hiring standards are restricting entrance to professional positions for those without a bachelor's degree.

Science courses recommended by the American Public Health Association for the first 2 years of college are mathematics, biology, chemistry, physics, and elementary bacteriology. In the second 2 years, the recommended program includes advanced general bacteriology, medical entomology, and a series of public health courses. Liberal arts courses also are considered useful.

Thirty-one colleges and universities offered undergraduate programs in environmental health in 1968; graduate training in environmental health was available in about 100 universities. Some stipends are available under Federal programs for graduate study in this field.

Beginning sanitarians usually start at the trainee level, where they remain up to a year, working under the supervision of experienced sanitarians. They receive on-the-job training in environmental health practice and learn to evaluate conditions and recommend corrective action. After a few years of experience, they may be promoted to minor supervisory positions with more responsibilities. Increased responsibilities usually come with additional experience; sometimes specialization begins at this level, especially in large local health offices. Further advancement is possible to top supervisory and administrative positions.

To keep abreast of new developments and to supplement their academic training, many sanitarians take specialized short-term training courses in subjects such as occupational health, water supply and pollution control, air pollution, radiological health, milk and food protection, metropolitan planning, and hospital sanitation.

In 1968, 31 States had laws providing for registration of sanitarians; in some States, registration is required to practice. Although requirements for registration vary considerably among the States, the minimum educational requirement for registration usually is a bachelor's degree, with emphasis on the biological, physical, and sanitary sciences.

Among the personal qualities useful to sanitarians is the ability to get along well with people. For example, it is often necessary to be tactful in securing the correction of unsanitary conditions. Sanitarians also should be able to speak effectively before civic groups or in court.

Employment Outlook

Employment opportunities for sanitarians are expected to be very favorable through the 1970's. Young people without a college degree with a major in one of the physical or biological sciences or in sanitary science will find that obtaining professional work in the sanitation field is increasingly difficult.

Employment of sanitarians is expected to increase very rapidly through the 1970's, as State and local health agencies expand their activities in the field of environmental health. Radiological health, occupational health, food protection, water pollution, and air pollution are expected to require the services of more trained personnel as health dangers grow under the stimulus of an expanding, highly technological civilization.

Air pollution is one example of an existing environmental hazard of public concern that is expected to increase the demand for sanitarians. It has attracted attention throughout the United States, especially in large cities where smog has become a problem. The discomfort and danger of air pollution from the exhausts of automobiles and from the fumes of industrial plants and other sources have been recognized in legislation at all levels of government. The possible relation of respiratory ailments to

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air pollution also has served to focus attention on this problem.

The expanding population is yet another factor that will intensify the demand for more trained sanitarians. The migration of people from rural to urban areas, along with the growth of industries, will place a greater strain on the food-service, housing, water, recreational, and waste-disposal facilities of urban communiities. Some increase in demand for sanitarians is expected in private industry, primarily in the food industry.

Earnings and Working Conditions

Beginning sanitarians having a college degree usually earned from $7,000 to $7,500 in 1968, according to the National Association of Sanitarians. Salaries of experienced professional sanitarians generally ranged from $8,000 to $10,000 a year; and environmental health directors often earned from $14,000 to $16,000. Sanitary aides without a college degree generally earned from $6,000 to $8,000 in 1968.

Professional sanitarians employed in the Federal Government began at $5,732 or $6,321 in 1968, depending on their academic records. Experienced sanitarians in the Federal service generally earned from $8,500 to $14,400.

Sanitarians spend considerable time away from their desks. Some come in contact with unpleasant physical surroundings, such as sewage disposal facilities and slum housing. Transportation or gasoline allowances frequently are given, and some health departments provide an automobile.

Sources of Additional Information

Information about careers as sanitarians is available from the following associations:

American Public Health Association, 1790 Broadway, New York, New York 10019.

International Association of Milk, Food and Environmental Sanitarians, Blue Ridge Road, P.O. Box 437, Shelbyville, Indiana 46176.

National Association of Sanitarians, 1550 Lincoln Street, Denver, Colorado 80203.

Information on stipends for graduate study is available from:

Division of Allied Health Manpower, Bureau of Health Professions Education and Manpower Training, National Institutes of Health, 9000 Rockville Pike, Bethesda, Maryland 20014.

VETERINARIANS

(D.O.T. 073.081 through .281)

Nature of the Work

Veterinarians (doctors of veterinary medicine) diagnose, treat, and control numerous diseases and injuries among many species of animals. Their work is important for the Nation's food production and for public health. Veterinarians perform surgery on sick and injured animals, and prescribe and administer drugs, medicines, serums, and vaccines. Their work helps to prevent the outbreak and spread of diseases among animals. Because many animal diseases can be transmitted to human beings, this aspect

Zoo veterinarian treats ailing alligator.

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of their work is vital to the public health.

Veterinarians treat animals in veterinary hospitals and clinics, or on the farm and ranch. In addition, veterinarians give advice on the care and breeding of animals.

The majority of veterinarians are general practitioners. Of those who are specialists, the greatest number treat small animals or pets. Some specialize in the health care of cattle, poultry, sheep, swine, or horses. Many veterinarians inspect meat, poultry, and other foods as a part of the Federal and State public health programs. Others are on the faculties of veterinary colleges. Some veterinarians do research related to animal diseases, foods, and drugs; other veterinarians, as part of a medical research team, seek knowledge about the prevention and treatment of human disease.

Places of Employment

About 24,000 veterinarians were working in 1968; only 2 percent were women. Almost two-thirds of all veterinarians were in private practice. The Federal Government employed about 2,400 veterinarians, chiefly in the U.S. Government of Agriculture; some worked for the U.S. Public Health Service. About 1,000 veterinarians were commissioned officers in the Veterinary Corps of the Army and the Air Force. In addition, many worked for State and local government agencies and a few worked for international health agencies. Some were emloyed by colleges of veterinary medicine, agricultural colleges, medical schools, research and development laboratories, large livestock farms, animal food companies, and pharmaceutical companies manufacturing drugs for animals.

In 1968, more than one-third of all veterinarians in the United States were in six States—California, New York, Texas, Illinois, Iowa, and Ohio. Veterinarians in rural areas chiefly treat farm animals; those in small towns usually engage in general practice; those in cities and suburban areas frequently limit their practice to pets.

Training, Other Qualifications, and Advancement

A license is required to practice veterinary medicine in all States and the District of Columbia. To obtain a license, an applicant must have the degree of Doctor of Veterinary Medicine (D.V.M.), awarded upon graduation from a veterinary school approved by the American Veterinary Medical Association; pass a State Board examination; and, in a few States, have some practical experience under the supervision of a licensed veterinarian. A limited number of States issue licenses without further examination to veterinarians already licensed by another State.

For positions in research or teaching, the master's or Ph. D. degree in a field such as pathology, physiology, or bacteriology is usually required, in addition to the D.V.M. degree.

The minimum requirements for the D.V.M. degree are 2 years of preveterinary college work followed by 4 years of professional study in a college of veterinary medicine. However, most candidates complete 3 or 4 years of a preveterinary curriculum which emphasizes the physical and biological sciences. The veterinary college training includes considerable practical experience in diagnosing and treating animal diseases and performing surgery on sick animals, as well as laboratory work in anatomy, biochemistry, and other scientific and medical subjects.

There were 18 colleges of veterinary medicine in the United States in 1968. Some of the qualifications considered by these colleges in selecting students are scholastic record, amount and character of preveterinary training, health, and an understanding and affection for animals. Since veterinary colleges are largely State supported, residents of the State in which the college is located usually are given preference. In the South and West, regional educational plans permit cooperating States without veterinary schools to send a few students to designated regional schools. In other areas, colleges accept a certain number of students from other States and usually give priority to applicants from nearby States which do not have veterinary schools. The number of women students in veterinary colleges is relatively small; about 8 percent of the undergraduates in 1968 were women.

Needy students may obtain loans and scholarships of up to $2,500 a year to pursue full-time study leading to the degree of Doctor of Veterinary Medicine under provisions of the Veterinary Medicial Education Act of 1966 and the Health Manpower Act of 1968. The U.S. Department of Agriculture offers students who have completed their junior year in schools of veterinary medicine opportunities to serve as trainees during the summer months.

Some veterinarians begin as assistants to, or partners of, established practitioners. Many start their own practice with a modest financial investment in essentials such as drugs, instruments, and an automobile. A more substantial financial investment is required to open an ani-

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mal hospital or purchase an established practice. Newly qualified veterinarians may enter the Army and Air Force as commissioned officers. New graduates who pass Federal civil service examinations can qualify for Federal positions as meat and poultry inspectors, disease-control workers, epidemiologists, and research assistants.

Employment Outlook

Veterinarians are expected to have very good employment opportunities through the 1970's. Although an increase in the demand for veterinary services is anticipated in the years ahead, the number of veterinarians will be restricted by the limited capacity of schools of veterinary medicine. However, some expansion in veterinary school facilities is expected because of the passage of the Veterinary Medical Education Act of 1966 which provides funds to assist in the construction of new educational facilities for veterinary colleges. Nevertheless, most of the veterinarians who will receive degrees will be needed to replace those who retire or die. As a result, the demand for veterinarians will probably exceed the supply during the 1970's.

Among the factors underlying the increasing need for veterinary services are the following: An increase in the number of livestock and poultry required to feed an expanding population; a growing pet population resulting from a trend toward suburban living; and an increase in veterinary research. Emphasis on scientific methods of raising and breeding livestock and poultry, and the growth in domestic and international public health and disease-control programs will probably also add to the opportunities for veterinarians.

Women will continue to have good opportunities, especially in small animal practice, teaching, and research.

Earnings and Working Conditions

Veterinarians beginning their own practice generally can cover their expenses the first year and often add to their earnings by working part time for government agencies. As they gain experience, their incomes usually increase substantially.

Newly graduated veterinarians without experience had an annual starting salary of $9,026 in the Federal Government in late 1968. Summer trainees in the U.S. Department of Agriculture could receive $134 each week they worked (representing a rate of $6,981 a year) in 1968.

The average annual salary of veterinarians employed as full professors by universities was about $20,000 in 1968, according to the American Veterinary Medical Association. Experienced veterinarians working for the Federal Government generally earned between $12,000 and $23,000 a year. The income of veterinarians in private practice usually is higher than that of other veterinarians, according to the limited data available.

Veterinarians sometimes are exposed to danger of physical injury, disease, and infection. Those in private practice are likely to have long and irregular working hours. Veterinarians in rural areas may have to spend much time traveling to and from farms and may have to work outdoors in all kinds of weather. Veterinarians can continue working well beyond the normal retirement age because of the many opportunities for part-time employment or practice.

Sources of Additional Information

Additional information on veterinary medicine as a career, as well as a list of schools providing training, may be obtained from:

American Veterinary Medical Association, 600 South Michigan Ave., Chicago, Ill. 60605.

Information on opportunities for veterinarians in the U.S. Department of Agriculture is available from:

Agricultural Research Service, U.S. Department of Agriculture, Hyattsville, Maryland 20782.

Consumer and Marketing Service, U.S. Department of Agriculture, 536 South Clark St., Chicago, Ill. 60605.

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MATHEMATICS AND RELATED FIELDS

Mathematics is both a profession and a tool essential for many kinds of work. The expression of ideas in mathematical language provides a framework within which these ideas can be understood. Mathematics always has been fundamental to science, engineering, and human affairs. The impact of mathematical methods on these fields has increased greatly because of the widespread use of electronic computers. For example, the use of mathematical models made possible by the computer, have opened up broad new horizons, not only in the natural sciences and engineering, but also in the social sciences, medicine, and management and administration. As a result, employment opportunities for persons trained in mathematics have expanded remarkably in the past 15 years.

This chapter includes descriptions of the occupations of mathematician and the two closely related occupations of statistician and actuary. Entrance into any of these fields requires college training in mathematics. For many types of work, graduate education is necessary.

In addition to the professions covered in this chapter, workers in many other jobs use mathematics extensively in performing their work. These workers include engineers, chemists, physicists, astronomers, geophysicists, life scientists, systems analysts, and programers, each of whose work is discussed elsewhere in the *Handbook*. Secondary school teachers of mathematics are not covered in this chapter but are included in the separate statement on Secondary School Teachers.

MATHEMATICIANS

(D.O.T. 020.088)

Nature of the Work

Mathematics is one of the oldest and most basic sciences. Yet, it is also one of the most dynamic and rapidly growing professions. Mathematicians today are engaged in a wide variety of challenging activities, ranging from the creation of new mathematical theories to the translation of scientific and managerial problems into mathematical terms.

Mathematical work may be divided into two broad classes: pure or theoretical mathematics; and applied mathematics, which includes mathematical computation. Theoretical mathematicians develop mathematical principles and discover relationships among mathematical forms. They seek to increase basic mathematical knowledge without necessarily considering its use. Yet, this pure and abstract mathematical knowledge has been instrumental in many scientific and engineering achievements. For example, a seemingly impractical non-Euclidean geometry invented by Bernhard Riemann in 1854 became an integral part of the theory of relativity developed by Albert Einstein more than a half-century later.

Mathematicians engaged in applied work develop theories, techniques, and approaches to solve problems in the physical, life, and

Mathematicians often collaborate with scientists in other fields.

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social sciences. They analyze the various parts of a problem and describe the existing relationships in mathematical terms. Their work ranges from the analysis of vibrations and stability of rockets in outer space to studies of the effects of new drugs on disease. Applied and pure mathematics are not always sharply separated in practice; many important developments in theoretical mathematics have arisen directly from practical problems. For example, in recent years, John Von Neumann developed the theory of games of strategy to improve the methods of analyzing conflicts between competing interests, such as those occurring in war and economics.

Mathematical statisticians use mathematical theory to design and improve statistical methods for obtaining and interpreting numerical information. They develop statistical tools in areas such as probability, experimental design, and regression analysis. They frequently work with statisticians when planning and designing experimental surveys.

An important part of the work in applied mathematics involves using mathematical knowledge and modern computing equipment to obtain numerical answers to specific problems. Some work in this area, requires a very high level of mathematical knowledge, skill, and ingenuity. However, much of this work may not require the advanced training and inventiveness of the mathematician. (See statements on Programers and Systems Analysts.)

More than one-third of all mathematicians are involved in research and development activities. Nearly one-fourth are primarily college teachers, many of whom do research part-time. Another one-fourth are in management and administration—about one-half of whom are concerned with the management and administration of research and development programs. Most of the remainder are concerned chiefly with operations research or production and inspection (quality control) of manufactured products.

Places of Employment

An estimated 65,000 mathematicians (including more than 4,000 engaged in actuarial work) were employed in the United States in 1968; about 10 percent were women. More than one-half of all mathematicians worked in private industry, primarily in independent research and development firms, and in the ordnance, aircraft, machinery, and electrical equipment industries. Other mathematicians were employed as consultants.

Colleges and universities employed about one-third of all mathematicians, some of whom have few or no teaching duties. Others were employed by the Federal Government, mostly by the Department of Defense. A few worked for nonprofit organizations and State and local governments.

Mathematicians were employed in all States. However, they were concentrated in States having large industrial areas and sizable college and university enrollments. Over half of the total were in 7 States—California, New York, Massachusetts, Pennsylvania, Illinois, Maryland, and New Jersey. Nearly one-fourth reside in 3 metropolitan areas—New York, N.Y.; Washington, D.C.; and Los Angeles-Long Beach, Calif.

Training, Other Qualifications, and Advancement

The minimum educational requirement for most beginning positions in mathematics is the bachelor's degree with a major in mathematics, or with a major in an applied field—such as physics or engineering—and a minor in mathematics. For many entrance positions, particularly in research or teaching, graduate training in mathematics is required. Graduate study is also valuable for advancement to more responsible positions in all types of work.

The bachelor's degree in mathematics is offered by about 1,100 colleges and universities throughout the country. The undergraduate mathematics curriculum typically includes courses in analytical geometry, calculus, differential equations, probability and statistics, mathematical analysis, and modern algebra.

Advanced mathematics degrees are conferred by more than 300 colleges and universities. In graduate school, the student builds upon the basic knowledge acquired in the undergraduate curriculum. He usually concentrates on a specific field of mathematics, such as algebra, mathematical analysis, statistics, applied mathematics, or topology, by conducting intensive research and taking advanced courses in that field.

The bachelor's degree is adequate preparation for many positions in private industry and the Federal Government, particularly those connected with computer work. Some new graduates having the bachelor's degree assist senior mathematicians by performing computations and solving less advanced mathematical problems in applied research. Others work as graduate teaching or research assistants in colleges and universities while working toward an advanced degree.

Advanced degrees are required for an ever-increasing number of

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jobs in industry and Government —in research and in many areas of applied mathematics. The Ph. D. degree is necessary for full faculty status at most colleges and universities, as well as for advanced research positions.

For work in applied mathematics, training in the field to which the mathematics will be applied is very important. Fields in which applied mathematics is used extensively include physics, engineering, and operations research; other fields include business and industrial management, economics, statistics, chemistry, the life sciences, and the behavioral sciences. Training in numerical analysis and programing is especially desirable for mathematicians working with computers.

Employment Outlook

Employment opportunties for mathematicians are expected to be favorable through the 1970's. In addition to opportunities resulting from the very rapid growth expected in this field, approximately 4,500 mathematicians will be needed each year to replace those who transfer to other fields of work, retire, or die.

As in the early and mid 1960's, there will be strong demand for mathematicians holding the Ph. D. degree for teaching and research positions in colleges and universities. Not only is the number of students majoring in mathematics expected to increase sharply, but the number of students majoring in other fields and taking mathematics courses will rise also. Thus, colleges and universities will continue to provide most of the employment opportunities for theoretical mathematicians.

Mathematicians also will be required in substantial numbers to solve an increasingly wide variety of complex research and development problems in engineering, natural and social sciences, military sciences, operations research, and business management. This work requires a high degree of mathematical competence and a broad knowledge of one of these fields of application. Expenditures to support these research and development activities have increased steadily in recent years and are expected to continue to rise, although somewhat more slowly than in the past.

Between 1968 and 1980, the number of new graduates having degrees in mathematics is expected to nearly triple. Thus, the number of persons seeking professional mathematics employment is expected to rise sharply, and competition for entry positions may intensify. Nevertheless, graduates who have advanced degrees and those who have a bachelor's degree and a good academic record should find favorable employment opportunities.

The education and training necessary for a degree in mathematics is also an excellent foundation for a number of other occupations, particularly in fields that rely heavily on the application of mathematical theories and methods. Thus, increasing numbers of mathematics graduates are likely to be hired for jobs in high school teaching, statistics, actuarial work, computer programing, systems analysis, economics, engineering, physics, geophysics, and life sciences. Employment opportunities in these related fields probably will be best for those students who combine their mathematics major with a minor in one of these disciplines.

Earnings and Working Conditions

Annual starting salaries in private industry for mathematicians and mathematical statisticians having a bachelor's degree were about $8,600 in 1968, according to the limited information available. New graduates having the master's degree received starting salaries averaging about $1,800 a year higher. Yearly salaries for new graduates having the Ph. D. degree, most of whom have some experience, averaged about $15,000 in 1968.

In the Federal Government in late 1968, mathematicians having the bachelor's degree and no experience could start at either $7,265 or $8,845 a year, depending on their college records. Beginning matheticians who had completed all requirements for the master's degree could start at $8,845 or $10,154; those having the Ph. D. degree could begin at either $11,563 or $12,580 a year.

In colleges and universities, starting salaries for mathematicians having the Ph. D. degree who were employed as teachers in 1968 ranged from about $6,500 to $13,000 for 9 months of teaching. Mathematicians in educational institutions often supplement their regular salaries with income from special research projects, consulting, and writing.

The average (median) annual salary for mathematicians in the National Science Foundation's National Register of Scientific and Technical Personnel was $13,000 in 1968. Only 10 percent earned less than $8,000 a year, and about 10 percent earned $22,300 or more.

Sources of Additional Information

General information on the field of mathematics—including career opportunities, professional training colleges and universities having degree-credit programs, and earnings—may be obtained from:

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American Mathematical Society, P.O. Box 6248, Providence, R.I. 02904.

Mathematical Association of America, 1225 Connecticut Ave. NW., Washington, D.C. 20036.

Specific information on careers in applied mathematics and electronic computer work may be obtained from:

Association for Computing Machinery, 1133 Avenue of the Americas, New York, N.Y. 10036.

Society for Industrial and Applied Mathematics, 33 South 17th St., Philadelphia, Pa. 19103.

Information on careers in mathematical statistics may be obtained from:

Institute of Mathematical Statistics, Department of Statistics, California State College at Hayward, Hayward, Calif. 94542.

Federal Government career information may be obtained from any regional office of the U.S. Civil Service Commission or from:

Interagency Board of U.S. Civil Service Examiners for Washington, D.C., 1900 E St. NW., Washington, D.C. 20415.

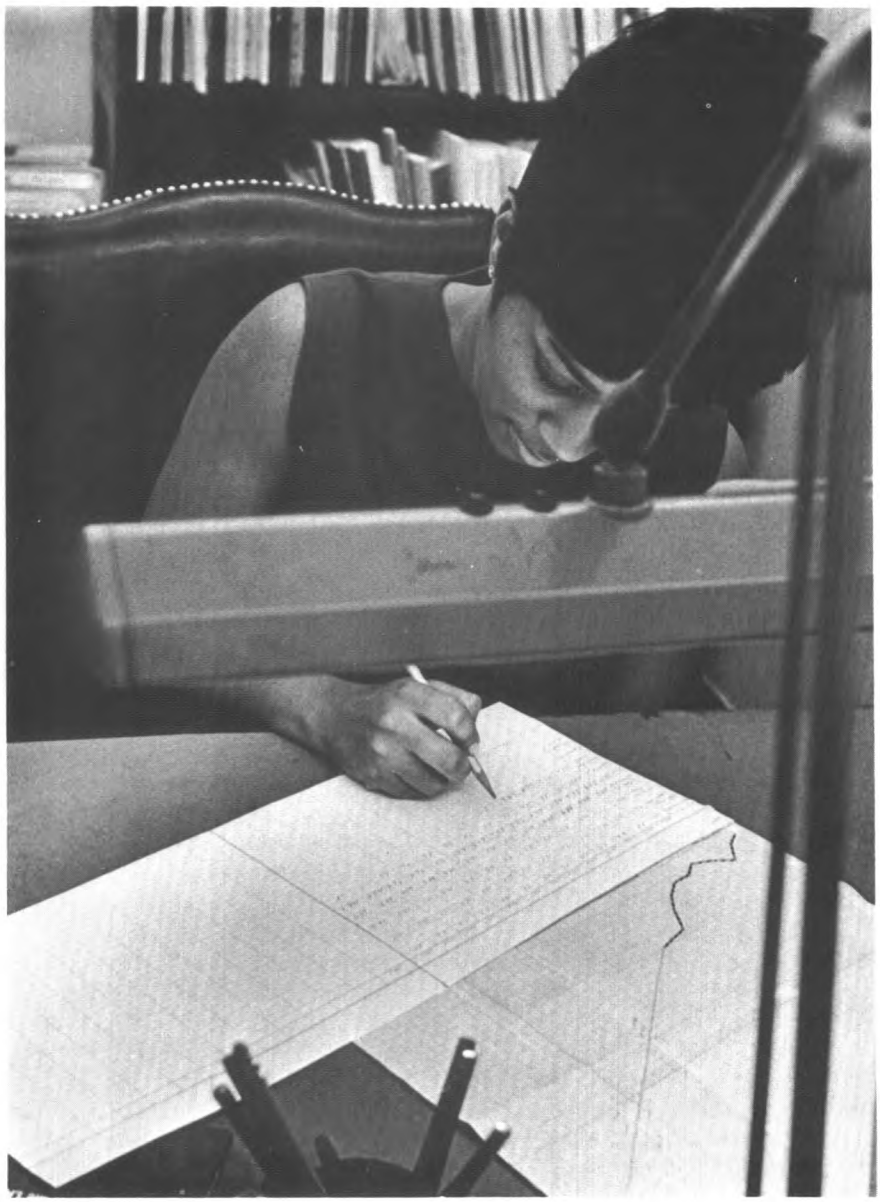
Other sources of information on related occupations, such as Statisticians, Actuaries, Programers, and Systems Analysts may be found elsewhere in the *Handbook*.

STATISTICIANS

(D.O.T. 020.188)

Nature of the Work

More than ever before, the characteristics of the world and its inhabitants are being described in numerical terms. Statisticians collect, develop, analyze, and interpret these data based on their knowledge of statistics and of a particular field, such as economics, demography, behavioral science, education, life science, physical science, or engineering. They may forecast population growth or economic conditions, predict and evaluate the results of new programs, develop quality control tests for manufactured products, or help decision-makers select from alternative choices. Their studies provide government and business officials with the statistical information needed to make decisions and establish policy. Statisticians sometimes work closely with mathematicians and mathematical statisticians. (See statement on Mathematicians elsewhere in this chapter.)



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Many statisticians plan surveys, design experiments, or analyze data. Those who plan surveys select the data sources, determine the type and size of the sample groups, and develop the survey questionnaire or reporting form. They prepare the instructions for those who will collect or report the information and for the workers who will code and tabulate the returns. Statisticians who design experiments prepare mathematical models that will test a particular theory. Those in analytical work interpret collected data and summarize their findings in tables, charts, and written reports. Another large group of statisticians chiefly perform administrative functions in connection with statistical programs. A few are teachers who often combine research with teaching. The remainder are involved in other activities such as quality control, operations research, production and sales forecasting, and market research.

Because statistics has such a wide use, it is sometimes difficult to distinguish statisticians from those subject-matter specialists making a limited use of statistics. For example, a statistician working with data on economic conditions may have the title of economist.

Places of Employment

Approximately 23,000 statisticians were employed in 1968; about one-third were women. Statisticians are employed in nearly all industries; about two-thirds of all statisticians were employed by private industry.

Federal, State, and local Government agencies employed about one-fourth of all statisticians. The Departments of Commerce; Agriculture; Defense; and Health, Education, and Welfare employed most of those in the Federal Government. Colleges and universities employed some statisticians, and several hundred were employed by nonprofit organizations and research institutes.

Although statisticians were employed in all States and areas, about one-third of them worked in three metropolitan areas—New York, N. Y.; Washington, D.C.; and Los Angeles-Long Beach, Calif.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in statistics or mathematics is the minimum educational requirement for many beginning positions in statistics. For other beginning positions in statistics, however, a bachelor's degree, with a major in economics or some other subject-matter field and a minor in statistics, is preferable. A graduate degree in mathematics or statistics is essential for faculty positions at most colleges and universities, as well as being an asset for advancement to top administrative and consulting positions. Advancement in analytical and survey work usually requires graduate training in the subject-matter field as well as in statistics.

Relatively few colleges and universities offer training leading to a bachelor's degree with a major in statistics. Most schools, however, offer either a degree in mathematics or a sufficient number of courses in statistics to qualify graduates for beginning positions. Courses essential for statisticians include college algebra, plane trigonometry, analytical geometry, differential and integral calculus, linear algebra, and at least one course in statistical methods. Other important courses cover sampling correlation and regression analysis, experimental design, probability theory, and computer uses and techniques. For many quality control positions, training in engineering and in the application of statistical methods to manufacturing processes are desirable. For many market research, business analysis, and forecasting positions, courses in economics, business administration, or a related field are helpful.

Graduate degrees in statistics were conferred by about 50 colleges and universities in 1968, and many other schools offered one or two graduate level statistical courses. Entrance into a graduate program in statistics usually requires a bachelor's degree with a good background in mathematics. The student should attend a school where he can pursue research projects in his subject-matter field, as well as take advanced courses in statistics.

Beginning statisticians who have only the bachelor's degree often spend much of their time performing routine statistical work. Through experience, they usually advance to positions of greater technical and supervisory responsibility. Those who have exceptional ability and interest may be promoted to top management positions.

Among the personal qualifications needed by statisticians are an interest and facility in mathematics, and the ability to translate problems into statistical terms.

Employment Outlook

The employment outlook for statisticians is expected to be good through the 1970's. In addition to new positions resulting from the very rapid growth expected in the profession, hundreds of statisticians will be

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needed annually to replace those who retire, die, or transfer to other fields of work.

Statisticians will be required in increasing numbers by private industry in quality control work in manufacturing. Those having a knowledge of engineering and physical sciences will be needed to work with scientists and engineers in research and development. Business firms are expected to rely more heavily on statisticians to forecast sales, analyze business conditions, modernize accounting procedures, and solve other management problems.

Government agencies will need statisticians for on-going and new programs in fields such as social security, health, education, and economics. Others will be required to teach the anticipated growing numbers of college and professional school students, especially as the more widespread application of statistical methods makes such courses increasingly important to non-mathematics majors.

Along with the expected growth in demand for statisticians, a steady increase in the number of statistics graduates is expected. However, in recent years, the number of these graduates was barely enough to replace those statisticians who retired or died. Thus, employment opportunities for new college graduates who have degrees in statistics are expected to be very good through the 1970's.

Earnings and Working Conditions

Starting salaries for new college graduates employed as statisticians in private industry generally averaged between $6,000 and $8,000 a year in 1968, according to the limited information available. Salaries for beginning statisticians having the master's degree averaged about $1,500 a year more than for those having only the bachelor's degree.

In the Federal Government service in late 1968, statisticians who had the bachelor's degree and no experience could start at either $5,732 or $6,981 a year, depending on their scholastic records. Beginning statisticians who had completed all requirements for the master's degree could start at $6,981 or $8,462. Those having the Ph. D. degree could begin at $10,203 or $12,174.

Statisticians employed by colleges and universities generally earn somewhat less than those employed by private industry and the Federal Government. Some indication of the salary levels of statisticians employed as teachers may be obtained from the earnings data for college and university teachers as a group. (See statement on College and University Teachers.) In addition to their regular salaries, statisticians in educational institutions sometimes earn extra income from outside research projects, consulting, and writing.

Sources of Additional Information

General information on career opportunities in statistics may be obtained from:

American Statistical Association, 810 18th Street, NW., Washington, D.C. 20006.

Society for Industrial and Applied Mathematics, 33 South 17th St., Philadelphia, Pa. 19103.

Information on Federal government careers may be obtained from:

Interagency Board of U.S. Civil Service Examiners for Washington, D.C., 1900 E St. NW., Washington, D.C. 20415.

A list of reading materials on career opportunities in the data processing field may be obtained from:

Association for Computing Machinery, 1133 Avenue of the Americas, New York, N.Y. 10036.

ACTUARIES

(D.O.T. 020.188)

Nature of the Work

Actuaries are responsible for designing insurance and pension plans and for maintaining these programs on a sound financial basis. They are concerned with rates of mortality (death), morbidity (sickness), injury, disability, unemployment, retirement, and property loss from accident, theft, fire, and other potential hazards. Actuaries use statistical data and other pertinent information to construct tables on the probability of insured loss. They develop and analyze estimates of the insurer's future earnings and investment income, expenses, and policyholder claims. Taking all these factors into consideration, actuaries determine the premium rates and policy contract provisions for each type of insurance offered. Most actuaries specialize in either life and health insurance or property and liability (casualty) insurance.

To perform their duties effectively, actuaries must keep abreast of general economic and social trends and legislative, health, and other developments that may affect insurance practices. Because of their broad knowledge of the insurance field, actuaries frequently work on problems arising in investment, underwriting, group insurance, and pension sales and service de-

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partments. Actuaries in executive positions may help determine general company policy. In that role, they also may testify before public agencies on proposed legislation affecting the insurance business or to justify intended changes in premium rates or contract provisions.

Actuaries employed by the Federal Government usually deal with a particular Government insurance or pension program, such as social security (old-age, survivors, disability, and health insurance) or life insurance for veterans and members of the Armed Forces. Acturaries in State government positions are involved in the supervision and regulation of insurance companies, the operation of State retirement or pension systems, and problems connected with unemployment insurance or workmen's compensation. Consulting actuaries perform services for private companies, unions, and government agencies, such as setting up pension and welfare plans and making periodic actuarial evaluations of these plans.

Places of Employment

More than 4,000 persons were engaged in actuarial work in the United States in 1968. About 2,600 had full professional status. Less than 3 percent of all actuaries were women. About one-half of all actuaries were employed in the 3 States that are the major centers of the insurance industry—New York, Connecticut, and Massachusetts.

Private insurance companies employed about four-fifths of all actuaries. The majority of this group worked for life insurance companies; the remainder worked for property and liability (casualty) companies. The size of an insurance company's actuarial staff depends primarily upon the volume of its insurance work. Large companies may employ as many as 50 to 100 actuaries. Small companies may have only a few actuaries on their staffs or rely instead on rating bureaus or consulting firms. Consulting firms and rating bureaus (associations that supply actuarial data to member companies) employed most of the remainder. Several hundred actuaries worked for private organizations administering independent pension and welfare plans or for Federal or State Government agencies. A few taught in colleges and universities.

Training, Other Qualifications, and Advancement

A bachelor's degree with a thorough foundation in calculus, probability, and statistics is required for entry into actuarial work. The new graduate having a major in fields such as mathematics, statistics, economics, or business administration can usually qualify for beginning actuarial positions. The prospective actuary should take courses in algebra, analytical geometry, differential and integral calculus, mathematical statistics, and probability. Other desirable courses include insurance law, economics, investments, accounting, and other aspects of business administration. Although only about 20 colleges and universities offer training specifically designed for actuarial careers, several hundred institutions offer the necessary courses.

It usually takes from 5 to 10 years after entering a beginning actuarial position to complete the entire series of examinations required for full professional status. These examinations cover general mathematics, specialized actuarial mathematics, and all phases of the insurance business. Those considering an actuarial career should take the beginning examinations covering general mathematics while still in college. Success in passing these first examinations helps the beginner to evaluate his potential as an actuary. Those who pass these examinations usually have better opportunities for employment and a higher starting salary. The advanced examinations, usually taken by those in junior actuarial positions, require extensive home study and experience in insurance work.

Actuarial assistants discuss research project with senior executive.

The 10 actuarial examinations for the life insurance and pension field are given by the Society of Actuaries, and the nine for property and liability (casualty) insurance by the Casualty Actuarial Society. Since the first two parts of the examination series of either Society are the same, the student may defer the selection of his insurance specialty

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until he has acquired more familiarity with the field. "Associate" membership is awarded after completion of five examinations in either specialty; the designation of "Fellow" is conferred after the successful completion of the entire series of examinations.

Employers frequently give preference to applicants who have passed one or more of the actuarial examinations, or to those who have actuarial experience gained in the special summer training programs for college students offered by some insurance companies. A beginning actuary usually is rotated among different jobs to learn various actuarial operations and to become familiar with different phases of insurance work. At first, his work may be rather routine, such as preparing calculations or tabulations for actuarial tables or reports. As he gains experience, he may supervise actuarial clerks and prepare correspondence and reports.

Advancement to more responsible work as assistant, associate, and chief actuary depends largely upon the individuals on-the-job performance and the number of actuarial examinations he has successfully completed. Many actuaries, because of their broad knowledge of insurance and related fields, qualify for administrative positions in other company activities, particularly in underwriting, accounting, or data-processing departments. A significant number of actuaries advance to top executive positions.

Employment Outlook

Employment opportunities for actuaries are expected to be excellent through the 1970's. New graduates who have the necessary mathematical education and have passed some actuarial examinations will be in particular demand as trainees.

Actuarial employment is expected to grow very rapidly primarily because of the rising numbers of insurance policies of all kinds which result, in part, from the existence of an affluent and more insurance-conscious population and business community. Actuaries will be needed to solve the growing number of problems arising from continuously changing and increasingly complex insurance and pension coverage. The expanding number of group health and life insurance plans and pension and other benefit plans will require actuarial services. Additional actuaries will be needed by government regulatory agencies. Demand will continue to be strong for actuaries capable of working with electronic computers. Some actuaries also will be needed each year to replace those who retire, die, or transfer to other occupations.

Earnings and Working Conditions

Starting salaries of new college graduates entering actuarial work as trainees in insurance companies ranged from $7,000-10,000 a year in 1968, depending on the individual's college record and experience. Most insurance companies paid $400-500 a year more if the trainee had completed his first actuarial examination and another $300-500 with the completion of the second examination.

In the Federal Government service in late 1968, new graduates who have the bachelor's degree entering actuarial work could start at $9,078 a year, if their college records were sufficiently good. The corresponding figure for those who have a master's degree is $10,154.

Beginning actuaries can look forward to a marked increase in earnings as they gain professional experience and successfully complete either Society's series of examinations. In insurance companies, merit pay increases are given to those who pass one or a group of the examination. Fellows of either the Society of Actuaries or the Casualty Actuarial Society earn over $15,000 a year and many actuaries earn more than $25,000 a year. Those in executive positions in large companies earn over $30,000.

Sources of Additional Information

Information on professional opportunities and qualifications may be obtained from:

Casualty Actuarial Society, 200 East 42d St., New York, N.Y. 10017.

Society of Actuaries, 208 South LaSalle St., Chicago, Ill. 60604.

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NATURAL SCIENCES

The natural sciences are concerned with the physical world and the living things in it. These sciences may be divided into three broad groups—physical, life, and environmental sciences —all of which are discussed in this chapter. Mathematics, often considered part of the natural sciences, is discussed in a separate chapter elsewhere in the *Handbook*.

The physical sciences are the largest field of employment among the natural sciences; over 200,000 physical scientists were employed in 1968. Chemistry is the largest of the physical science specialties; more than 130,000 chemists were employed in 1968. Smaller numbers were employed as physicists (45,000) and as astronomers (1,400). There were nearly 20,000 other physical scientists; more than half were metallurgists.

An estimated 170,000 life scientists specialized in 1 of 3 broad fields—agriculture, biology, or medicine. The largest number, more than 66,000, worked in biological sciences. Nearly 48,000 were employed as agricultural scientists, and more than 54,000 worked on problems related to medical science.

The environmental sciences are relatively small fields of scientific employment. In 1968, the number of environmental scientists totaled about 39,000. Of these, the largest group were geologists (23,000). Smaller numbers were employed as geophysicists (7,000) oceanographers (5,200), and meteorologists (4,000).

A bachelor's degree is the usual minimum educational requirement for work in the natural sciences. Graduate training is needed for many positions, especially in teaching and research, and is helpful for advancement in all types of work. In some fields, advanced degrees are needed for most positions.

Employment in the natural sciences has grown rapidly in recent years and the outlook is for continued rapid growth through the 1970's. In general the most important factor underlying the expected increase in employment is the likely growth of expenditures for research and development. These expenditures have increased rapidly in recent years and are expected to continue to increase, although somewhat more slowly than in the past. Other factors contributing to the expected employment growth in the natural sciences are the expansion of industry, the increasing complexity of industrial products and processes, and the sharp increase in science enrollments expected in college and universities.

The following chapter presents descriptions of some of the major occupations within the natural sciences. In addition to these occupations, workers in many other fields may require a strong background in the natural sciences. Included are engineering, mathematics, and health service occupations, which are described elsewhere in the *Handbook*.

Environmental sciences

The environmental sciences are concerned with the history composition, and characteristics of the earth's land, water, interior, atmosphere, and its environment in space. A large group of the scientists in this field explore for new sources of mineral fuels and ores. Some scientists perform basic research to increase scientific knowledge. Others work mainly in applied research use knowledge gained from basic research to solve practical problems. Meteorologists, for example, apply scientific knowledge of the atmosphere to forecast weather conditions for specific localities and times. Some of these scientists teach in colleges and universities. They also may administer scientific programs and operations.

Many environmental scientists specialize in one particular branch of their broad occupational field. Geophysicists, for example, may be specialists in geodesy, hydrology, seismology, or physical oceanography. This chapter discusses the specialties and the employment outlook for four environmental science occupations —geologist, geophysicist, meteorologist, and oceanographer.

GEOLOGISTS

(D.O.T. 024.081)

Nature of the Work

Geologists study the structure, composition, and history of the earth's crust. Many geologists spend a large amount of their time in field work. They study rock cores and cuttings from deep holes drilled into the earth and examine rocks, minerals, and fossils found at or near the surface of the earth. Geologists also spend considerable time in laboratories, where they study geological specimens, analyze geological materials under controlled temperature and pressure, and do

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other research on geological processes. To present the results of their field and laboratory investigations, geologists prepare reports, articles, and maps of surface and subsurface geological phenomena. In their work, geologists use a variety of complex instruments, such as the X-ray diffractometer, which determines the structure of minerals, and the petrographic microscope, which permits close study of how rocks have been formed and modified by earth processes.

Some geologists administer research and exploration programs. Others teach in colleges and universities, where they also may work on research projects.

Research geologist pans stream sediments for heavy metals.

Geologists usually specialize in one branch of the science. *Economic geologists* find and supervise the development of mineral and fuel resources. *Petroleum geologists* specialize in the discovery and recovery of oil and natural gas. *Engineering geologists* apply geological knowledge to engineering problems in the construction of roads, airfields, tunnels, dams, harbors, and other large structures. *Stratigraphers* study the distribution and relative arrangement of sedimentary rock layers by analyzing their fossil and mineral content. *Sedimentologists* determine the processes and prodcts involved in the formation of sedimentary rocks, and *paleontologists* identify, classify, and determine the significance of fossils found within the sediments. *Petrologists* classify and determine the origins of rock masses. *Mineralogists* examine, analyze, and classify minerals and precious stones according to their composition and structure. *Geomorphologists* study the form of the earth's surface and the forces, such as erosion and glaciation, which change it.

Increasing numbers of geologists specialize in new fields that require a detailed knowledge of both geology and one or more other sciences. Among these specialists are *geochemists*, who study the chemical composition of and the changes in minerals and rocks, and *astrogeologists*, who use knowledge of the earth's geology in studies of surface conditions on the moon and the planets. *Geological oceanographers* study the sedimentary and other rocks on the ocean floor and continental shelf. (See statement on Oceanographers elsewhere in this chapter.)

Places of Employment

Nearly 23,000 geologists were employed in the United States in 1968; only about 3 percent were women. Nearly three-fifths of all geologists worked for private industry, mostly for petroleum and natural gas producers. A number of the employees of American petroleum companies worked in

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foreign countries. Geologists also were employed by companies engaged in various other types of mining. Some geologists specialized in problems related to the construction of dams, bridges, buildings, and highways. Still other geologists worked as independent consultants offering specialized services to industry and government.

The Federal Government employed approximately 2,000 geologists, two-thirds of whom worked for the Department of the Interior in the U.S. Geological Survey, the Bureau of Mines, and the Bureau of Reclamation. State agencies also employed geologists, some of whom worked on surveys conducted in cooperation with the U.S. Geological Survey. Although a few positions were in foreign countries, most Federal jobs were in the United States.

Colleges and universities employed more than 4,500 geologists. A few others worked for nonprofit research institutions and museums.

Training, Other Qualifications, and Advancement

Young people seeking professional careers in geology should plan to earn an advanced degree. The master's degree is required for beginning research and teaching positions and for many positions in exploration. Advancement in college teaching as well as in high-level research and administrative posts usually requires the Ph. D. degree. The bachelor's degree is considered adequate training for only a few entry jobs, primarily in exploration work.

About 350 colleges and universities offer the bachelor's degree in geology. In the typical undergraduate curriculum, students devote about one-fourth of their time to geology courses, such as historical geology, structural geology, mineralogy, petrology, and invertebrate paleontology. About another third of the work is in mathematics, the related natural sciences—such as physics, geophysics, chemistry, and biology—and in engineering; the remainder is in general academic subjects.

More than 200 universities award advanced degrees in geology. The student seeking a graduate degree in geology takes advanced courses in geology, with emphasis on the student's area of specialization.

The student planning a career in exploration geology should like outdoor activities and have the physical stamina for geological field work, which frequently involves camping out. This is not a requirement, even though it is an excellent way to get training. An increasing amount of the work, formerly done in the field, is now accomplished by aerial photography. In addition, a growing number of specialties are laboratory-oriented.

Employment Outlook

Employment opportunities for geologists having advanced degrees are expected to be favorable through the 1970's. However, those having the bachelor's degree, including those who rank high in their class, probably will face competition for entry positions, depending largely on the hiring practices of petroleum companies. A number of new graduates having the bachelor's degree may find it necessary to enter semiprofessional positions, such as technician or surveyor. Some may take training to qualify as science teachers in secondary schools, or seek other work outside the field of geology.

Replacement needs are expected to be the chief source of openings. More than 800 new geologists will be required each year to replace those who are promoted to managerial positions or who transfer to other fields, retire, or die.

As world population expands and nations become more industrialized, the demand for petroleum, minerals, and fresh water will rise, and increasing numbers of geologists will be required to locate these resources. Geologists will be needed to devise techniques for exploring deeper within the earth's crust, both on land and under the sea, and to work with engineers to develop more efficient methods of recovering natural resources. Space-age activities will require some geologists to analyze data on the surface conditions of the moon and the planets.

During the next few years, private industry probably will employ more geologists than formerly. Domestic petroleum exploration activities, which declined in the late 1950's, are expected to continue to expand in the 1970's. The nature of exploration activities is such that the need for geologists may vary widely from one year to the next, and the shortrun demand for geologists occasionally exceeds the number of persons available for these activities. Geologists also will be needed to help solve problems related to construction, water supply, and improved methods of locating mineral resources.

Federal agency demand for geologists is expected to grow moderately, primarily in the U.S. Geological Survey. Employment of geologists by colleges and universities will probably rise slightly; the need will be mainly for those having Ph. D. degrees who are capable of performing high-level research.

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The demand for earth science teachers in secondary schools is expected to increase very rapidly in the next decade. Geology graduates having the bachelor's degree, but who have had additional training in educational methods, should have good opportunities in this area.

Earnings and Working Conditions

The average (median) annual starting salary for new geology graduates who have a bachelor's degree was $7,800 in private industry in 1968, according to the American Geological Institute's annual survey. New graduates who have a master's degree usually started at between $1,000 and $1,500 more a year than those having the bachelor's degree. Starting salaries for those who have doctor's degrees averaged $12,000 a year.

Depending on their college records, new graduates who have a bachelor's degree could begin at either $7,456 or $8,845 a year in late 1968 in the Federal Government. Those who have a master's degree could start at $8,845 or $9,872, and those who have the Ph.D. degree, at $10,883 or $12,174.

Teachers often supplement their regular salaries with income from research, consulting, or writing. Extra allowances generally are paid geologists for work outside the United States.

The work of geologists is often active and sometimes strenuous. When their work is outdoors, geologists may be exposed to all kinds of weather. Many geologists travel a great deal and may do fieldwork away from home for long periods. Their hours of work often are uncertain because their field activities are affected by weather and travel.

Sources of Additional Information

General information on career opportunities, training, and earnings for geologists may be obtained from:

American Geological Institute, 2201 M St. NW., Washington, D.C. 20037.

Information on Federal Government careers may be obtained from:

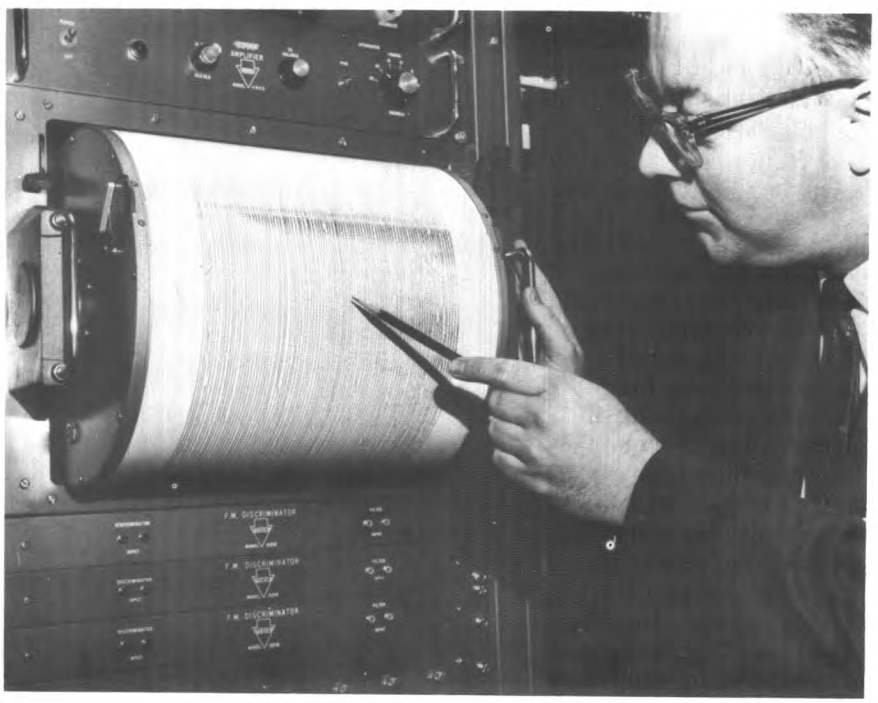
Interagency Board of U.S. Civil Service Examiners for Washington, D.C., 1900 E St. NW., Washington, D.C. 20415.

GEOPHYSICISTS

(D.O.T. 024.081)

Nature of the Work

Geophysics is an overall term covering a number of sciences concerned with the composition and physical aspects of the earth —its size and shape, interior, surface, atmosphere, the land and bodies of water on its surface and underground, and the environment of the earth in space. Geophysicists study the earth's physical characteristics, such as its electric, magnetic, and gravitational fields; the earth's interior heat flow and vibrations; and solar radiation. To conduct their investigations, geophysicists apply the principles and techniques of physics, geology, meteorology, oceanography, geodesy, mathematics, chemistry, and engineering. They use many instruments, including highly complex precision ones such as the seismograph, which measures and records the transmission time and magnitude of earthquake waves or vibrations through the earth; the magnetometer, which measures variations in the earth's magnetic field; and the gravimeter, which measures minute variations in gravitational at-



Geophysicist examines seismogram.

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traction. In geophysical exploration, increasing use is being made of electronic computers to collect and process pertinent data.

Exploration geophysicists search for oil and mineral deposits, using the knowledge of earthquake vibrations, the magnetic field, gravitational attraction, and other basic geophysical techniques. Others conduct research, usually to develop new or improved techniques and instruments for prospecting.

Hydrologists study the occurrence, circulation, distribution, and physical properties of surface and underground waters in the land areas of the earth. Some hydrologists are concerned with water supplies, irrigation, flood control, and soil erosion.

Seismologists study the structure of the earth's interior and the vibrations of the earth caused by earthquakes and manmade explosions. They may explore for oil and minerals, provide information for use in designing bridges, dams, and buildings in earthquake regions, or study the problems involved in detecting underground nuclear explosions.

Geodesists measure the size and shape of the earth, determine the positions and elevations of points on or near the earth's surface, and measure the intensity and direction of gravitational attraction. They track satellites orbiting in outer space to study the size and shape of the earth and the distributions of mass within the earth.

Geomagneticians and aeronomists are concerned with the earth's magnetic field—its variations, courses, and form in space—and with many aspects of space science.

Tectonophysicists study the structure of mountains and ocean basins, the properties of materials forming the earth's crust, and the physical forces that formed the mountains and the ocean basins.

Oceanographers and meteorologists, sometimes classified as geophysical scientists, are discussed separately in this chapter, as is the closely related occupation of geologist.

Places of Employment

Nearly 7,000 geophysicists were employed in the United States in 1968. Private industry employed a majority of all geophysicists, chiefly in the petroleum and natural gas industry. Other geophysicists were employed by mining companies, exploration and consulting firms, and research institutions. A few were in business for themselves as consultants and provided services on a fee or contract basis to companies and individuals engaged in prospecting or other activities utilizing geophysical techniques.

Geophysicists in private industry were employed mainly in the southwestern and western sections of the United States, including the Gulf Coast, where most of the country's large oil and natural gas fields and mineral deposits are located. Some geophysicists employed by American firms are assigned to work in foreign countries for varying periods of time.

In 1968, Federal Government agencies employed more than 1,200 geophysicists, geodesists, and hydrologists, mainly the U.S. Geological Survey; the Coast and Geodetic Survey and the Institute for Earth Sciences of the Environmental Science Services Administration; the Army Map Service; and the Naval Oceanographic Office. Colleges and universities, State governments, and nonprofit research institutions employed small numbers of geophysicists.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in geophysics or in one of the geophysical specialties qualifies young persons for many beginning jobs in exploration geophysics. A bachelor's degree in a related science or in engineering, including courses in geophysics, physics, geology, mathematics, chemistry, and engineering, also is adequate preparation for many beginning jobs, especially in geophysical exploration. Some background in electronic data processing is useful.

For geophysical specialties other than exploration, and for the more responsible positions in exploration work, graduate education in geophysics or in a related physical science usually is required. A doctor's degree with a major in geophysics, or in a related science with advanced courses in geophysics, generally is required for teaching careers. The Ph. D. is required frequently for positions involving fundamental research and for advancement in most types of geophysical work.

The bachelor's degree in geophysics is awarded by less than 20 colleges and universities. These undergraduate programs provide training chiefly in exploration geophysics. Other curriculums that offer the required training for beginning jobs as geophysicists include geophysical technology, geophysical engineering, engineering geology, petroleum geology, and geodesy.

The master's degrees and Ph. D. in geophysics are granted by about 15 universities. For admission to a graduate program, a bachelor's degree with a good background in geology, mathematics, physics, or engineering, or a combination of these subjects is the usual requirement. In gen-

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eral, the graduate student should attend a school in which he can take advanced courses and carry out research projects in the aspect of geophysical science in which he has a special interest.

Beginning geophysicists having only the bachelor's degree are usually given on-the-job training in the application of geophysical principles to their employers' projects. If a new employee has not taken the courses in geophysics needed for his job, he is taught geophysical methods and techniques on the job.

Federal Government agencies also have training programs in which a few geophysicists are sent each year to universities for graduate training. Some Federal Government agencies provide a few summer jobs for promising undergraduates and make permanent positions available to them after graduation.

The prospective geophysicist should be energetic and in excellent health, since geophysicists often have to work outdooors under somewhat rugged conditions. A willingness to travel is also important, since a geophysicist may be required to move from place to place in the course of his employment.

Employment Outlook

Employment opportunities for the few new graduates having degrees in geophysics are expected to be good through the 1970's. Opportunities will be best for those having the master's or doctor's degree. There also should be favorable opportunities in geophysical work for well-qualified people having degrees in other sciences if they have had some formal training in geophysics.

Moderate growth is expected in this profession through the 1970's. Federal Government agencies will need geophysicists for new or expanded geophysical programs. The petroleum and mining industries will need geophysicists for exploration activities which are expected to expand in the 1970's. Several hundred new geophysicists also will be needed each year to replace those who leave the profession, retire, or die.

Although the number of job openings for geophysicists is not expected to be large in any one year, the number of new graduates having degrees in the science also is expected to be small. As in past years, the number of geophysics graduates who are seeking work as geophysicists probably will be insuffiicent to meet employers' needs, and well-trained persons having degrees in related sciences and in engineering probably will continue to be hired for geophysical positions.

Over the long run, further growth in the profession is expected. There will be increasing use of petroleum and mineral products by a growing population. As natural resources in the more easily accessible locations become depleted, additional exploration geophysicists will be needed by petroleum and mining companies to find the more concealed sites of fuels and minerals. In addition, the growing importance of basic research in the geophysical sciences, as well as the continuing need to develop new geophysical techniques and instruments, will create a demand for personnel having advanced training in hydrology, seismology, geodesy, and other geophysical specialties. In Federal Government agencies, additional geophysicists probably will be needed to study the problems of the Nation's water supplies and mineral resources; to work on flood control; to do research in radioactivity and cosmic and solar radiation; and to explore the outer atmosphere and space, using such vehicles as sounding rockets and artificial satellites.

Earnings and Working Conditions

In private industry in 1968, new graduates having bachelor's degrees typically received starting salaries between $7,500 and $9,000 a year, according to the limited information available. New graduates having master's degrees received about $1,500 more than those having the bachelor's degree. Those having doctor's degrees received salaries of between $11,000 and $13,000, depending upon individual qualifications. In private industry, geophysical scientists working outside the United States usually receive bonuses and allowances.

In the Federal Government in late 1968, graduates having bachelor's degrees and no experience could enter most types of geophysical work at either $7,456 or $9,078 a year, depending upon their college records. Those who had completed all requirements for the master's degree could start at $9,078 or $10,154; those having the Ph.D. could start at $11,563 or $12,580. In the Federal Government as in industry, geophysicists stationed outside the United States are paid an additional amount.

In educational institutions, starting salaries are generally lower than in private industry or in the Federal Government. University teachers, however, may supplement their income by consulting, writing, or research activities.

The work of geophysicists is often active and sometimes strenuous. Exploration geophysicists are subject to reassignment in various locations as exploration activities shift. Their working hours may be irregular and fre-

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quently are determined by the requirements of field activities.

Sources of Additional Information

General information on career opportunities for geophysicists may be obtained from:

American Geophysical Union, 2100 Pennsylvania Ave. NW., Washington, D.C. 20037.

Society of Exploration Geophysicists, P. O. Box 3098, Tulsa, Okla. 74101.

Information on Federal Government careers may be obtained from:

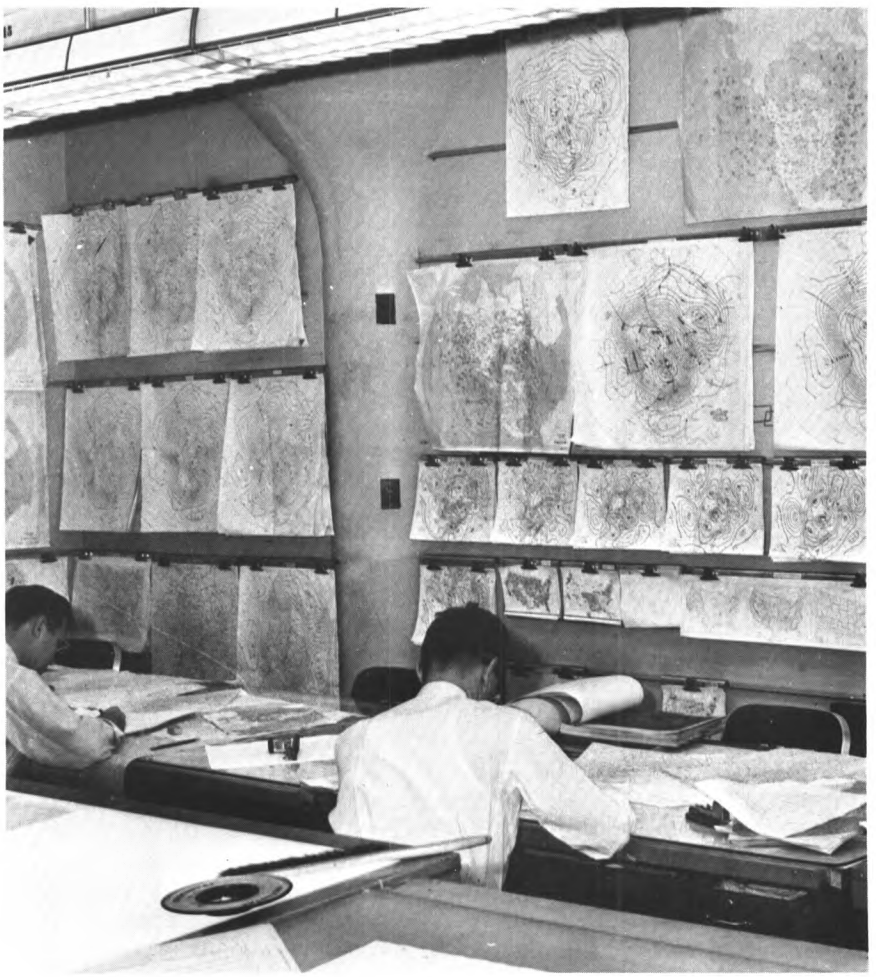
Interagency Board of U.S. Civil Service Examiners for Washington, D.C., 1900 E St. NW., Washington, D.C. 20415.

METEOROLOGISTS

(D.O.T. 025.088)

Nature of the Work

Meteorology is the study of atmospheric phenomena—not only of the earth, but of all celestial bodies. Meteorologists attempt to describe and understand the atmosphere's constituents, motions, processes, and influences. Their knowledge helps solve many practical problems in agriculture, transportation, communications, health, defense, and business.



Meteorologists usually specialize in one branch of the science. Weather forecasters known professionally as *synoptic meteorologists*, are the largest group of specialists. They interpret current weather information (such as air pressure, temperature, humidity, wind velocity) reported by observers in many parts of the world and by radiosondes and weather satellites to make short- and long-range forecasts for specific regions. *Climatologists* analyze past records on wind, rainfall, sunshine, temperature, and other weather data for a specific area to determine the general pattern of weather which makes up the area's climate. *Dynamic meteorologists* investigate the physical laws governing atmospheric motions. *Physical meteorologists* study the physical nature of the atmosphere, including its chemical composition and electrical, acoustical, and optical properties, the effect of the atmosphere on the transmission of light, sound, and radio waves; and the factors affecting the formation of clouds, precipitation, and other weather phenomena. *Meteorological instrumentation specialists* develop the devices that measure, record, and evaluate data on atmospheric processes. Specialists in applied meteorology, sometimes called *industrial meteorologists*, study the relationship between weather and specific human activities, biological processes, and agricultural and industrial operations. For example, they make weather forecasts for individual companies, attempt to induce rain or snow in a given area, and work on problems such as smoke control

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and air pollution abatement.

Approximately one-third of all civilian meteorologists perform research on ways to modify weather, weather conditions affecting the behavior of forest fires, and other problems. Another one-third are engaged primarily in weather forecasting, and about one-fourth manage or administer forecasting and research programs. In both weather forecasting and research, meteorologists use electronic computers to process large amounts of data.

A number of meteorologists teach or do research—frequently combining the two activities—in universities or colleges. In colleges without separate departments of meteorology, they may teach geography, mathematics, physics, chemistry, or geology, as well as meteorology.

Places of Employment

More than 4,000 civilian meteorologists were employed in the United States in 1968; only about 3 percent were women. The Environmental Science Services Administration (ESSA), which includes the Weather Bureau, employed by far the largest number of civilian meteorologists—nearly 2,000—at 300 stations in all parts of the United States, the polar regions, Puerto Rico, Wake Island, and other Pacific area sites. A few worked for other Federal Government agencies. The Armed Forces employed about 300 civilian professional meterologists.

Nearly 700 meteorologists worked for private industry. Commercial airlines employed several hundred to forecast weather along flight routes and to brief pilots on atmospheric conditions. Others worked for private weather consulting firms, which provided special weather information for a fee, for companies that designed and manufactured meteorological instruments, and for large firms in aerospace, insurance, utilities, and other industries.

Colleges and universities employed about 800 meteorologists in research and teaching. Several hundred others worked for State and local governments and for nonprofit organizations.

In addition to these civilian meteorologists, more than 3,000 officers and 1,500 enlisted members of the Armed Forces were engaged in forecasting and other meteorological work in 1968. About four-fifths were on active duty in the Air Force.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in meteorology is the usual minimum educational requirement for beginning meteorologists in weather forecasting. However, a bachelor's degree in a related science or in engineering is acceptable for many positions, provided the applicant has credit for courses in meteorology. For example, the Federal Government's minimum requirement for beginning positions is a bachelor's degree with at least 20 semester hours of study in meteorology and with additional training in physics and mathematics.

For research and teaching and for many top-level positions in other meteorological activities, an advanced degree is essential, preferably in meteorology, although persons having graduate degrees in other sciences also may qualify if they have taken advance meteorology, physics, mathematics, and chemistry.

Nearly 50 colleges and universities in 1968 offered degree-credit programs in meteorology or specialized meteorological disciplines; 28 of these schools granted Ph. D. degrees in the atmospheric sciences. Many other institutions offered courses in meteorology.

Meteorology training is given or supported by the Armed Forces. In 1968, more than 350 commissioned officers received university training in meteorology at either the undergraduate or graduate level. In addition, about 100 enlisted personnel were being sponsored in college and university programs leading to an undergraduate degree and an Air Force commission. Ex-servicemen who have experience as meteorologists frequently are qualified for civilian meteorologist positions, not only with the Armed Forces but with other employers as well.

The ESSA has an in-service training program under which some of its meteorologists are attending college for advanced or specialized training. Some college students preparing for careers in meteorology may obtain summer jobs with this agency. Promotions for regular full-time employees are made according to U.S. Civil Service Commission regulations. (See chapter on Occupations in Government.)

Airline meteorologists have somewhat limited opportunities for advancement. However, after considerable work experience, they may advance to flight dispatcher or to various supervisory or administrative positions. A few well-trained meteorologists having a background in science, engineering, and business administration may establish their own weather consulting services.

Employment Outlook

The employment outlook for civilian meteorologists is expected to be favorable through the 1970's. In addition to job opportunities resulting from the rapid

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growth expected in this profession, several hundred new meteorologists will be needed each year to replace those who transfer to other fields, retire, or die.

Meteorologists having advanced degrees will be in demand to conduct research, teach in colleges and universities, and engage in management and consulting work. The advent of weather satellites, manned spacecraft, world circling weather balloons, new international cooperative programs, and the use of electornic computers to make weather forecasts have expanded greatly the boundaries of meteorology and opened new fields of activity in the study of weather on a global scale. Meteorologists will be in demand to develop and improve instruments used to collect and process weather data.

Employment opportunities for meteorologists with commercial airlines, weather consulting services, and other private companies also are expected to increase, as the value of weather information to all segments of our economy receives further recognition. This recognition also may create opportunities in research positions with private research organizations and colleges and universities. The number of teaching positions for meteorologists also should rise, primarily because of anticipated increases in total college enrollments and in meteorology programs.

In addition, there will be a continuing demand for meteorologists to work in existing programs, such as weather measurements and forecasts, storm and flood forecasts, and research on the problems of severe storms, turbulence, and air pollution.

Earnings and Working Conditions

In late 1968, meteorologists having the bachelor's degree and no experience could start in Federal Government service at $7,456 or $9,078 a year, depending on their college records. Meteorologists who had completed all requirements for the master's degree could start at $9,078 or $10,154; those having the Ph. D. degree could begin at $11,563 or $12,580. Workers stationed outside the United States were paid an additional amount. Employee benefits for Federal Government meteorologists are the same as for other civil service workers. (See chapter on Occupations in Government.)

Airline meteorologists received a starting salary of approximately $8,500 - $9,000 a year in 1968, according to the Air Transport Association. Meteorologists generally receive the same benefits as other airline employees. (See chapter on Occupations in Civil Aviation.)

According to the National Science Foundation's National Register of Scientific and Technical Personnel, the average (median) annual salary of meteorologists in 1968 was $13,400. Only 10 percent of the meteorologists earned less than $9,600 and about 10 percent earned more than $19,600.

Jobs in weather stations, which are operated on a 24-hour, 7-day week basis, often involve nightwork and rotating shifts. Most stations are at airports or at places in or near cities; some are in isolated and remote areas.

Sources of Additional Information

General information on career opportunities, educational facilities, and professional development in meteorology may be obtained from:

American Meteorological Society, 45 Beacon St., Boston, Mass. 02108.

American Geophysical Union, 2100 Pennsylvania Ave., NW., Washington, D.C. 20037.

Information on employment opportunities with the ESSA Weather Bureau and on its student-assistance program may be obtained from:

Personnel Division AD42, Environmental Science Services Administration, 6010 Executive Blvd., Rockville, Md. 20852.

Information on the Air Force meteorological training programs may be obtained from the nearest USAF recruiting office or from:

Commander, USAF Recruiting Service, Wright-Patterson AFB, Ohio 45899.

OCEANOGRAPHERS

(D.O.T. 024.081 and 041.081)

Nature of the Work

The ocean, which covers more than two-thirds of the earth's surface, provides valuable foods and minerals, influences the weather, serves as a "highway" for transportation, and offers many varieties of recreation. Oceanographers study the ocean —its characteristics, movements, physical properties, and plant and animal life. The results of their studies not only extend basic scientific knowledge, but contribute to the development of practical methods for use in operations such as forecasting weather, improving fisheries, mining ocean resources, and defending the Nation.

Oceanographers plan extensive tests and observational programs and conduct detailed surveys and experiments to obtain information about the ocean. They may collect and study data on the

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ocean's tides, currents, and waves; its temperature, density, and acoustical properties; its sediments; its subbottom; its shape; its interaction with the atmosphere; and marine plants and animals. They analyze the samples, specimens, and data collected, often using electronic computers. To present the results of their studies, they prepare maps and charts, tabulations, reports, and manuals, and write papers for scientific journals.

In developing and carrying out tests and observational programs, oceanographers use the principles and techniques of the natural sciences, mathematics, and engineering. They use a variety of special instruments and devices that measure the earth's magnetic and gravity fields, the speed

Oceanographer hauls plankton net.

of sound traveling through water, the oceans' depths, the flow of heat from the earth's interior, and the temperature and chemical composition of the water. Specially developed cameras using strong lights enable oceanographers to photograph marine organisms and the ocean floor; new research vehicles transport marine scientists to the floor of the sea. When their work requires new oceanographic instruments or analytical techniques, they usually develop them.

Most oceanographers are specialists in one of the branches of the profession. *Biological oceanographers* (marine biologists) study the ocean's plant and animal life and the environmental conditions affecting them. *Physical oceanographers* (physicists and geophysicists) study the physical properties of the ocean, such as its density, temperature, and ability to transmit light and sound; the movements of the sea; and the relationship between the sea and the atmosphere. *Geological oceanographers* (marine geologists) study the topographic features, rocks, and sediments of the ocean floor. *Chemical oceanographers* investigate the chemical composition of ocean water and sediments, and chemical reactions that occur in the sea. *Marine meteorologists* study the interaction of the atmosphere and the ocean, and the processes by which weather over the ocean is generated. *Oceanographic engineers* and *electronic specialists* design and build the systems, devices, and instruments used in oceanographic research and operations.

About 3 out of 4 oceanographers are engaged primarily in performing or administering research and development activities. A number of oceanographers teach in colleges and universities; a few are engaged in technical writing, consulting, and in the administration of activities other than research.

Most oceanographers work part of the time aboard oceanographic ships at sea. These voyages may last from a few days to several months. A few oceanographers work nearly all of the time aboard ship. On the other hand, some oceanographers never go to sea, but analyze data collected by other scientists or pursue mathematical or theoretical studies ashore.

Places of Employment

An estimated 5,200 oceanographers and closely related technical personnel were employed in the United States in 1968. About four-fifths were employed by the Federal Government and colleges and universities. Those Federal agencies employing substantial numbers of oceanographers were the Naval Oceanographic Office, the Bureau of Commercial Fisheries, and the Environmental Science Services Administration.

A growing number of oceanographers worked in private industry for firms that design and develop instruments and vehicles for oceanographic research. A few worked for fishery laboratories of State and local governments.

Training, Other Qualifications, and Advancement

The minimum educational requirement for beginning professional positions in oceanography is the bachelor's degree with a major in oceanography, biology, a geo-science, one of the other basic sciences, mathematics, or engineering. For professional positions in research and teaching and for advancement to high-level positions in most types of work, graduate training in oceanography or one of the basic sciences usually is required.

Undergraduate training in oceanography, marine science, ocean engineering, or fisheries was offered by only about 15 colleges and universities in 1968;

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and only seven institutions offered the bachelor's degree with a major in oceanography. However, since oceanography is an interdisciplinary field, training in the related basic sciences, when coupled with a strong interest in oceanography, is adequate preparation for most beginning positions in the field or for entry into graduate school.

Important undergraduate courses for the prospective oceanographer are in the fields of mathematics, physics, chemistry, geophysics, geology, meteorology, and biology. In general, the student should specialize in the particular science field which is closest to his area of interest in oceanography. For example, students interested in chemical oceanography should obtain a degree in chemistry.

In 1968, about 35 colleges and universities offered advanced degrees in oceanography, and about 30 other institutions offered advanced courses in fisheries, marine science, or oceanographic engineering. The academic work of the graduate student in oceanography consists primarily of extensive training in a basic science combined with further training in oceanography. The graduate student usually works part of the time aboard ship—doing oceanographic research for his dissertation, and at the same time acquiring familiarity with the sea and the techniques used to obtain oceanographic information. A variety of summer courses is offered by universities at the various marine stations along our coasts. These are for both undergraduate and graduate students and are recommended particularly for students from inland universities.

The beginning oceanographer with the bachelor's degree usually starts as a research or laboratory assistant, or in a position involving routine data collection, analysis, or computation. Most new oceanographers receive on-the-job training related to the specific work at hand. The nature and extent of the training vary with the background and needs of the individual. Thus, the new graduate who has a degree in a basic science rather than in oceanography usually can be provided enough understanding of oceanographic principles to enable him to perform adequately in this field.

Beginning oceanographers having advanced degrees usually can qualify for research and teaching positions. Experienced oceanographers may be selected for administrative positions, in which they may supervise a research laboratory or direct specific survey or research projects.

Employment Outlook

Employment opportunities for those having degrees in oceanography—especially the Ph.D. degree—are expected to be excellent through the 1970's. Well-trained persons with bachelor's degrees in related sciences will find opportunities mainly as research assistants in routine analytical positions.

The outlook is for very rapid growth in this profession through the 1970's. Growing recognition of the importance of the oceans to the Nation's welfare and security has heightened interest in oceanography and has opened new fields for specialists. In the years ahead, oceanographers will be needed for research in areas such as underwater acoustics, surface and subsurface ocean currents, and ocean floor topography, all of which are important in improving the Nation's defense against submarines and surface vessels. There also will be a demand for oceanographers to supply weather and iceberg forecasts; to study air-sea interaction in order to improve long-range weather forecasts; to solve sea mining problems; and to predict, control, and prevent pollution and damage caused by waves and tides. Other oceanographers will be needed to improve methods of deriving foods from the oceans, to manage fisheries, and to develop economical ways to harness the ocean for energy and to increase the supply of fresh water.

The demand for oceonographers qualified to teach in colleges and universities also is expected to expand. As interest in oceanography grows and more courses in oceanography are offered, more teachers in the science will be needed.

Replacement of oceanographers who transfer to other fields, retire, or die also will provide some opportunities.

Since oceanography is a relatively small profession, job openings will not be numerous in any one year. On the other hand, the number of new graduates having degrees in this science is small and is expected to remain so. Thus, new oceanography graduates should continue to have excellent opportunities.

Earnings and Working Conditions

In the Federal Government service in late 1968, oceanographers having the bachelor's degree and no experience could begin at $7,456 or $9,078 a year, depending on their college records. Beginning oceanographers who had completed all requirements for the master's degree could start at $9,078 or $10,154; those having the Ph. D. degree could begin at $11,563 or $12,580. Scientists in geological and biological specialties had somewhat lower starting salaries.

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Beginning oceanographers in educational institutions receive the same salary as other beginning faculty members. (See statement on College and University Teachers.) In addition to their regular salaries, many experienced oceanographers in educational institutions earn extra income from consulting, lecturing, and writing activities.

Oceanographers engaged in research requiring sea voyages are frequently away from home for weeks or months at a time, sometimes living and working in cramped quarters. Young people who like the sea, however, may find these voyages very satisfying.

Sources of Additional Information

General information about oceanography—including career opportunities, professional training, colleges and universities having applicable degree-credit programs, earnings, and the economic significance of oceanographic activities—may be obtained from:

American Society for Oceanography, 854 Main Bldg., Houston, Tex. 77002.

American Society of Limnology and Oceanography, W.K. Kellogg Biological Station, Michigan State University, Hickory Corners, Mich. 49060.

International Oceanographic Foundation, 1 Rickenbacker Causeway, Virginia Key, Miami, Fla. 33149.

National Oceanography Association, 1900 L St. NW., Washington, D.C. 20036.

U.S. Naval Oceanographic Office, Washington, D.C. 20390.

Federal Government career information may be obtained from any regional office of the U.S. Civil Service Commission or from:

Interagency Board of U.S. Civil Service Examiners for Washington, D.C., 1900 E St. NW., Washington, D.C. 20415.

The bulletin *University Curricula in the Marine Sciences* may be obtained from:

Committee on Marine Research, Education and Facilities, Bldg. 159E, Rm. 476, Washington Navy Yard, Washington, D.C. 20390.

The booklet, *Oceanography Information Sources*, lists the names and addresses of many professional, research, and industrial organizations interested in oceanography. Copies, priced at $1.50 each, may be purchased from:

Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Ave. NW., Washington, D.C. 20418.

The bulletin, *Marine Science Affairs—A Year of Plans and Progress*, contains information on the national oceanography program. Copies, priced at $1, may be obtained from:

Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

Some information on oceanographic specialties may be obtained from professional societies listed elsewhere in the *Handbook*. (See statements on Geologists, Geophysicists, Life Scientists, Meteorologists, and Chemists.)

Life sciences

The life sciences encompass the study of all living organisms and the processes that determine the nature of life. They are concerned with men and microbes, plants and animals, and health and disease, as well as how these organisms relate to their environment.

Some scientists in this field perform research to expand our understandings of living things. Others, who teach, pass this knowledge on to students. Many scientists pursue both activities. Still others apply these concepts and principles to the solution of practical problems, such as the development of new drugs or varieties of plants.

This chapter discusses life scientists as a group since they receive comparable basic training and have similar employment and earning prospects. Brief descriptions are provided about the nature of the work of a number of life scientists—including botanists, zoologists microbiologists, biophysicists, ecologists, pathologists, and pharmacologists. This chapter also contains a separate statement on biochemists. More detailed statements for other professional workers in the life sciences—soil scientists, soil conservationists, foresters, and range managers—are discussed elsewhere in the *Handbook*.

LIFE SCIENTISTS

(D.O.T. 040.081, 041.081, 070.081, and 077.128)

Nature of the Work

Life scientists study living organisms, their structure, evolutionary development, behavior, and life processes. They place emphasis on the relationship between these organisms and their environments. The number and

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variety of plants and animals are so vast and the life processes so varied and complex that life scientists must of necessity become specialists. Some learn as much as possible about a particular kind of animal, plant, or microorganism. Others, interested in how an animal or the human body functions, study such things as the nervous system, how food is digested, or how organisms are affected by disease. Some are interested in the evolution of living organisms, the mechanisms of heredity; or the ways environmental factors, such as light or heat, affect life processes. In general, life scientists specialize in one of three broad areas—agriculture, biology, medicine.

Two-fifths of all life scientists are engaged in research and development. Many conduct basic research, which is aimed at adding to our knowledge of living organisms with only secondary regard to its application. Nevertheless, the development of insecticides, disease-resistant crops, and antibiotics have resulted from basic research in the life sciences. Much of the basic medical knowledge of the treatment of disease has its origin in pure science.

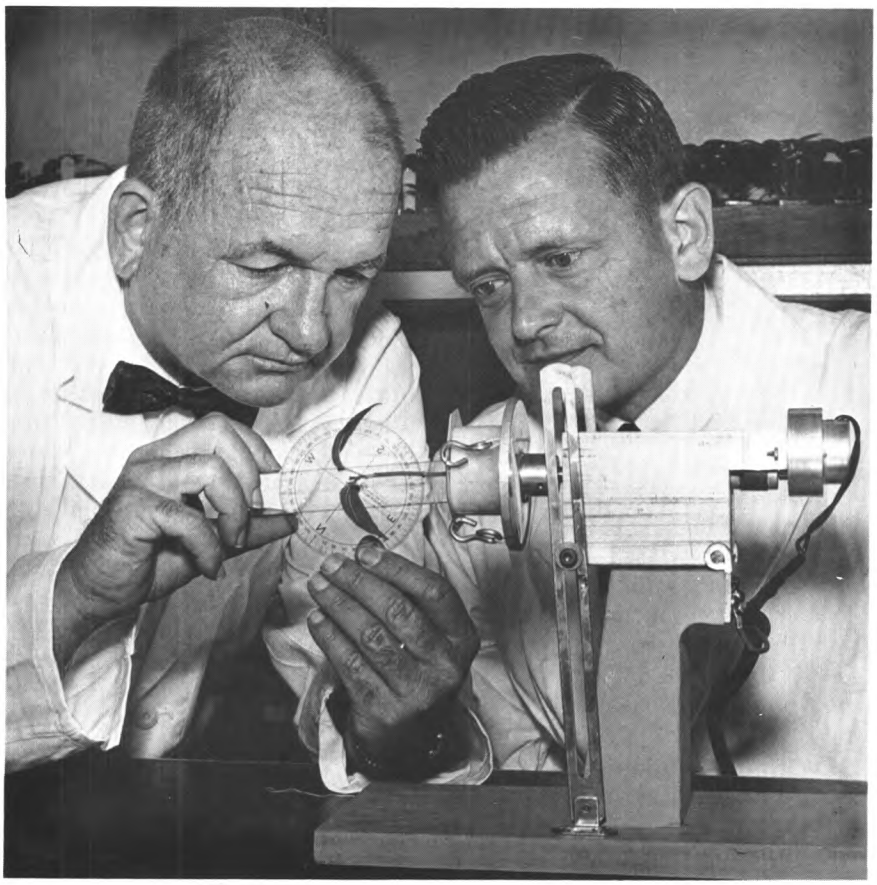
Research in the life sciences may take many forms. A botanist exploring the volcanic Alaskan valleys to see what plants live in this strange environment and a zoologist searching the jungles of the Amazon valley for previously unknown kinds of animals are both doing research; likewise, an entomologist in a laboratory tests various chemical insecticides for effectiveness and possible hazards to human and animal life.

Regardless of the type of research in which they are engaged, life scientists must be familiar with fundamental research techniques and the use, not only of light and electron microscopes, but of other complex physical and electronic laboratory equipment. Advanced techniques and principles from chemistry and physics are applied widely. A knowledge of mathematical and statistical procedures, as well as of the operation of electronic computers, often is needed in experiments involving a large number of variable factors.

Teaching in a college or university is the major function of nearly one-fourth of all life scientists. Many teachers combine independent research with their regular teaching duties, and in some large educational institutions, use the major portion of their time on research.

More than one-fourth of all life scientists are engaged in management and administrative work, primarily the planning, supervision, and administration of programs of research or testing of foods, drugs, and other products. Others provide liaison between the Federal Government and the agricultural experiment stations at State universities, assisting in the planning, development, and evaluation of research programs at these stations.

The remaining life scientists are engaged in a variety of other types of work, such as consulting, writing, testing, and inspection. A few are employed in technical sales or field service work for industrial firms; such work may include, for example, teaching company salesmen and prospective purchasers the value and proper use of new chemicals. Some are engaged in research in



Botanists study leaves of pepper plant to be launched into earth orbit.

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natural history museums, zoos, and botanical gardens.

Life scientists may be classified into three broad groups characterized by the general type of organism with which they work: Botanists, who study plants; zoologists, who are concerned with animals; and microbiologists, who work with micro-organisms.

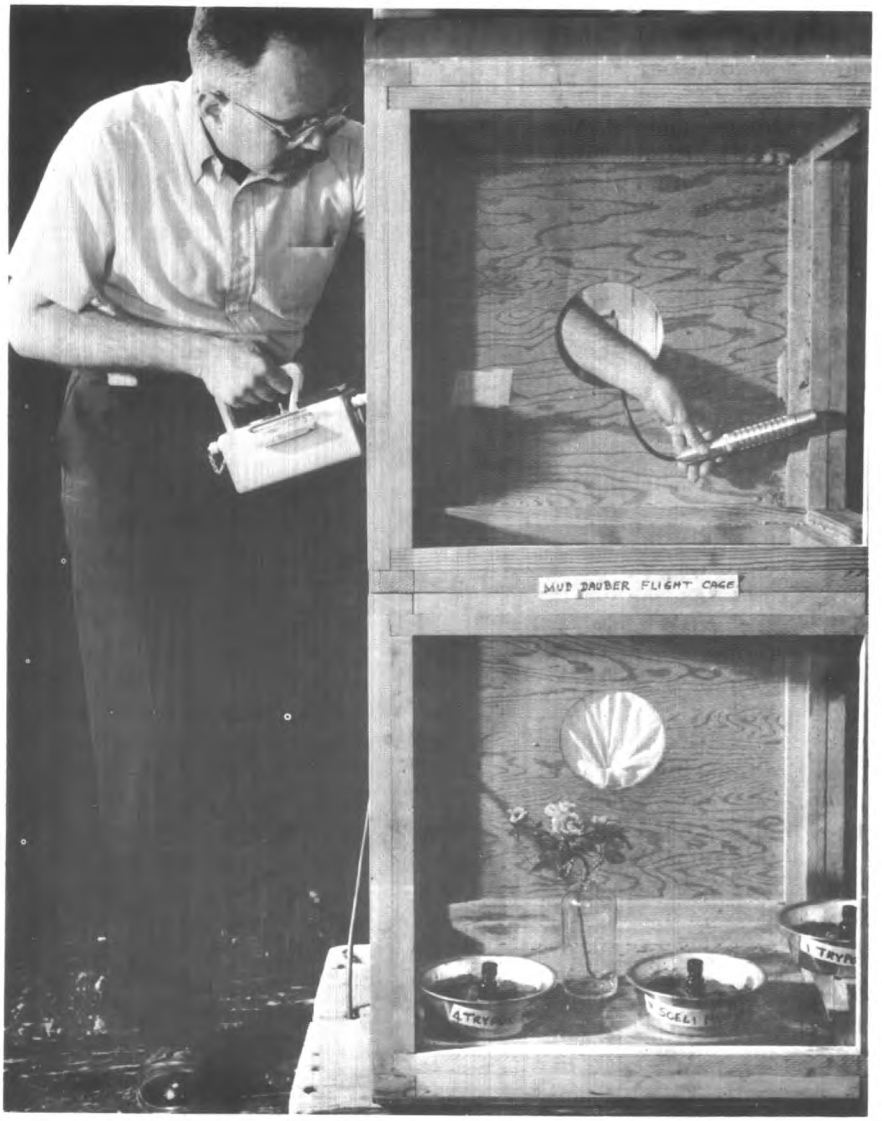
Botanists study all aspects of plant life. Plant taxonomists identify and classify plants. Plant ecologists study the interrelationships between environmental elements and plant life and distribution. Other botanists include plant morphologists, concerned with the structure of plants and plant cells; plant physiologists, interested in the life processes of plants; and plant pathologists, engaged in determining the cause and control of plant diseases.

Zoologists study animal life—its origin, classification, behavior, life processes, diseases, and parasites—and the ways in which animals influence and are influenced by their environment. Zoologists who specialize in the study of certain classes of animals may use titles that indicate the kind of animal studied, such as ornithologists (birds), herpetologists (reptiles and amphibians), ichthyologists (fishes), and mammalogists (mammals).

Microbiologists investigate the growth, structure, and general characteristics of bacteria, viruses, molds, and other organisms of microscopic or submicroscopic size. Although the terms bacteriology and microbiology are sometimes used interchangeably, microbiology, the broader term, is preferable when referring to the study of all microscopic organisms. Microbiologists isolate and make cultures of these organisms in order to examine them with a variety of highly specialized equipment. Some microbiologists pursue medical problems, such as the relationship between bacteria and infectious disease, or the effect of antibiotics on bacteria. Others specialize in soil bacteriology (the study of soil microorganisms and their relation to soil fertility), virology (the study of viruses), immunology (the study of the mechanisms that fight infection), or serology (the study of animal and plant fluids, including blood serums).

Life scientists also may be classified according to the type of approach used—some of which are wholly within 1 of the 3 major groupings, and others which may be found in all 3 groups. Some life scientists are classified according to the specific type of organism studied. Some life scientists whose work cuts across more than one of these major groupings, as often in the case of college and university teachers, simply may call themselves biologists. A description of the work of some life scientists follows.

Agronomists are concerned with



Ecologist inspects wasp's nests made of radioactive mud.

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field-crop problems. They develop new methods of growing crops for improved quality, higher yield, and more efficient production. They seek new, hardier varieties of crops and better methods of controlling disease, pests, and weeds. Agronomists may specialize in the problems of a geographical region, a particular crop, or a technical area, such as crop-breeding or production methods.

Anatomists study the form and structure of organisms. Those who specialize in the structure of cells are known as cytologists, whereas those who specialize in the structure of tissues and organs are known as histologists. Anatomists may examine structures visible to the naked eye or of microscopic size, or those of submicroscopic size, visible only through the use of the electron microscope. Many anatomists specialize in human anatomy.

Biochemists, who are trained in both chemistry and biology, study the chemical processes of living things. A more detailed description of their work is contained in a separate statement elsewhere in this chapter.

Biological oceanographers, or marine biologists, study the plant and animal life in the oceans and the environmental conditions affecting them. See separate statement on Oceanographers elsewhere in the *Handbook*.

Biophysicists who are trained in both physics and biology, investigate the physical principles of living cells and organisms, and their responses to physical forces, such as heat, light, radiation, sound, and electricity. They may use the electron microscope to make tissues visible down to the smallest units and they may use nuclear reactors to study the effect of radiation on cells and tissues.

Ecologists study the mutual relationship among organisms and between them and their environment. They are interested in the effects of environmental influences such as rainfall, temperature, altitude, and kind and quality of food.

Embryologists study the development of an organism from fertilization of the egg through the hatching process or gestation period. They investigate the physiological, biochemical, and genetic mechanisms that control and direct the processes of development, how and why this control is accomplished, and the causes of abnormalities in development.

Entomologists are concerned with insects and their relation to plant and animal life. They identify and classify the enormous number of different kinds of insects. Some entomologists seek methods of controlling harmful insects that carry disease and spoil food supplies. Others develop ways to encourage the growth and spread of beneficial insects, such as honeybees.

Geneticists explore the origin, transmission, and development of hereditary characteristics. Geneticists engaged primarily in improving plant and animal breeds of economic importance—such as cereal and tobacco crops or dairy cattle and poultry—may be classified as plant or animal breeders, agronomists, or animal science specialists. Theoretical geneticists search for the mechanisms that determine inherited traits in plants, animals, or humans.

Horticulturists work with orchard and garden plants, such as fruits, nuts, vegetables, flowers and ornamental plants, and other nursery stocks. They develop new or improved plant varieties and better methods of growing, harvesting, storing, and transporting horticultural crops. Horticulturists usually specialize in either a specific plant or a particular technical problem, such as plant breeding.

Husbandry specialists (animal) conduct research on the breeding, feeding, management, and diseases of domestic farm animals to improve the health and yield of these animals.

Nutritionists examine the processes through which food is utilized, the kinds and quantities of food elements—such as minerals, fats, sugars, vitamins, and proteins—that are essential to build and repair body tissues and maintain health, and how these food elements are transformed into body substances and energy. Nutritionists also analyze food to determine its composition in terms of essential ingredients or nutrients.

Pathologists study the nature, cause, and development of disease, degeneration, and abnormal functioning in humans, in animals, or in plants. Many specialize in the study of the effects of diseases, parasites, and insect

Pathologists usually work in laboratories.

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pests on cells, tissues, and organs. Others investigate genetic variations and other abnormal effects caused by drugs. The term "pathologist" is normally reserved for specialists in human pathology (medical pathology). Specialists in animal pathology are usually veterinarians. (See statement on Veterinarians.) Those who study plant diseases may be called plant pathologists or phytopathologists; their work is discussed under the section on botanists.

Pharmacologists conduct tests to determine the effects of drugs, gases, poisons, dusts, and other substances on the functioning of tissues and organs, and relate their findings with medical data. They may develop new or improved chemical compounds for use in drugs and medicines.

Physiologists study the structure and functions of cells, tissues, and organs and the effects of environmental factors on life processes. They may specialize in cellular activities or in one of the organ systems, such as the digestive, nervous, circulatory, or reproductive systems. The knowledge gained in such research often provides the basis for the work of many other specialists, such as biochemists, pathologists, pharmacologists, or nutritionists.

Places of Employment

An estimated 170,000 persons were employed in the life sciences in 1968. About 10 percent were women. Of this total, nearly 48,000 worked in agricultural science, more than 66,000 worked in biological science, and about 54,000 worked on problems related to medical science.

More than half of the total were employed by colleges and universities in teaching and research positions. Medical schools and their associated hospitals employed particularly large numbers of life scientists in the medical field. State agricultural colleges and agricultural experiment stations operated by universities in cooperation with Federal and State Governments employed sizable numbers of agronomists, horticulturists, animal husbandry specialists, entomologists, and other agriculture-related specialists.

The Federal Government in 1968 employed about 28,000 life scientists, two-thirds of whom were employed in the Department of Agriculture. The Department of the Interior employed nearly all the fish and wildlife biologists in the Federal Government. Other large numbers of life scientists were employed by the Department of the Army and the National Institutes of Health. State and local governments, combined, employed about 19,000 biologists—mostly fish and wildlife specialists, microbiologists, and entomologists—for work in conservation, detection and control of diseases, and plant breeding.

Approximately 26,000 life scientists worked for private industry in 1968. Among the major industrial employers were manufacturers of pharmaceuticals, industrial chemicals, and food products. A few were self-employed. Nearly 6,000 life scientists worked for privately financed research organizations and other nonprofit foundations.

Although life scientists were employed in all States, nearly two-fifths were located in five States—California, New York, Pennsylvania, Illinois, and Maryland. More than one-tenth of all life scientists were located in only two Metropolitan areas—Washington, D.C., and New York, N.Y.

Training, Other Qualifications, and Advancement

Young people seeking professional careers in the life sciences should plan to obtain an advanced degree—preferably a Ph. D.—in their field of interest. The bachelor's degree with a major in one of the life sciences is adequate preparation for many beginning jobs, but promotional opportuniities for those without graduate training may be limited to intermediate level positions.

The Ph. D. degree generally is required for higher level college teaching positions and for independent research. It is also necessary for an increasing number of other positions involving the administration of research programs.

New graduates having a master's degree may qualify for most entry positions in applied research and for some types of positions in college teaching and basic research.

Those having a bachelor's degree may qualify for positions involving testing, production and operation work, technical sales and service, and duties connected with the enforcement of government regulations. They also may obtain positions as advanced technicians, particularly in the medical area. Those who graduate near the top of their class may qualify for some research positions, but these positions are mostly of a routine nature or are performed under close supervision. Some graduates having a bachelor's degree may take courses in education and choose a career as a high school teacher of biology rather than one as a life scientist. (See statement on Secondary School Teachers.)

Training leading to a bachelor's degree with a major in one of the life science specialties is offered by nearly all colleges and

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universities. Courses differ greatly from one college to another, and it is important that a student determine which college program best fits his interests and needs. In general, liberal arts colleges and universities emphasize training in the biological scences and in the medical aspects of life science. State universities and land-grant colleges offer special advantages to those interested in agricultural sciences because their agricultural experiment stations provide many opportunities for practical training and research work.

Prospective life scientists should obtain the broadest undergraduate training possible in all branches of biology and in related sciences, particularly biochemistry, organic and inorganic chemistry, physics, and mathematics. Courses in statistics, calculus, biometrics and computer programming analysis are becoming increasingly essential. Training and practice in laboratory techniques, in the use of laboratory equipment, and in fieldwork are also important.

Advanced degrees in the life sciences also are conferred by a large number of colleges and universities. Requirements for advanced degrees usually include fieldwork and laboratory research, as well as classroom studies and preparation of a thesis.

Employment Outlook

Employment opportunities for life scientists having graduate degrees are expected to be very good throughout the 1970's. Demand will be strong for those having doctorates to do research on problems important to medicine, health, and environmental quality control. Employment opportunities are likely to be favorable for persons having bachelor's degrees who graduate near the top of their class. New graduates holding the bachelor's degree will find many opportunities to work as research assistants or in technician jobs while continuing their graduate education.

Employment in the life sciences is expected to grow very rapidly throughout the 1970's. In addition to employment opportunities resulting from growth, nearly 9,600 life scientists will be needed each year to replace those who transfer to other fields, retire, or die.

One of the major factors which will tend to increase the employment of life scientists is the anticipated continued growth in research and development, particularly in medical research programs sponsored by the Federal Government and voluntary health agencies, including those promoting studies of heart disease, cancer, and birth defects. Research in such relatively new areas as space biology, radiation biology, environmental health, biological oceanography, and hereditary regulation also will probably increase.

Industry also is expected to increase its spending for research and development in the biological sciences. Furthermore, the stringent health standards of the Federal regulatory agencies are likely to result in a heightened demand for additional life scientists in industry to perform research and testing before new drugs, chemicals, and processing methods are made available to the public.

Another factor which should increase employment of life scientists is the substantially larger college and university enrollments expected during the 1970's. Although the resulting rise in demand for teachers will be to a large extent for Ph. D.'s, there will be many openings for qualified people holding master's degrees.

Earnings and Working Conditions

In the Federal Government in late 1968, life scientists having a bachelor's degree could begin at $5,732 or $6,981 a year, depending on their college records. Beginning life scientists having a bachelor's degree and some graduate study could start at $6,981, $8,462, or $10,203, depending upon academic records and previous experience. Those having the Ph. D. degree could begin at $10,203 or $12,174. Pharmacologists had somewhat higher starting salaries than other life scientists.

Life scientists having the Ph. D. degree and employed as college and university teachers typically received starting salaries between $7,000 and $8,500 a year in 1968, according to the limited information available. (For further information, see statement on College and University Teachers.) Life scientists in educational institutions sometimes supplement their regular salaries with income from writing, consulting, and special research projects.

According to the National Science Foundation's Register of Scientific and Technical Personnel, agricultural scientists earned about $11,000 a year in 1968. The average (median) annual salary for biological scientists was $13,000 in 1968, according to the Register; only 10 percent earned less than $7,500 a year, and about 10 percent earned $23,000 or more. In general, life scientists in private industry tend to have higher salaries than those in either colleges and unversities or Government employment.

Sources of Additional Information

General information on careers in the life sciences may be obtained from:

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American Institute of Biological Sciences, 3900 Wisconsin Ave. NW., Washington, D.C. 20016.

Specific information on Federal Government careers may be obtained from:

Interagency Board of U.S. Civil Service Examiners for Washington, D.C., 1900 E St. NW., Washington, D.C. 20415.

BIOCHEMISTS

(D.O.T. 041.081)

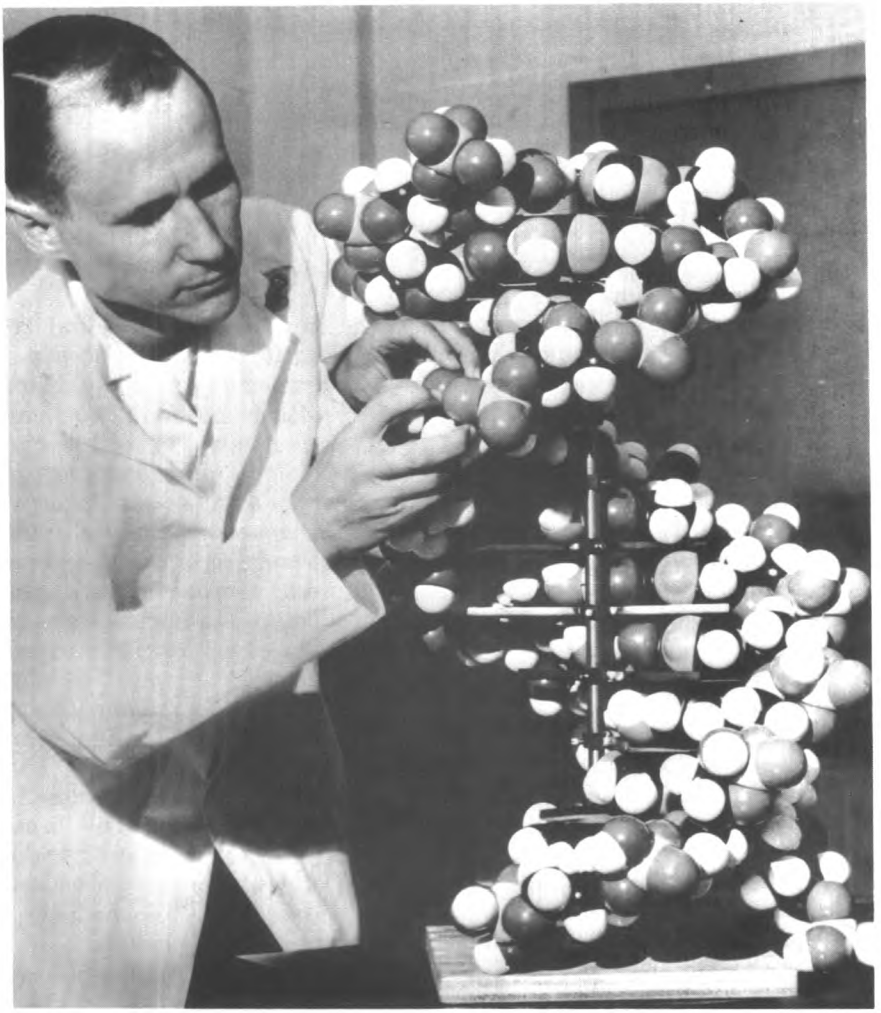
Nature of the Work

The biochemist has an important role in modern science's research for the basis of life and the factors that sustain life. His professional interests range from what determines heredity to how living things react to space travel.

Biochemists study the chemical composition of living organisms. They identify and analyze the chemical processes related to biological functions, such as muscular contraction, reproduction, and metabolism. Bichemists investigate the effects on organisms of such chemical substances as foods, hormones, and drugs. They study the chemical changes in living tissue caused by genetic and environmental factors.

Biochemists study a wide variety of substances, ranging from very small molecules to giant macromolecules. They analyze chemical compounds such as minerals, sugars, amino acids, proteins polysaccharides, nucleic acids, fats, and steriods. Biochemists deal with problems in genetics, enzymology, hormone action, bioenergetics, and the phenomena of biochemical control.

Foremost among the areas of application of biochemistry are medicine, biomedicine, nutrition, and agriculture. In the medical field, biochemists may investigate the causes and cures of disease or develop diagnostic procedures. In the biomedical area, they contribute to our understanding of genetics, heredity, brain function, and physiological adaption. In the nutritional field, they may identify the nutrients necessary to maintain good health and the effects of specific deficiencies on various kinds of performance, including the ability to learn. In agriculture, biochemists investigate soils, fertilizers, and plants, and undertake studies to discover more efficient methods of crop cultivation, storage, and utilization, and the design and use of pest-control agents.



Biochemist constructs molecular model.

Biochemists apply the principles and procedures of chemical and physical analysis to their research problems. They use a variety of scientific instruments and devices, including electron microscopes and radioactive isotope counters, and devise new instruments and analytical techniques as needed. Biochemists usually report the results of their research in scientific journals and sometimes lecture before scientific groups.

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About seven out of ten biochemists are engaged in research. The vast majority pursue basic research designed to increase scientific knowledge. The small group of biochemists working in applied research use the discoveries of basic research to solve practical problems or develop useful products. For example, through basic research, biochemists discover how a living organism forms a hormone. This knowledge is put to use by synthesizing the hormone in the laboratory and then producing it on a mass scale to enrich hormone-deficient organisms. The distinction between basic and applied research, however, is often one of degree; biochemists may engage in both types of work.

Some biochemists teach in colleges and universities, often combining research with teaching. Small proportions are engaged in production and testing activities or private consulting.

Places of Employment

Approximately 11,000 biochemists were employed in the United States in 1968; about 15 percent were women. Biochemists were employed in both large and small cities, and in all States.

About half of all biochemists were employed by colleges and universities in 1968. Many of these scientists were teaching and performing research in university-operated laboratories and hospitals. Another 700 biochemists worked for nonprofit organizations, such as research institutes and foundations.

Private industry employed several thousand biochemists. The largest group of these worked in the chemical industry, primarily for manufacturers of drugs, insecticides, and cosmetics.

About one-fifth of all biochemists worked for Federal, State, and local government agencies. Most of these scientists were employed by Federal agencies concerned with health or agriculture.

Training, Other Qualifications, and Advancement

The minimum educational requirement for beginning positions in biochemistry is the bachelor's degree with a major in biochemistry or chemistry, or with a major in biology and a minor in chemistry. For most entrance positions in research and teaching, graduate training in biochemistry is required. Graduate work also is needed for advancement to most high-level positions in all types of work.

Fewer than 40 schools award the bachelor's degree in biochemistry. However, all colleges and universities offer a major in biology or chemistry. The prospective biochemist should take undergraduate courses in chemistry, biology, biochemistry, mathematics, and physics.

More than 100 colleges and universities offer graduate degrees in biochemistry. For entrance into a graduate program in biochemistry, schools usually require the student to have a bachelor's degree in biochemistry, biology, or chemistry. However, students who have the bachelor's degree in another basic science but who have had several undergraduate courses in chemistry usually are admitted.

In graduate school, the student builds upon the basic knowledge obtained in the undergraduate curriculum. He takes advanced courses and may conduct research in many areas of biochemistry. In completing work for the doctoral degree, he usually specializes in a particular field of biochemistry by doing intensive research and writing a thesis.

Some graduate schools having extensive research facilities or a staff highly accomplished in a special field have gained a reputation for training students in that particular field of biochemistry. For example, a university affiliated with a medical school or hospital often has the facilities and equipment available for studying the biochemisty of disease. Therefore, a student who desires to specialize in a particular field of biochemistry should investigate the specialties of the various schools and make his selection carefully.

New graduates having the bachelor's degree usually begin work in industry or government as research assistants. These positions involve testing and analysis. In the drug manufacturing industry, for example, research assistants may analyze the ingredients of a product to verify and maintain its purity or quality. Some graduate students become research or teaching assistants in colleges and universities.

Beginning biochemists having advanced degrees usually qualify for research or teaching positions. Some experienced biochemists who have Ph. D. degrees advance to high-level administrative positions and supervise research programs. Other highly qualified biochemists, who prefer to devote their time to research, often become leaders in a particular field of biochemistry.

Employment Outlook

The employment outlook is likely to be very good for biochemists through the 1970's. In addition to new opportunities resulting from the very rapid growth expected in this field, about 450 new biochemists will be

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needed each year to replace workers who transfer to other fields of work, retire, or die.

The greatest demand will be for the biochemist who has the Ph. D. degree, to conduct independent research or to teach.

The major factor underlying the anticipated growth is the continued increase in expenditures for research and development in life sciences. These expenditures, which have risen rapidly in recent years, are expected to continue to rise, although at a somewhat slower rate.

The greatest growth in employment of biochemists is expected in medical research as research is expanded on health problems such as cancer, heart disease, muscular dystrophy, and mental illness. Additional biochemists will be needed to implement the more stringent drug standards that have been established by Congress and the Federal regulatory agencies. Biochemistry also is becoming important in other fields, such as environmental studies.

Growing college enrollments, especially of students majoring in chemistry and the life sciences, will strengthen the demand for biochemists qualified to teach in colleges and universities.

Although biochemistry is a relatively small profession and job openings will not be numerous in any one year, the number of graduates who have degrees in this science also is fairly small and is expected to remain small. Thus, the employment outlook should continue to be favorable for biochemistry graduates.

Earnings

Starting salaries paid to biochemists employed by colleges and universities are comparable to those for other professional faculty members. Biochemists in educational institutions often supplement their income by engaging in outside research or consulting work.

In 1968, the average (median) earnings for all biochemists who had a bachelor's degree was $8,600; for those having a master's degree, $9,900; and for those having a Ph. D., $14,000.

Sources of Additional Information

General information on careers in biochemistry may be obtained from:

American Society of Biological Chemists, 9650 Rockville Pike, Bethesda, Md. 20014.

Physical sciences

The physical sciences deal with the basic laws of the physical world. Many physical scientists conduct basic research designed to increase man's knowledge of the properties of matter and energy. Others conduct applied research, using the knowledge gained from basic research to develop new products and processes. For example, chemists in applied research use their knowledge of the interactions of various chemicals to develop new fuels for rockets and missiles. Physical scientists also teach in colleges and universities and supervise research and development programs.

This chapter includes descriptions of three major physical science occupations—chemist, physicist, and astronomer—and of biochemists, one of the major groups of chemists. Engineers, life scientists, and earth scientists also require a background in the physical sciences; these occupations are described in separate chapters elsewhere in the *Handbook*.

CHEMISTS

(D.O.T. 022.081, .168, .181, and .281)

Nature of the Work

The clothes we wear, the food we eat, the houses in which we live—in fact, most of the things which help to make our lives more comfortable, healthy, and productive—have resulted, in part, from the chemist's continuing search for new knowledge. Although the day-to-day activities of chemists generally receive little notice, some of their discoveries have led to the creation of whole new industries, such as the plastics, frozen foods, and manmade fibers industries.

Chemists investigate the properties and composition of matter, and the laws that govern the combination of elements in a seemingly endless variety of forms. They search for new knowledge about substances and try to utilize this knowledge for practical use. In conducting studies, they apply scientific principles and techniques and use a variety of specialized instruments to measure, identify, and evaluate changes in matter. Chemists

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Research chemists test plastic interlayer for safer automobile windshields.

maintain accurate records of their work and prepare clear and concise reports showing the results of the tests or experiments. They often present their findings in scientific publications or in lectures before scientific groups.

The activities of chemists are varied. Some chemists develop new substances, such as rocket fuels, solids for transistors, or vaccines. Other chemists, by observing how light is absorbed by a substance or how X-rays or beams of electrons are affected when passed through it, determine the chemical composition of a substance and the atomic make up of its molecules. Other chemists, are interested in the bulk properties of matter rather than those of individual molecules; they examine the behavior of solids, liquids, and reactions on surfaces. Another group of chemists study the rate at which matter undergoes changes in composition, ranging from the combustion in a jet engine to the growth of a living organism. A sizable number of chemists make qualitative and quantitative measurements of the properties of matter and develop analytical instruments and techniques. Biochemists challenge the problems related to the chemistry of life processes. (See separate statement on Biochemists elsewhere in the *Handbook*.)

Nearly one-half of all chemists are engaged in research and development. Many research chemists work on applied research projects to create new products or improve or find new uses for existing ones. Chemists in applied research have helped to develop a vast range of new products, including antibiotics, plastics, synthetic rubbers, detergents, insecticides, and manmade fibers. Many other chemists work on basic research to extend scientific knowledge rather than to solve immediate practical problems. Results of basic research frequently apply immediately to practical problems. For example, basic research on polymerization —how and why small molecules unite to form giant molecules— resulted in the development of synthetic rubber, nylon, and plastics.

About one-fourth of all chemists are employed in management and administration—especially of research and development activities. A smaller proportion of chemists devote most of their time to teaching, often combining research with teaching. Analysis and testing is another major activity of chemists because various kinds of tests must be made at practically every stage in the manufacture of a product, from initial development to final production. Others are employed as marketing experts or sales representatives of chemical companies and other manufacturers in positions where the employee must be familiar with the technical aspects of products. Some chemists work as private consultants to private industry firms and government agencies.

Places of Employment

Chemistry is by far the largest field of employment in the physical sciences. More than 130,000 chemists were employed in the United States in 1968; nearly 10 percent were women.

Nearly three-fourths of all chemists were employed by private industry in 1968. The chemicals manufacturing industry employed almost half of these chemists. Relatively large numbers of other chemists were found in the industries manufacturing food, scientific instruments, petroleum,

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rubber, paper, textiles and apparel, electrical equipment, and primary metals products. Independent laboratories and research institutes providing consulting services and distributors of chemical, pharmaceutical, food, and petroleum products also employed significant numbers of chemists.

Colleges and universities employed more than 20,000 chemists. A smaller number worked for nonprofit research organizations. A number of chemists were employed by Federal Government agencies, chiefly by the U.S. Departments of Defense; Health, Education, and Welfare; Agriculture; and Interior. Small numbers worked for State and local governments, primarily in agencies concerned with health or agriculture.

Chemists were employed in all States, in small as well as large cities. However, they were usually concentrated in large industrial areas. Nearly one-fifth of all chemists were located in four metropolitan areas—New York, Chicago, Philadelphia, and Newark. About half of the total worked in six States—New York, New Jersey, California, Pennsylvania, Ohio, and Illinois.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in chemistry is usually the minimum educational requirement for starting a career as a chemist. Graduate training is essential for many positions, particularly in research and college teaching, and is helpful for advancement in all types of work.

Training leading to the bachelor's degree in chemistry is offered by about 1,000 colleges and universities throughout the country. In addition to the required chemistry courses in inorganic, organic, and physical chemistry, and quantitative and qualitative analysis, the undergraduate chemistry major also takes courses in mathematics (especially analytical geometry and calculus) and physics.

Advanced degrees in chemistry are awarded by nearly 300 colleges and universities, many of which offer financial assistance to students interested in graduate study. In graduate school, the student usually specializes by taking several courses in a particular field of chemistry. Requirements for the master's or doctor's degree vary by institution, but usually include lectures, laboratory work, and a thesis.

New graduates having the bachelor's degree usually qualify for beginning positions in analysis and testing, quality control, technical service and sales, or assist senior chemists in research and development work. Most chemists having only the bachelor's degree start their careers in industry or government. In industry, employers often have special training programs for new chemistry graduates. These programs supplement college training with specific industry techniques and help determine the type of work for which the new employee is best suited. Some chemists who have the bachelor's degree teach or do research in colleges and universities while working toward advanced degrees. They also may qualify as secondary school teachers.

Chemists having the master's degree often qualify for applied research positions in government or private industry. They also may qualify for some teaching positions in colleges and universities and in 2-year colleges.

The Ph. D. degree generally is required for basic research, for higher level faculty positions in a college or university, or for advancement to top-level positions in administration and in other activities.

Employment Outlook

The employment outlook for chemists is expected to be very good through the 1970's. In addition to new opportunities resulting from the very rapid growth expected in the profession, approximately 6,500 new chemists will be needed each year to replace those who retire, die, or transfer to other occupations.

Chemists will be required in increasing numbers to perform research and development work. Expenditures for research and development, which have increased rapidly in recent years, probably will continue to rise, although somewhat more slowly than in the past. These expenditures not only create jobs for chemists in research and development, but also produce new products that result in new positions for chemists in other types of work.

Another factor increasing the opportunities for chemists is the growing demand for the products of industry. These products include plastics, manmade fibers, drugs, fertilizers, and high energy and nuclear fuels for missiles and space ships.

Because of the large increases in college and university enrollments expected through the 1970's, requirements for chemists to teach at these institutions are projected to double by 1980. The greatest demand will be for those who have Ph. D. degrees, but many openings, especially in 2-year colleges, also should arise for chemists who have master's degrees. (See statement on College and University Teachers.)

Along with the expected growth in demand for chemists, a rapid

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rise is expected in the number of chemistry graduates seeking professional employment through the 1970's. Nevertheless, the demand is expected to be somewhat greater than the number of new graduates who will be available for employment. Thus, new chemistry graduates should continue to have very favorable employment opportunities, although some competition may exist for the better paying entry positions.

New graduates also will find openings in high school teaching, provided they have completed the professional education courses and other requirements for a State teaching certificate. However, they usually are regarded as teachers rather than as chemists. (See statement on Secondary School Teachers.)

Earnings and Working Conditions

Inexperienced chemistry graduates having a bachelor's degree had an average (median) starting salary of about $8,400 a year in private industry in 1968, according to a survey conducted by the American Chemical Society. Inexperienced graduates having the master's degree averaged about $9,600 a year and those having the Ph. D. degree, about $13,500.

In academic institutions, the average (median) annual starting salary for the few entrants having the bachelor's degree and no experience was about $6,600, according to the American Chemical Society. The average salary for inexperienced graduates having the master's degree was about $8,600, and for those having the Ph. D. degree, $10,800. Many experienced chemists in educational institutions supplement their regular salaries with income from consulting, lecturing, and writing.

In Federal Government positions in late 1968, the annual starting salary for inexperienced chemists having the bachelor's degree was either $7,456 or $9,078, depending on the individual's college record. Beginning chemists who have 1 year of graduate study could start at $9,078 and those who have 2 years of graduate study at $10,154. Chemists having the Ph. D. degree could start at $11,563 or $12,580.

The average (median) annual salary for all chemists was $13,500 in 1968, according to the National Science Foundation's National Register of Scientific and Technical Personnel. Only 10 percent of all chemists earned less than $8,500 a year, and about 10 percent earned $21,000 or more.

Chemists spend most of their time working in modern, well-equipped, well-lighted laboratories, offices, or classrooms. Chemists work with chemicals that can be dangerous if handled carelessly. However, when safety regulations are followed, health hazards are negligible.

Sources of Additional Information

General information on career opportunities and earnings for chemists may be obtained from:

American Chemical Society, 1155 16th St. NW., Washington, D.C. 20036.

Manufacturing Chemists' Association, Inc., 1825 Connecticut Ave. NW., Washington, D.C. 20009.

Specific information on Federal Government careers may be obtained from:

Interagency Board of U.S. Civil Service Examiners for Washington, D.C., 1900 E St. NW., Washington, D.C. 20415.

For additional sources of information, see statements on Biochemists, Chemical Engineers, and Industrial Chemical Industry. Information on chemical technicians may be found in the statement on Technician Occupations.

PHYSICISTS

(D.O.T. 023.081 and .088)

Nature of the Work

The flight of astronauts through space, the probing of the oceans' depths, or even the safety of the family car depend in numerous ways on research performed by physicists. By determining basic laws governing phenomena such as gravity, electromagnetism, heat flow, and radioactivity, potential difficulties can be anticipated and overcome.

Physicists observe and analyze the various forms of energy, the structure of matter, and the relationship between matter and energy. From their research, physicists develop theories and discover fundamental laws that describe the behavior of the forces at work within the universe. Their studies have continued to broaden man's understanding of the physical world and have enabled him to make increasing use of natural resources. Physicists have contributed to scientific progress in recent years in areas such as nuclear energy, electronics, communications, and aerospace.

Nearly three-fifths of all physicists are engaged in research and development. Some conduct basic research to increase scientific knowledge with only secondary regard to its practical applications. Some of these, called theoretical physicists, attempt to describe the interactions between

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Physicist studies creation of energy in fuel cell model.

matter and energy in mathematical terms. Others, called experimental physicists, make careful systematic observations and perform experiments to identify and quantify these interactions. For example, they try to identify and measure the lifetime of tiny particles of matter which may exist within the nucleus of the atom. Experimental physicists use apparatus such as particle accelerators, X-ray spectrometers, microwave devices, lasers, and phase and electron microscopes. When their research requires new kinds of instruments, they may design them. The difference between theoretical and experimental physicists is often merely one of emphasis. Some members of the profession are skilled in both types of work.

A large number of physicists who are engineering-oriented engage in applied research and development. They use the knowledge gained from basic research to solve practical problems or to develop new or improved products. For example, the work of physicists specializing in solid-state physics led to the development of transistors and microcircuits, now used in place of vacuum tubes in many types of electronic equipment ranging from hearing aids to guidance systems for missiles.

About one-fifth of all physicists teach in colleges and universities. Others are engaged in management and adminstration, especially of research and development programs. A small number work in activities related to the production of industrial products such as inspection and quality control. Some physicists do consulting work.

Most physicists specialize in one or more branches of the science—mechanics, thermal phenomena, high energy physics, optics, acoustics, electromagnetism, electronics, atomic and molecular physics, nuclear physics, physics of fluids, solid-state physics, or classical theoretical physics. They may concentrate in a subdivision of one of these branches. For example, within solid-state physics they may specialize in ceramics, crystallography, or semiconductors, among others. In addition, emerging knowledge continually opens new areas of research. For example, the development of lasers and masers had led to new experimentation in optics and other fields. However, since all physics specialties rest on the same fundamental principles, the physicist's work often overlaps a number of specialties.

Physicists often apply the theories and methodology of their science to problems originating in other sciences, including astronomy, biology, chemistry, and geology. Growing numbers of scientists have specialized in fields that combine physics and a related science. Thus, a number of specialties have developed on the borderline between physics and other fields—astrophysics, biophysics, chemical physics, and

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geophysics. (Information on these occupations is continued elsewhere in the *Handbook.)* Furthermore, the practical applications of physicists' work have increasingly merged with engineering.

Places of Employment

Approximately 45,000 physicists were employed in the United States in 1968; only about 3 percent were women. Private industry employed about 18,000; more than two-fifths of whom worked in the electrical equipment, ordnance, and chemicals industries. Commercial laboratories and independent research institutes employed more than one-fourth of the physicists in private industry.

In 1968, colleges and universities employed almost 20,000 research or teaching physicists, many of whom combined both activities. Federal Government agencies employed approximately 6,000 physicists in 1968, nearly three-fourths of whom worked for the Department of Defense. The National Bureau of Standards and the National Aeronautics and Space Aministration also employed significant numbers of physicists. Nonprofit organizations employed more than 1,000 physicists.

Physicists were employed in all States. However, their employment was greatest in those areas having industrial concentrations and large colleges and universities. Nearly one-fourth of all physicists were employed in four metropolitan areas—Washington, D.C., Boston, New York, and Los Angeles-Long Beach. More than one-third of the total were employed in three States—California, New York, and Massachusetts.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in physics is generally the minimum entrance requirement for young people seeking careers as physicists. Graduate training is required for many entry positions and is helpful for advancement in all areas of work.

A doctor's degree usually is required for full faculty status at colleges and universities. It usually is needed for employment in positions involving responsibility for research and development with any type of employer.

Physicists having master's degrees qualify for many research jobs in private industry, educational institutions, and government. Some also instruct in colleges and universities. Usually, graduate students working toward a doctor's degree are assigned to teach elementary college courses, conduct laboratory sessions, or assist senior faculty members on research projects.

Physicists having bachelor's degrees qualify for a variety of jobs in applied research and development work in private industry or the Federal Government. Some become research assistants in colleges and universities while working toward advanced degrees. Many persons having a bachelor's degree in the science do not work as physicists but enter nontechnical work, other sciences, or engineering.

About 800 colleges and universities offer training leading to the bachelor's degree in physics. In addition, many engineering schools offered a physics major as part of the general curriculum. The undergraduate program in physics provides a broad background in the science, which serves as a base for later specialization either in graduate school or on the job. A few of the physics courses typically offered in an undergraduate program are mechanics, electricity and magnetism, optics, thermodynamics, and atomic and molecular physics. In addition, courses in chemistry and mathematics are required.

Approximately 300 colleges and universities offer advanced degrees in physics. In graduate school, the student, with faculty guidance, usually works in a specific field The graduate student, especially the candidate for the Ph.D. degree, spends a large portion of his time in research.

Employment Outlook

Employment opportunities for physicists are expected to be favorable through the 1970's. In addition to opportunities resulting from the very rapid growth expected in this field, approximately 2,200 physicists will be needed each year to replace those who transfer to other fields of work, retire, or die.

Graduate training is increasingly the hallmark of full professional status in physics. As in recent years, a strong demand is expected for physicists who have advanced degrees to teach in colleges and universities. Among the factors contributing to the demand for physics teachers are the rapid increase in graduate enrollments and the growing need for physics training in other science and engineering programs.

Physicists also will be required in substantial numbers to perform complex and demanding research and development work related to physics, engineering, or other natural sciences. Expenditures for research and development, which have increased rapidly in recent years, probably will continue to rise, although somewhat more slowly than in the past.

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New graduates also will find opportunities in other occupations that utilize their training. For example, they may become high school teachers, provided they complete the required professional educational courses and obtain a State teaching certificate. However, they are usually regarded as teachers rather than as physicists. (See statement on Secondary School Teachers elsewhere in the *Handbook.)*

Earnings and Working Conditions

Starting salaries for physicists having bachelor's degrees were usually about $9,000 a year in private industry in 1968, according to the limited information available. Physicists having master's degrees received starting salaries about $1,500 higher than those having bachelor's degrees. Depending on specialty and experience, graduates having Ph. D. degrees generally received entrance salaries of around $15,000 annually, although some were paid considerably less.

In the Federal Government in late 1968, physicists having the bachelor's degree and no experience could start at either $7,456 or $9,078 a year, depending on their college records. Beginning physicists who had completed all the requirments for the master's degree could start at $9,078 or $10,154. Physicists having the Ph. D. degree could begin at $11,563 or $12,580.

Starting salaries for physicists having the Ph. D. degree on college and university faculties ranged from $7,500 to $10,000 for the 1967-68 academic year. (For further information, see statement on College and University Teachers.) Many faculty physicists supplement their regular incomes and satisfy their professional interests through consulting work and special research projects.

The average (median) annual salary for physicists was $14,000 in 1968, according to the National Science Foundation's Register of Scientific and Technical Personnel. Only 10 percent earned less than $9,000 a year, and about 10 percent earned $22,500 or more.

Sources of Additional Information

General information on career opportunities in physics may be obtained from:

American Institute of Physics, 335 East 45th St., New York, N.Y. 10017.

Information on Federal Government careers may be obtained from:

Interagency Board of U.S. Civil Service Examiners for Washington, D.C., 1900 E St. NW., Washington, D.C. 20415.

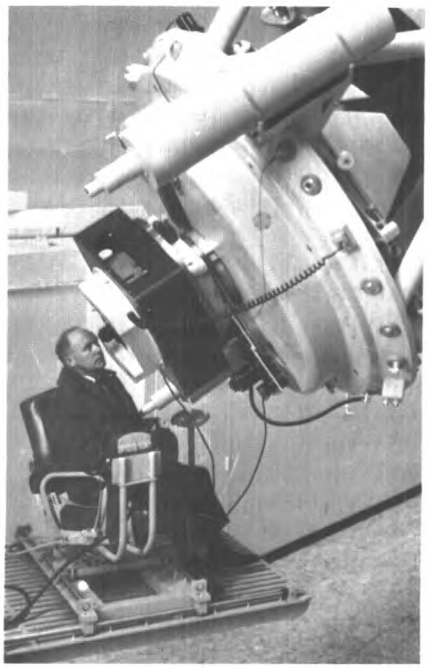
ASTRONOMERS

(D.O.T. 021.088)

Nature of the Work

Astronomy often is considered the most theoretical of all sciences, although it has many practical applications. Astronomers study all the celestial bodies in the universe. They collect and analyze data on the sun, moon, planets, and stars and attempt to determine the sizes, shapes, surface temperatures, chemical composition, and motions of these bodies and make studies of the gases and dust between them. They compute the positions of the plants; calculate the orbits of comets, asteroids, and artificial satellites; and make statistical studies of stars and galaxies. Astronomers also study the size and shape of the earth and the properties of its upper atmosphere. Astronomical observations are valuable to navigation and the accurate measurement of time.

In making detailed observations of the heavens, astronomers use complex photographic techniques, light-measuring instruments, and other optical devices. The telescope is the major instrument used for observation. Devices for making specialized observations are usually attached to the telescope. Although most observations are made by means of telescopes permanently mounted in observatories, astronomers are gathering information increasingly by means of rockets, balloons, and earth satellites carrying various measuring devices. In processing and analyzing the vast amounts of data derived from from their observations, astronomers often use electronic computers.



Astronomers usually specialize

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in one of the many branches of the science. In *astrophysics*, they apply physical laws to stellar atmospheres and interiors. Some astronomers work in the field of *celestial mechanics*, one of the oldest fields of astronomy that has recently acquired new importance because it deals, in part, with the motions of objects in the solar system, and hence has a particular application in the calculation of the orbits of spacecraft and artificial earth satellites and the paths of ballistic missiles. *Radio astronomy* is the study of the source and nature of celestial radio waves by means of radio telescopes of extraordinary sensitivity. Among the other specialties are *astrometry* (measurement of angular positions and movements of celestial bodies); photoelectric and photographic *photometry* (measurement of the intensity of light); *spectroscopy of astronomical sources* (wave length analyses of radiation from celestial bodies); and *statistical astronomy* (statistical study of large numbers of celestial objects, such as stars, to determine their average properties).

More than three-fifths of all astronomers are engaged in research activities. Another fifth are primarily teachers in colleges and universities. In some schools not having separate departments of astronomy or having only small enrollments in the subject, astronomers may teach courses in mathematics or physics as well as astronomy. Other members of the profession are engaged in a variety of activities, including administration of research programs, development and design of astronomical instruments, and consultation in areas to which astronomy is applied.

Places of Employment

Astronomy is one of the smallest of the physical sciences; in 1968, the total number of astronomers in the United States was estimated to be about 1,400. More than two-fifths of all astronomers were employed by colleges and universities. Many of these worked in university-operated observatories, where they usually devoted most of their time to research, working alone or together with other astronomers. Other astronomers worked for observatories financed by nonprofit organizations.

The Federal Government employed about 500 astronomers in 1968. Four-fifths of these worked for the National Aeronautics and Space Administration. The U.S. Naval Observatory and the U.S. Naval Research Laboratory also employed astronomers.

A growing number of astronomers were employed in private industry, mostly by firms in the aerospace field. A few astronomers worked for museums and planetariums.

Training, Other Qualifications, and Advancement

Young people seeking professional careers in astronomy should obtain an advanced degree—preferably the Ph. D. The doctorate usually is required for high-level positions in teaching and research and is important for other types of work in this field. Although the bachelor's degree is adequate preparation for some entry jobs, astronomers without graduate work usually find that opportunities for promotion are limited.

Undergraduate curriculums leading to the bachelor's degree in astronomy are offered by only about 35 colleges and universities. The undergraduate work of the prospective astronomer is weighted heavily with courses in physics and mathematics. Courses in chemistry, statistics, and electronics also are useful. A few of the courses often taken by astronomy undergradautes are optics, spectroscopy, atomic physics, calculus, differential equations, solar and stellar systems, introductory astrophysics, and astronomical techniques and instruments.

The prospective astronomer is not necessarily handicapped if the college he has selected for his undergraduate study does not offer a major in astronomy. Well-qualified students having a bachelor's degree in physics or mathematics with a physics minor usually are able to enter and pursue graduate programs in astronomy without difficulty.

Programs leading to the doctorate in astronomy are available at about 30 institutions located in various sections of the country. The academic work of the graduate student consists primarily of advanced courses in astronomy, physics, and mathematics. A few of the astronomy courses typically offered in graduate schools are celestial mechanics, galactic structure, radio astronomy, stellar atmospheres and interiors, theoretical astrophysics, and binary and variable stars. Some schools require that graduate students spend several months in residence at an observatory. In most institutions, the program of work leading to the doctorate is flexible and allows the student to take the courses which will be of most value to him in his astronomical specialty or particular area of interest.

New graduates having a bachelor's or master's degree in astronomy usually begin as assistants in observatories, planetariums, large departments of astronomy in colleges and universities, Government agencies, or

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industry. Some persons, having only the bachelor's degree, work as research assistants while studying toward advanced degrees; others, particularly those in Government employment, receive on-the-job training in the application of astronomical principles. New graduates having the doctorate can usually qualify for college teaching positions and for research positions in educational institutions, Government, and industry.

Employment Outlook

Employment opportunities for astronomers having the Ph. D. degree are expected to be good through the 1970's. Well-qualified persons with only bachelor's or master's degrees in astronomy will have favorable employment prospects, primarily as research and technical assistants. As in the past, however, the higher level professional positions in astronomy will be filled mainly by persons having the doctorate.

The outlook is for a rapid growth of this small profession through the 1970's. However, because astronomy is a small profession, the number of job openings in any one year will not be large. On the other hand, because relatively few college students are expected to receive advanced degrees in astronomy each year, those who do should have good employment opportunities.

Among the factors underlying the expected increase in demand for astronomers is the progress of the space age—the age of rockets, missiles, manmade earth satellites, and space exploration. Astronomers will be needed to analyze the data collected by rockets and spacecraft. They also will be needed to plan and give direction to the astronomical observations that can only be carried out by means of equipment placed in space vehicles.

Increased research activities in astronomy by educational institutions, Government, and industry are expected to add to the demand for astronomers. In recent years, the growth of Federal Government-sponsored research, in the form of grants to educational institutions and observatories (for astronomical research and for new buildings, observatories, and equipment), has opened many new positions for astronomers.

Earnings and Working Conditions

In late 1968, beginning astronomers having the Ph. D. were eligible to enter Federal Government service at a salary of $11,563 or $12,580 a year, depending on their college record. Astronomers having the bachelor's degree could start at $7,456 or $9,078 a year; those having a bachelor's degree and some graduate study could begin at $9,078 or $10,154.

Average starting salaries for the 1967-68 academic year for instructors of astronomy in colleges and universities ranged from about $7,500 to $10,000, according to the limited data available. As the astronomer advances to higher level teaching positions, his earnings increase significantly. Some full professors earn over $20,000 a year. Astronomers in educational institutions often earn extra income by writing books and articles, lecturing, or consulting.

Some astronomers are occupied much of the time in nightwork, making visual photographic or photoelectric observations. Others make observations only 4 or 5 nights each month, or even only a few nights a year, and devote the remainder of the time to studying and analyzing photographic plates, photoelectric tracings, and other material during usual daytime working hours. Observational work at a telescope involves exposure to the outside air through the open dome of the observatory, sometimes on cold winter nights. In general, however, the physical requirements of astronomical work can be met by a reasonably healthy person.

Sources of Additional Information

General information on careers in astronomy may be obtained from:

American Astronomical Society, 211 FitzRandolph Rd., Princeton, N.J. 08540.

Specific information on Federal Government career opportunities may be obtained from:

Interagency Board of U.S. Civil Service Examiners for Washington, D.C., 1900 E St. NW., Washington, D.C. 20415.

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THE PERFORMING ARTS

The performing arts include music, acting, singing, and the dance. In these fields, the number of first-rate artists seeking employment generally is much larger than the number of full-time positions available. As a result, many performers supplement their incomes by teaching, and others work much of the time in different types of occupations.

The difficulty of earning a living as a performer is one of the facts young people should bear in mind in considering an artistic career. They should consider, therefore, the possible advantages of making their art a hobby rather than a profession. Aspiring young artists usually must spend many years in intensive training and practice before they are ready for public performances. They need not only great natural talent but also determination, a willingness to work long and hard, and an overwhelming interest in their chosen field.

The statements which follow this introduction give detailed information on the musician, singer, actor, and dancer as performing artists and in related work.

ACTORS AND ACTRESSES

(D.O.T. 150.028 and .048)

Nature of the Work

Making a character come to life before an audience is a job that has great glamour and fascination. It is also hard and demanding work that requires special talent and involves many difficulties and uncertainties.

Only a few of the approximately 14,000 actors and actresses in the United States in 1968 have achieved recognition as stars—on the stage, in motion pictures, or on television or radio. A somewhat larger number are well-known, experienced performers, who frequently are cast in supporting roles. However, most are struggling for a toehold in the profession, and are glad to pick up small parts wherever they can.

New actors generally start in "bit" parts, where they speak only a few lines. If successful, they may progress to larger, supporting roles, of which there are several in most stage, television, and screen productions. Actors who have minor parts in stage productions also may serve as understudies for the principals. If a leading player misses a performance, the understudy has a chance to demonstrate his acting ability.

Actors who prepare for roles either on the stage, in television, or in the movies spend many hours in rehearsal. They also must memorize their lines and know their cues. Radio actors typically read their parts. They have to be especially skilled in expressing character and emotion through the voice, since this is their sole means of creating an impersonation for their audience.

In addition to the actors with speaking parts, "extras," who

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have no lines to deliver, are used in almost every motion picture and many television shows. In spectacular productions, a large number of extras take part in crowd scenes.

Some actors find jobs as dramatic coaches or become directors of stage, television, radio, or motion picture productions. A few teach in schools of acting or in the drama departments of colleges and universities.

Places of Employment

Stage plays, motion pictures (including films made especially for television), and commercials are the largest fields of employment for actors, although some are employed by "live" television and radio.

In the winter, most employment opportunities on the stage are in New York and other large cities. In the summer months, stock companies in suburban and resort areas throughout the Nation provide many opportunities for employment. In addition, many cities now have "little" theaters, which provide opportunities for local talent as well as for professional actors and actresses from New York and other centers. Plays that go "on the road," moving from city to city, are normally produced in New York with casts selected there.

Although employment opportunities in motion pictures and film television are centered in Hollywood, a few studios are in Long Island, N.Y., Miami, Fla., and other parts of the country. In addition, many films are shot on location, providing employment for "extras" who live in the area. In live television and radio, most opportunities for actors are at the headquarters of the main networks—in New York, Los Angeles, and, to a lesser extent, Chicago. A few local television and radio stations occasionally employ actors.

Training and Other Qualifications

Young people aspiring to acting careers should get as much acting experience as possible by taking part in high school and college plays, or working with little theaters and other acting groups in their home towns.

Formal training in acting is increasingly necessary. Such training can be obtained at special schools of the dramatic arts, located chiefly in New York, and in over 500 colleges and universities. Because college drama curriculums usually include courses in liberal arts, speech, pantomine, play production, and the history of the drama, as well as practical courses in acting, the student develops an appreciation of the great plays and a greater understanding of the roles he may be called on to play. Graduate degrees in the fine arts or in drama are necessary for college teaching positions.

Outstanding talent for acting and great interest and determination are essential for success in the theater. Ability to memorize, a good speaking voice, good health, and the physical stamina to work long hours are necessary. Ability to sing and dance is also an asset for those who seek an acting career.

In all media, whether the stage, motion pictures, radio, or television, the best way to start is to use local opportunities and to build on the basis of such experience. Many actors who are successful in local dramatic productions eventually try to appear on the New York stage. Inexperienced actors usually find it extremely difficult to obtain employment in New York or Hollywood. The motion picture field is especially difficult to enter, and employment often results from previous experience on Broadway.

To become a movie extra, one must usually be listed by Central Casting, a no-fee agency which works with the Screen Extras Guild and supplies all extras to the major movie studios in Hollywood. Applicants are accepted only when the number of people of a particular type on the list—for example, athletic young men, old ladies, or small children—is below the foreseeable need. In recent years, only a very small proportion of the total number of applicants have succeeded in being listed. Extras have very little, if any, opportunity to advance to speaking roles in the movies.

The length of an actor's working life depends largely on his skill and versatility. Great actors and actresses can work almost indefinitely. On the other hand, employment opportunities become increasingly limited by middle age, especially for those who become typed in romantic, youthful roles.

Employment Outlook

The overcrowding that has existed in the acting field for many years is expected to persist. In the legitimate theater and also in motion pictures, radio, and television, job applicants outnumber by many times the jobs available. Moreover, many actors are employed in their profession for only a small part of the year.

The development of motion pictures, radio, and TV has greatly reduced employment opportunities for actors in the theater. Although a motion picture production may use a very large number of actors, they are em-

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ployed only during filming and the films are widely distributed and may be used for years. Radio uses few actors. The number of filmed TV dramas and commercials using actors is increasing, but not enough to offset the decline in other media. Moreover, television stations often broadcast "taped" dramas rather than live productions, and, like motion picture films, these tapes may be widely distributed and used many times.

One possibility for future growth in the legitimate theater lies in the establishment of year-round professional acting companies in more cities. The number of communities with such acting groups is growing. The recent growth of summer stock companies and dinner theaters also has increased employment. Further increases are likely also in the employment of actors on television. In the acting field as a whole, however, employment opportunities are expected to change little through the 1970's. The number of new entrants to the profession is expected to outnumber employment opportunities. Even highly talented young people are likely to face stiff competition and economic difficulties in the profession.

Earnings and Working Conditions

Actors and actresses employed in the legitimate theater belong to the Actors' Equity Association. If employed in motion pictures, including television films, they belong to the Screen Actors Guild, Inc., or to the Screen Extras Guild, Inc. If employed in television or radio, they belong to the American Federation of Television and Radio Artists. These unions and the show producers sign basic collective bargaining agreements which set minimum salaries, hours of work, and other conditions of employment. In addition, each actor enters into a separate contract which may provide for higher salaries than those specified in the basic agreement.

The minimum weekly salary for actors in Broadway Productions was $150.65 in mid-1969. Those apearing in small "off-Broadway" theaters had considerably lower earnings. For shows on the road, the minimum rate was $202.60 a week. Earnings for rehearsal time were $150.65 a week in Broadway shows and much lower in small "off-Broadway" theaters. All minimum salaries are adjusted upward according to increases in the cost of living as reflected in the Bureau of Labor Statistics Consumer Price Index.

Motion picture actors and actresses had a minimum daily rate of $112 in mid-1969. For extras, the minimum rate was about $29 a day. Actors on network television received a minimum program fee of $165 for a single half-hour program and 10 hours of rehearsal time; actors on radio received $49.60 for a half-hour performance, including 1 rehearsal hour. To encourage more stable employment on radio and TV, minimum guarantees for those actors with contracts for a series of programs are sometimes discounted below the single program guaranteed fee. Because of the frequent periods of unemployment characteristic of this profession, annual earnings may be low for many of the lesser known performers. In all fields, many well-known actors and actresses have salary rates above the minimums. Salaries of the few top stars are many times the figures cited.

Eight performances amount to a week's work on the legitimate stage, and any additional performances are paid for as overtime. The basic work-week after the opening of a show is 36 hours, including limited time for rehearsals. Before the opening, however, the workweek usually is longer to allow enough time for rehearsals. Evening work is, of course, a regular part of a stage actor's life. Rehearsals may be held late at night and on weekends and holidays. Traveling over the weekend often is necessary when plays are on the road.

Most actors are covered by a pension fund and a growing number have hospitalization insurance to which their employers contribute. All Equity members have paid vacations and sick leave. Most stage actors get little if any unemployment compensation, since they seldom have enough employment in any State to meet the eligibility requirements. Consequently, when a show closes, they often have to take any casual work obtainable while waiting for another role.

DANCERS

(D.O.T. 151.028 and .048)

Nature of the Work

Dancing is an ancient and worldwide art, having many different forms. Professional dancers may perform in classical ballet or modern dance, in dance adaptations for musical shows, in folk dances, or in tap and other popular kinds of dancing. In the classical ballet, movements are based on certain conventional or styled "positions," and women dance "en pointe" (on the tips of their toes). In the modern dance, movements are much more varied but are nonetheless care-

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fully planned and executed to follow a pattern.

In dance productions, the performers most often work together as a chorus. However, a group of selected dancers may do special numbers, and a very few top artists do solo work.

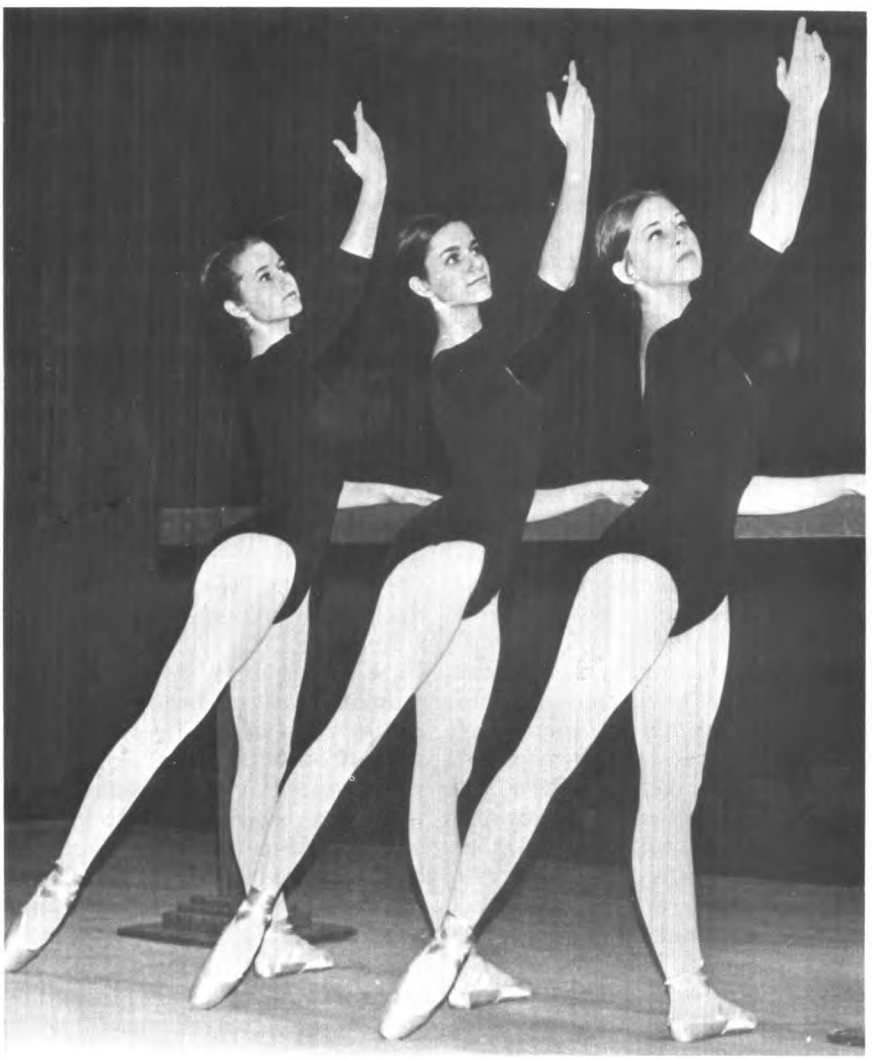
Many dancers combine teaching with their stage work or teach full time in schools of the dance or in colleges and universities. The few dancers who become choreographers create new ballets or dance routines. Others are dance directors who train dancers in new productions.

This statement does not include instructors of ballroom and other social dancing.

Places of Employment

In 1968, there were approximately 23,000 dancers and dancing teachers in the United States. More than half of this number were teachers employed at schools of the dance and in schools and colleges. Most of the other dancers were performers on the stage, screen, and television. A few teachers trained in dance therapy were employed by hospitals to work in the treatment of mental disorders. About 80 percent of all dancers are women, but in some types of dance, particularly ballet and modern, women constitute about one-half of the performers.

Dancing teachers are located chiefly in large cities, but many smaller cities and towns have schools of the dance. New York City is the hub for the majority of performing dancers; others are situated in Los Angeles, San Francisco, and Chicago.



Training and Other Qualifications

Serious training for a dancing career traditionally begins by age 12 or earlier. Girls wishing to become ballet dancers should begin taking lessons at the age of 7 or 8. From 2 to 3 years of prior preparation is needed before the young girl should start dancing "en pointe." Professional training typically takes from 10 to 12 lessons a week for 11 or 12 months in the year and many additional hours of practice. The length of the training period depends on the student's ability and physical development, but most dancers have their professional audition by age 17 or 18.

The selection of a professional dancing school is important for two reasons. First, the school must use expert judgment in setting the pace of training, since too early and too severe exercise can permanently damage the legs and feet. Second, the school's connections with producers may help the students in obtaining employment.

Because of the strenuous training program in the professional schools, the general education received by students in these schools may not exceed the legal minimum. However, a dancer's education should include subjects such as music, literature, and

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history to aid him in his interpretation of dramatic episodes and music. About 200 colleges and universities confer bachelor's degrees on students who have either majored in physical education and concentrated on the dance, majored in a dance program designed to prepare students to teach dance, or majored in a dance program designed to prepare students as professional dance artists. Some of these schools also give graduate degrees.

A college education is an advantage in obtaining employment as a teacher of professional dancing or choreography. However, dancers who postpone their first audition for openings in classical ballet until graduation may compete at a disadvantage with younger dancers.

A teaching position in professional schools usually requires experience as a performer; in colleges and conservatories, graduate degrees are generally required, but experience as a performer often may be substituted. Maturity and a broad educational background are also important for teaching positions.

Excellent health and unusual physical vitality are necessary for a dancing career. Height and body build should not vary much from the average. Good feet and normal arches are required. These physical qualifications must be accompanied by a natural aptitude for dancing.

For women dancers, employment in ballet companies is very difficult to obtain after the age of 30, except for outstanding stars. Women past 25 are rarely hired for Broadway shows unless they have already had experience in such productions. Men who are ballet dancers, and men and women who perform in modern dance productions, usually can continue somewhat longer. After the employable age as performers has passed, some dancers teach in colleges or conservatories, or establish their own schools. The few who become choreographers or dance directors can continue working as long as people in most other occupations.

Employment Outlook

Opportunities in this field will be limited both by the small number of full-time jobs available and the relatively large supply of applicants seeking full-time work. The supply of trained dancers has exceeded the demand for many years. The irregular employment experienced in this profession for many years may persist despite a few recent union-management contracts aimed at guaranteeing some dancers full or near-full employment each year. Among the factors affecting demand are the decline in the total number of stage productions because of competition from motion pictures and television. Few stage shows run more than 26 weeks and many "fold" after the first week. On the other hand, the number of shows being produced is increasing, and there is a growing trend toward using professional dancers at industrial exhibitions, such as auto shows. Also, some new professional dance companies are being developed around the country, and television will offer some additional employment opportunities. Civic and community dance groups are increasing in number, and opportunities for dancers will expand as these develop into professional groups. Nevertheless, employment opportunities for dance performers will remain limited, and most of the openings for dancers in the years ahead will stem from the need to replace those who leave the field.

The employment outlook for dancers who have the personal and educational qualifications for teaching will be much better than for those trained only as performers. The growing interest in the dance as one of the fine arts is contributing to the demand for teachers of dancing. The increase in college enrollments will be another factor which will tend to enlarge teaching opportunities. (See statement on College and University Teachers.)

Men dancers face less competition for employment than do women dancers, since fewer men than women seek dancing as a career.

Earnings and Working Conditions

Dancers who perform professionally are members of one of the unions affiliated with the Associated Actors and Artistes of America (AFL-CIO). Dancers who perform in opera ballets, classical ballet, and the modern dance belong to the American Guild of Musical Artists, Inc.; those who perform on television belong to the American Federation of Television and Radio Artists; and those who appear in musical comedies join Actors' Equity Association. Dancers may also be members of other unions, depending upon the field in which they perform. (See statement on Singers and Singing Teachers.) Minimum salary rates, hours of work, and other conditions of employment are specified in basic agreements signed by the unions and the producers. The separate contract signed by each dancer with the producer of the show may be more favorable than the basic agreement regarding salary, hours of work, and working conditions.

The minimum salary for dancers in ballet and other stage productions was $140 a week, as of 1968. The minimum rate for rehearsal

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time was $135 a week, except in small ballet companies which provide $110 for a rehearsal week. Salaries are increased when a show goes on tour since dancers pay their own hotel bills. The employer pays the cost of first-class transportation. If a dancer signs a contract for a brief appearance in a performance on television or a few days' work in a movie, the minimum rate is higher, relative to time worked. However, this difference is offset by the brevity of the engagement and the long period likely to be spent waiting for the next one. A few performers, of course, have much higher salaries. For stars, principals, and choreographers, salaries in stage productions ranged from $215 to over $750 a week in 1968.

Some dancers qualified to teach in schools of the ballet are able to combine this work with engagements as performers. A much greater number of dancers have to supplement their incomes by other types of work.

Salaries of teachers in the technical schools of the ballet vary with the location and prestige of the school. Dancers employed as teachers in colleges and universities are paid on the same basis as other faculty members. (See statement on College and University Teachers.)

The normal workweek is 30 hours spent in rehearsals and matinee and evening performances. Extra compensation is paid for hours worked outside the normal workweek. Most stage performances are, of course, in the evening, and rehearsals may require very long hours, often on weekends and holidays. When shows are on the road, traveling over the weekend is often required.

Dancers are entitled to some paid sick leave and various health and welfare benefits provided by their unions, to which the employers contribute.

Sources of Additional Information

Information on colleges and universities and conservatories of music which give a major in the dance or some courses in the dance, and details on the types of courses and other pertinent information may be obtained from the Dance Directory, compiled by the American Association for Health, Physical Education and Recreation, a division of the National Educational Association, 1201 16th St. NW., Washington, D.C. 20036.

Information on wages and working conditions may be obtained from:

American Guild of Musical Artists, 1841 Broadway, New York, N.Y. 10023.

MUSICIANS AND MUSIC TEACHERS

(D.O.T. 152.048 and .028; 090.168; 091.168; and 092.228)

Nature of the Work

Professional musicians—whether they play in a symphony orchestra, dance band, or "jazz combo"—have behind them many years of study and intensive practice. As a rule, musicians specialize in either popular or classical music; only a few play both types professionally.

Musicians who specialize in popular music usually play the trumpet, trombone, clarinet, saxophone, or one of the "rhythm" instruments—the piano, string bass, drums, or guitar. Dance bands play in nightclubs, restaurants, and at special parties. The best known bands, jazz groups, and solo performers sometimes give concerts and perform on television.

Professional musician gives public school students some musical pointers.

Musicians specializing in classical music play in opera and theater orchestras, symphony orchestras, and for other kinds of performances requiring orchestral accompaniments. The instruments played by most of these musicians are the strings, brass, and wood winds. Some form small groups—usually a string quartet or a trio—to give concerts of chamber music.

Many pianists accompany vocal or instrumental soloists or choral groups or provide background music in restaurants or other places. Most organists play in churches, often directing the choir. A very few exceptionally brilliant and well-known musicians become concert artists. They give their own concerts and appear as soloists with symphony orchestras. Both classical and popular musicians often make recordings, either individually or as members of a group.

A very high proportion of all

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musicians teach in the Nation's schools and colleges and are seldom, if ever, paid for performing. These teachers may be members of the faculty of music schools or conservatories or of colleges which offer instruction in instrumental and vocal music. Some are music teachers in elementary or secondary schools where they direct vocal and instrumental music programs, teach general classroom music appreciation, and give group instruction on an instrument. Private lessons are given by many teachers employed by school systems, and by performing musicians, either in their own studios or in pupils' homes.

A few musicians work in the field of music therapy in hospitals, and in music libraries.

Places of Employment

An estimated 166,000 musicians were employed in 1968. Most professional musicians who perform work in large cities, principally in New York, Chicago, and Los Angeles, where the Nation's entertainment activities are concentrated. Music teachers in elementary and secondary schools, as well as in colleges and universities, are employed all over the country. Moreover, almost every town and city has at least one private music teacher. Dance bands and civic orchestras also are located in many communities, although in the smaller towns, their members usually are part-time musicians with other regular jobs.

In addition to the people primarily employed as musicians or music teachers, thousands of qualified instrumentalists have other full-time jobs and only occasionally work as musicians. Most of these part-time musicians belong to dance bands, which are hired to play at private parties or for special occasions. Others, with a background in classical music, play occasionally in an orchestra, become conductors or composers, or do some part-time teaching.

Training and Other Qualifications

Most people who become professional musicians begin studying an instrument at an early age. To achieve a career as a performer or as a music teacher, young people need intensive training—either through private study with an accomplished musician, in a college or university which has a strong music program, or in a conservatory of music. They need to acquire not only great technical skill but also a thorough knowledge of music, and they must learn how to interpret music. Before a young person can qualify for advanced study in a music conservatory or in a college or university school of music, an audition frequently is necessary. Many teachers in these schools are accomplished artists who will train only promising young musicians.

Over 550 conservatories of music and college and university schools of music offer 4-year programs leading to a bachelor's degree in music education. Students who complete these programs can qualify for the State certificate required for elementary and secondary school positions. Conservatories and collegiate music schools also frequently award the degree of bachelor of music to students who major in instrumental or vocal music. The 4-year program leading to either of these degrees provides not only training as a performer but also a broad background in musical history and theory, together with some liberal arts courses. Advanced degrees usually are required for college teaching positions, but exceptions may be made for especially well-qualified artists.

Musicians who play jazz and other popular music must have an understanding of and feeling for that style of music, but skill and training in classical styles may expand their employment opportunities. As a rule, they take lessons with private teachers when young, and seize every opportunity to play in amateur or professional performances. Some groups of young people form their own small dance bands. As they gain experience and become known, the players may have opportunities to audition for other local bands, and, still later, for the better known bands and orchestras.

Employment Outlook

As a field of employment, music performance has been overcrowded for many years, and it is expected to remain so through the 1970's. Opportunities for concerts and recitals are not numerous enough to provide adequate employment for all the pianists, violinists, and other instrumentalists qualified as concert artists. Competition is usually keen for positions which afford some stability of employment—for example, jobs with major orchestras and teaching positions in conservatories and colleges and universities. Because of the ease with which a musician can enter private music teaching, the number of music teachers has been and will probably continue to be more than sufficient to give instruction to all the young people seeking lessons. Although many opportunities for single and short-term engagements playing popular music in night clubs,

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theaters, and other places can be expected, the supply of qualified musicians seeking such jobs is likely to remain greater than the demand. On the other hand, a shortage of highly qualified church organists may persist in many communities during the next few years; first-class, experienced accompanists and well trained, outstanding players of stringed instruments are likely to remain relatively scarce; and public school systems will probably continue to need more fully qualified music teachers and supervisors.

Employment opportunities for performers are expected to increase slightly over the long run. Although the number of civic orchestras in smaller communities has been growing steadily, many of these orchestras provide only part-time employment for musicians who work chiefly as teachers or in other occupations. Moreover, the openings created by the establishment of these orchestras have been more than offset by the decline in opportunities in the theater, radio, motion pictures, and other places, which has resulted, in part, from the greatly increased use of recorded music.

The employment outlook in music education for people who are qualified as teachers as well as musicians is considerably better than for those qualified as performers only. A great increase in the numbers of young people of high school and college age will take place through the 1970's. Moreover, the number of schools with music programs is growing steadily, and interest in music as an avocation is also rising, as evidenced by the increasing sales of musical instruments. Thus, over the long run, an increase can be expected in the employment of elementary and secondary school music teachers and also in the teaching staffs of college and university music schools and conservatories of music.

Earnings and Working Conditions

The amount received for a performance by either classical or popular musicians depends to a large extent on their professional reputations. Musicians who were members of 1 of the 28 major symphony orchestras in the United States had minimum salaries ranging from about $4,000 to $13,000 a year in 1968, according to the American Symphony Orchestras League, Inc. Five orchestras—New York, Boston, Philadelphia, Cleveland, and Chicago—have year-round seasons and minimum salaries ranging from $10,500 to $13,000. The remaining 23 orchestras have seasons ranging from 29 to 47 weeks. Instrumentalists who were members of small ensembles reportedly received as much as $200 a concert. Those who played in dance bands were paid from $60 to $300 a week in 1968, according to the limited information available.

The salaries of public school music teachers are determined by the salary schedule adopted for all teachers. (See statements on Elementary and Secondary School Teachers.) However, they frequently supplement their earnings by giving private music lessons and taking church positions. Earnings from private lessons are uncertain and vary according to the musician's reputation, the number of teachers in the locality, the number of students desiring lessons, and the economic status of the community.

Musicians who are performers customarily work at night and on weekends. They must also spend considerable time in regular daily practice and in rehearsing new scores.

Performers may have relatively long periods of unemployment between jobs and, thus, the overall level of their earnings generally is lower than that of many other occupations. Moreover, they do not usually work steadily for one employer. Consequently, some performers cannot qualify for unployment compensation, and few have either sick leave or vacations with pay.

Most musicians who play professionally belong to the American Federation of Musicians (AFL-CIO). Concert soloists also belong to the American Guild of Musical Artists, Inc. (AFL-CIO).

Sources of Additional Information

Information about wages, hours of work, and working conditions for professional musicians is available from:

American Federation of Musicians (AFL-CIO), 641 Lexington Ave., New York, N.Y. 10022.

Information about the requirements for certification of organists and choir masters may be secured from:

American Guild of Organists, 630 Fifth Ave., New York, N.Y. 10020.

A list of accredited schools of music is available from:

National Association of Schools of Music, 1424 16th St., NW., Washington, D.C. 20036.

Further information about music teaching in elementary and secondary schools is available from:

Music Educators National Conference, The National Education Association of the United States, 1201 16th St. NW., Washington, D.C. 20036.

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SINGERS AND SINGING TEACHERS

(D.O.T. 152.048 and .028; 090.168; 091.168; and 092.228)

Nature of the Work

Professional singing is an art that usually requires not only a fine voice but also a highly developed technique and a broad knowledge of music. A small number of singing stars make recordings or go on concert tours in the United States and abroad. Somewhat larger numbers of singers obtain leading or supporting roles in operas and popular music shows, or secure engagements as soloists in oratorios and other types of performances. Most professional singers of classical music are soloists in churches or synagogues. Some singers also become members of opera and musical comedy choruses or other professional choral groups. Popular music singers perform in musical shows of all kinds—in the movies, on the stage, on radio and television, and in nightclubs and other entertainment places. The best known popular music singers make and sell many recordings.

Since most singers of both classical and popular music have only part-time or irregular employment as singers, they often have full-time jobs of other types and sing only in the evenings or on weekends. Some give private voice lessons. A number of singers are employed in elementary and secondary schools, where they are qualified to teach general music courses and lead choruses. Others give voice training or direct choral groups in churches, music conservatories, or in colleges and universities with schools or departments of music.

Places of Employment

In 1968, about 60,000 people were employed as professional singers or singing teachers. Opportunities for singing engagements are mainly in New York City, Los Angeles, and Chicago—the Nation's chief entertainment centers. Nashville, Tenn., also is a major place of employment for singers in both "live" performances and recordings, and for those who specialize in folk and country music. Persons trained as singers who teach music in elementary and secondary schools, colleges, universities, and conservatories of music are employed throughout the country. Many singers are employed part-time chiefly as church singers and choir masters.

Training and Other Qualifications

Young people who want to perform professionally as singers should acquire a broad background in music, including its theory and history. The ability to dance is also helpful, since singers are sometimes required to dance. In addition, those interested in a singing career should start piano lessons at an early age. As a rule, voice training should not begin until after the individual has matured physically, although young boys who sing in church choirs receive some training before their voices change. Moreover, because of the work and expense involved in voice training—which often continues for years after the singer's professional career has started—it is important that a prospective singer show great determination and audition before a competent voice teacher to decide whether professional training is warranted.

Young people can prepare for careers as singers of classical music by enrolling in a music conservatory, a school or department of music connected with a college or university, or by taking private voice lessons. These schools provide not only voice training, but other training necessary for understanding and interpreting music, including music-related training in foreign languages and sometimes dramatic training. After completing a 4-year course of study, a graduate may be awarded either the degree of bachelor of music, bachelor of science or arts (in music), or bachelor of fine arts.

Young singers who plan to teach music in public elementary or secondary schools need at least a bachelor's degree with a major in music education and must meet the State certification requirements for teachers. Such training is available in over 550

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colleges and universities throughout the country. College teachers usually are required to have a master's degree and sometimes a doctor's degree, but exceptions may be made for especially well-qualified artists.

Although voice training is an asset for singers of popular music, many with untrained voices have had successful careers. The typical popular song does not demand that the voice be developed to cover as wide a range on the musical scale as does classical music, and the lack of voice projection may be overcome by using a microphone.

Young singers of popular songs may become known by participating in amateur and paid performances in their communities. These engagements may lead to employment with local dance bands and possibly later with better known ones.

In addition to musical ability, perseverance, an outstanding personality, an attractive appearance, good contacts, and luck often are required to achieve a singing career. Furthermore, a singing career is sometimes relatively short, since it depends on a good voice and public acceptance of the artist, both of which may be affected by age.

Employment Outlook

The employment situation for singers will probably remain highly competitive through the 1970's. Competition among popular singers will continue to be especially keen. A great number of short-term jobs are expected in the entertainment field—the opera and concert stage, movies, theater, nightclubs, radio and television, dance bands, and other places—but not enough to provide steady employment for all qualified singers. The demand for church singers is expected to expand because of the continued growth in number of religious congregations, but most of these openings will probably be filled either by part-time singers who have steady employment in other fields or by volunteers.

Little growth in overall employment opportunities for singers is likely over the long run. The use of recorded music has practically replaced the "live" singer on radio; also, the number of television performances given by singers is limited, although it may increase in future years. However, there is a growing demand for singers to record popular music and commercials for both radio and television advertising. The outlook for singers who can meet State certification requirements for positions as music teachers, or who can qualify for college teaching, will be considerably better than for performers. The demand for music teachers in the Nation's elementary and secondary schools is expected to grow, and some increased employment of music teachers can be expected in colleges and universities. In addition, music teachers will be needed to replace those who will transfer to other fields of work, retire, or die.

Earnings and Working Conditions

Some singers employed by dance bands and the motion picture industry earn as much as $200 a week, and a few well-known concert soloists, opera stars, and top recording artists of popular music may command more than $1,000 for a performance. However, most professional singers experience difficulty in obtaining regular employment and have to supplement their singing incomes by doing other types of work.

The salaries of public school music teachers are determined by the salary schedule adopted for all teachers in their school system. The fees that private music teachers charge depend on the teacher's reputation, the economic status of the families in the community, and other factors.

Singers generally work at night and on weekends. School teachers have regular working hours; private voice teachers often give lessons after school or business hours or on weekends work in the entertainment field is seasonal, and few performers have steady jobs.

Singers who perform professionally on the concert stage or in opera belong to the American Guild of Musical Artists, Inc.; those who sing on radio or television or who make phonograph recordings are members of the American Federation of Television and Radio Artists; singers in the variety and night club field belong to the American Guild of Variety Artists; those who sing in musical comedy and operettas belong to the Actors' Equity Association; and those who sing in the movies belong to the Screen Actors Guild, Inc. All of these unions are branches of the Associated Actors and Artists of America (AFL-CIO).

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Sources of Additional Information

Information about accredited schools and departments of music may be obtained from:

National Association of Schools of Music, 1424 16th St. NW., Washington, D.C. 20036.

Further information about music teaching in elementary and secondary schools is available from:

Music Educators National Conference, The National Education Association of the United States, 1201 16th St. NW., Washington, D.C. 20036.

Information concerning salary and working conditions is available from:

American Guild of Musical Artists, 1841 Broadway, New York, N.Y. 10023.

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OTHER ART RELATED OCCUPATIONS

COMMERCIAL ARTISTS

(D.O.T. 141.031 and .081, 970.281 and .381, and 979.381)

Nature of the Work

The artwork appearing in newspaper and magazine advertisements, on billboard posters, brochures, catalogs, and television commercials often is created by a team of commercial artists. The *art director* supervises a group of artists of varying levels of skill and diverse specializations. He may develop the art aspects of an advertising plan which he turns over to a layout man for further refinement. The *layout artist* works up the construction or arrangement of the elements of the advertisement, planning the selection and layout of illustrations, photographs, and typography, and determining color and other elements of design. Then he prepares a "rough visual" or sketch. After consulting with the director, he may make changes in the visual and complete a more comprehensive layout for the customer's consideration.

Working with the layout man in turning out the finished product are a variety of specialists such as *renderers*, who make rough pastel or wash drawings; *letterers*, who execute appropriate lettering either freehand or with mechanical aids; *illustrators*, who make sketches and drawings in more finished form; and *paste-up and mechanical men*, who cut and paste together the basic parts of the advertisement or other artwork, using a ruling pen and other drafting tools. Some workers, called *general boardmen*, spend nearly all their time at the drawing board performing many of these specializations. Often supporting the general boardmen or other specialists are apprentices, who engage primarily in mechanical, routine, and noncreative functions such as separating colors, ruling pen work, washing paintbrushes, cutting mats, running errands, and so forth.

In a small office, the art director may perform the layout and boardwork himself, with the aid of apprentices. In a large office, he may be responsible for developing concepts with the copy writer; setting standards; dealing with clients; and purchasing needed photographs, illustrations, lettering, and other art work from freelancers or art services.

Much of the advertising artists' work is in creating the concept and artwork for a wide variety of promotional items or "collateral material" (including direct mail advertising, booklets, folders, brochures, catalogs, counter displays, etc.) used to supplement newspaper and magazine ads or television commercials. They also may prepare slides, film strips, and other visual aids.

Commercial artists also create the formats of magazines and

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other publications, designing or laying out the editorial pages and features and producing or purchasing the necessary illustrations or artwork. Some commercial artists specialize in fashion illustrations, greeting cards, book illustrations, or in technical drawings for industry.

Places of Employment

An estimated 50,000 commercial artists were employed in 1968; over one-third were women. Most commercial artists are employed in big cities, such as New York, Chicago, Philadelphia, Los Angeles, and Detroit, where the largest users of commercial art are to be found. Some, however, are employed in nearly every city.

Most commercial artists are employed as staff artists on a regular salaried basis by advertising agencies, commercial art studios, advertising departments of large companies, printing and publishing firms, textile companies, television and motion picture studios, department stores, sign shops, mail-order houses, greeting card companies, and a variety of other business organizations. Many work as freelance artists, selling their artwork to any available customers—chiefly to the same kinds of organizations that employ salaried artists. Some salaried commercial artists also do freelance work in their spare time. A number of commercial artists work for Federal Government agencies, principally in the Defense Department. A few teach in art schools on a regular or part-time basis.

Training, Other Qualifications, and Advancement

Artistic ability and good taste are the most important qualifications for success in the field of commercial art, but it is essential that these qualities be developed by specialized training in the techniques of commercial and applied art. In addition, extensive education in the fine arts—painting, sculpture, or architecture—and in academic studies provides a good foundation for obtaining employment in commercial art and is essential for promotion to higher level jobs.

The most widely accepted training for commercial art is the instruction given in art schools or institutes that specialize in commercial and applied art. To enter art school, a high school education usually, but not always, is required. Some schools admit only those applicants who demonstrate talent by submitting acceptable work samples. The course of study, which may include some academic work, generally takes 2 or 3 years, and a certificate is awarded on graduation. A growing number of art schools, particularly those in or connected with universities, require 4 years or more of study and confer a bachelor's degree—commonly the bachelor of fine arts (B.F.A.). In these schools, commercial art instruction is supplemented by liberal arts courses, such as English and history. Limited training in commercial art also may be obtained through public vocational high schools, private home-study schools, and practical experience on the job, but supplemental training usually is needed for advancement.

The first year in art school may be devoted primarily to the study of fundamentals—perspective, design, color harmony, composition—and to the use of pencil, crayon, pen and ink, and other art media. Subsequent study, generally more specialized, includes drawing from life, advertising design, graphic design, lettering, typography, illustrations, and other courses in the student's particular field of interest. Artistic judgment, imagination, and ability to visualize ideas on paper are basic requirements for a successful career in commercial art. The various specialties, however, differ in some of the specific abilities required. For example, letterers and retouchers must be able to do precise and detailed work requiring excellent coordination, whereas illustrators and designers need imagination, a distinctive art style, and, in most cases, the ability to draw well. Some experience with photography is useful to those interested in art direction or design. For commercial artists engaged in freelance work, the ability to sell both ideas and finished work to clients is important. A knowledge of type specifications and printing production is very helpful. Also, a business sense and responsibility in meeting deadlines are assets. Art directors need a strong educational background not only in art and business practices but also in the liberal arts. Advertising art directors require a special kind of creativity—the ability to conceive ideas that will stimulate the sale of the clients' products or services.

Beginning commercial artists usually need some on-the-job training before they can qualify for other than strictly routine work. Advancement is based largely on the individual's artistic talent, creative ability, and education. After considerable experience, many commercial artists leave salaried employment for freelance work. Most illustrators are freelancers; many of them have an agent, or artist's representative.

Commercial artists usually assemble their best artwork into a folder, or "portfolio," to use

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in displaying their work. A good portfolio is essential in obtaining initial employment and freelance assignments as well as in changing jobs.

Employment Outlook

Employment and advancement opportunities for talented and well-trained commercial artists in most kinds of work are expected to be good through the 1970's. Young people having only average ability and little specialized training, however, will encounter competition for beginning jobs and will have limited opportunity for advancement.

The demand for commercial artists will continue to vary with the kind of specialization: For example, demand for paste-up and mechanical artists is expected to increase but jobs for designers, art directors, and layout men are fewer, much sought after, and open only to experienced, highly talented, and creative artists.

Among the factors underlying an expected slow-increase in employment of commercial artists through the 1970's is the upward trend in business expenditures for all kinds of visual advertising. Demand for television graphics, packaging design, poster and window displays, and greeting cards will create some increase in the employment of commercial artists. In addition, the growing field of industrial design is expected to require the services of more artists who are qualified to perform three dimensional work with engineering concepts. (See statement on Industrial Designers.)

Women having exceptional artistic talent will continue to find employment in all aspects of commercial art work, but particularly in the textile industry and as fashion illustrators in department stores.

Earnings and Working Conditions

In 1968, beginning commercial artists having no training beyond vocational high school typically earned $65 a week; graduates of 2-year professional schools generally received $75 a week; and graduates of 4-year post-high school programs typically received $85 to $95 a week, according to the limited data available. Talented artists having strong educational backgrounds and a good portfolio, however, sometimes started at higher salaries. After a few years of experience, qualified artists may expect to earn $100 to $200 a week or more. Art directors, designers, executives, well-known freelance illustrators, and others in top positions generally have much higher earnings, from $15,000 to $20,000 a year or more.

The earnings of freelance artists have an especially wide range, since they are affected by such factors as the nature of the artwork he performs, the range of his board skills, the amount of artwork he sells, and the price he receives. In 1968, a freelancer received from $25 for a single black and white fashion sketch to $750 for a figure in full color with a background; from $1,000 to $2,000 for a color cover for a national magazine; or from $75 to $300 for a book jacket or record album. Freelance artists may be paid for their services by the hour or an amount for the assignment. Experienced pasteup and mechanical artists may be paid $4 to $8 an hour or more.

Salaried commercial artists generally work 35 to 40 hours a week, but sometimes they must work additional hours and under a considerable amount of pressure in order to meet deadlines. Freelance artists usually have irregular working hours.

Sources of Additional Information

Additional information on employment opportunities in commercial art may be obtained from:

National Art Education Association, National Education Association, 1201 16th St. NW., Washington, D.C. 20036.

INDUSTRIAL DESIGNERS

(D.O.T. 142.081)

Nature of the Work

Industrial designers combine technical knowledge of materials, machines, and methods of production with artistic talent to improve the appearance and functional design of machine-made products. Since the public has a wide choice of styles in products such as radios, television sets, automobiles, refrigerators, and furniture, a primary objective of the industrial designer is to design his employer's product to compete favorably with similar goods.

As a first step, the industrial designer does historical research on the product or related products. He studies competition in the market and the different ways in which the product may be used. Then, he sketches a variety of possible designs, which are examined by various departments. For example, the designer consults engineers, production supervisors, and the sales and market research staff for their opinions on the practicability of producing a newly designed product, or changing the design of an old product, and the sales potential of the proposed designs. After the most suitable design is selected by company officials, a model

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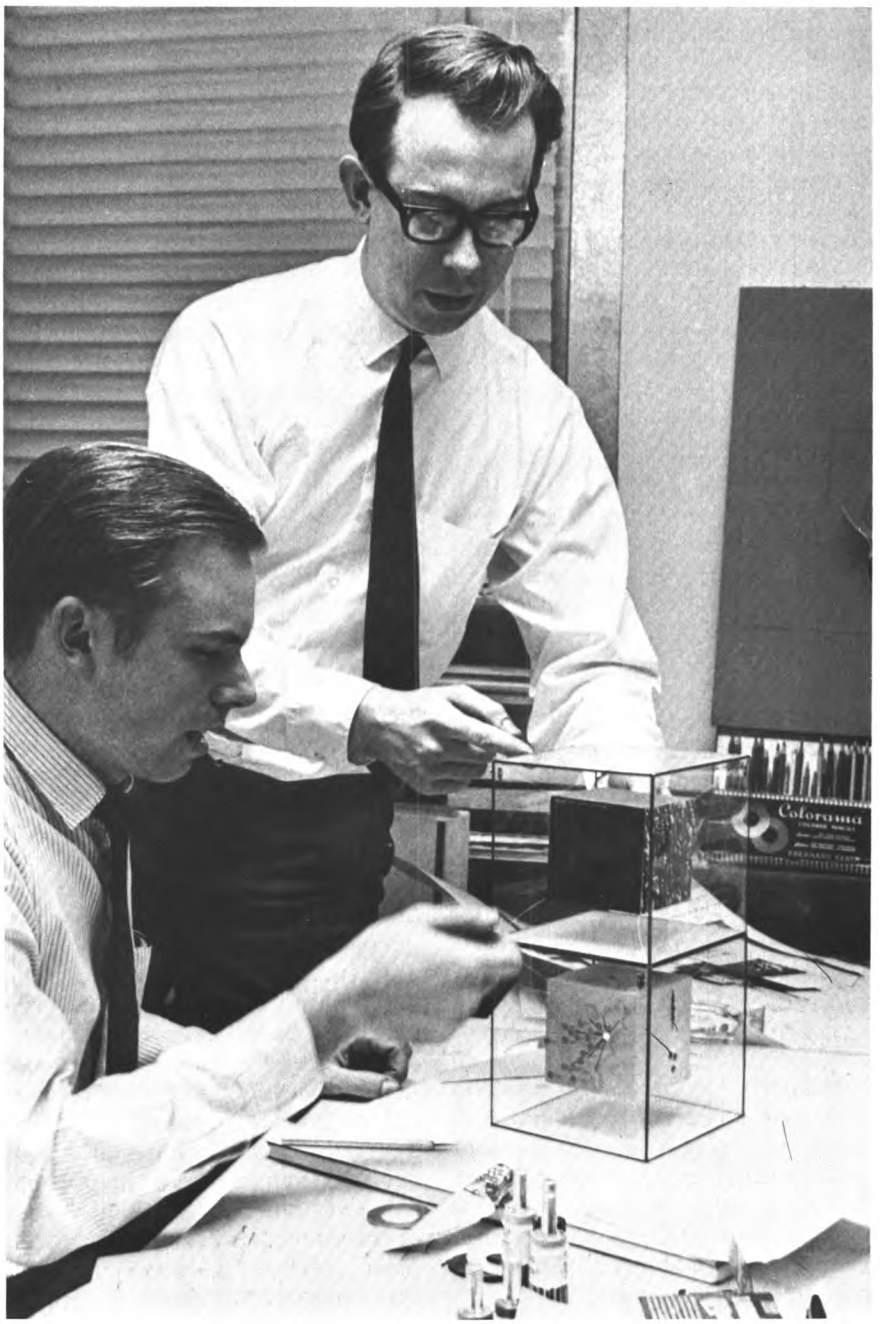
may be made by the designer. The first model of a new design is often made of clay so that it can be altered easily to reflect modifications. The final or working model is usually made of the material to be used in the finished product. If the model is approved in this form, it is put into production.

Industrial designers also may do related types of work. For example, they may design containers and packages, prepare small exhibits for display purposes, or design the entire layout for industrial fairs. Some also design the interior layout of special purpose commercial buildings, such as gasoline stations and supermarkets.



Industrial designers employed by a manufacturing company usually find their work limited to the one or few products made by their employer; many senior designers, however, are now given a free hand to engage in long-range planning for new or diversified products. Designers who work as consultants to more than one industrial firm, either as freelance designers or as members of consulting firms, may plan and design a great variety of products.

Places of Employment

Most of the estimated 10,000 industrial designers in 1968 were employed by large manufacturing companies and by design consulting firms. Of the remainder, the greatest number did freelance work or combined salaried employment with it. Some also worked for architects, and a few were on the staffs of firms of interior designers.

Industrial designers employed by consulting firms are located mainly in large cities. For example, the New York and Chicago areas have the largest number of design consulting organizations. Those employed by industrial firms are found most often in the manufacturing plants of their companies.

Training, Other Qualifications, and Advancement

The completion of a course of study in industrial design—in an art school, an art department of a university, or a technical college—is the usual requirement for entering this field of work.

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People from other areas, however, notably engineering and architecture, may qualify as industrial designers if they have appropriate experience and artistic talent.

Formal education in industrial design at the college or university level usually takes at least 4 years to complete, and a few schools require 5 years of study. These schools award the bachelor's degree in industrial design or fine arts; about half of these schools also award the master's degree for advanced study in the field. Some schools, usually private art schools or those associated with large art museums, offer a 3-year course of study in industrial design which leads to a diploma. In the past few years, however, some art and museum schools have moved toward accreditation or affiliation with a university. If accredited or affiliated, they usually offer a 4-year program and the bachelor's degree.

Entrance to the course of study in industrial design is limited, with rare exceptions, to qualified high school graduates; in addition, some schools may require students to present sketches and other examples of their artistic ability. Some schools also require students to complete their freshman or sophomore years before they select an industrial design major.

Industrial design curriculums differ considerably among schools. Some schools stress the engineering and technical aspects of the field, and others give students a strong cultural background in art. Nevertheless, most industrial design curriculums include at least one course in two-dimensional design (color theory, spatial organization, etc.) and one in general three-dimensional design (abstract sculpture and art structures), including a substantial amount of studio practice in the actual design of three-dimensional products. In the studio course, students learn to make working drawings and models with clay, wood, plaster, and other easily worked materials. In schools that have the necessary machinery, students gain experience in making models of their designs while learning to use metalworking and woodworking machinery. Some schools require the completion of courses in basic engineering and in the composition of materials. All schools which offer 4- or 5-year courses leading to a bachelor's degree also include academic subjects, such as English, history, psychology, economics, and science, in their curriculums.

Creative ability, skill in drawing, and the ability to anticipate consumer needs are the most important personal qualifications needed by young people aspiring to work in this field. A mechanical interest also is desirable for some types of work. Applicants for jobs will find it helpful to have previously assembled a "portfolio" which demonstrates their skill in designing and their creative talent. Since industrial designers are required frequently to work cooperatively with engineers and other staff members, the ability to work and communicate well with others is important. Young people who plan to practice industrial designing on a consulting basis should have a knowledge of business practices and possess sales ability.

New graduates of industrial design courses frequently start as assistants to other designers. They are usually given relatively simple assignments which do not involve making structural changes in the product. As they gain experience, designers may be assigned to supervisory positions with major responsibility for the design of a product or a group of products. Those who have an established reputation in the field, as well as the necessary funds, may start their own consulting firms.

Employment Outlook

Employment in this relatively small occupation is expected to expand moderately through the 1970's. Employers will be actively seeking applicants having a college degree and outstanding talent. Some employment opportunities also will arise each year from the need to replace designers who retire or leave the field for other reasons.

A number of factors will affect employment of industrial designers. Rapid obsolescence of household and commercial equipment and the rising population will increase the demand for newly designed products. As in the past, manufacturers will strive to hold or increase their share of these markets through the creation of new products , improvements in the design of existing ones, and change in package designs and other modernizations in the appearance and use of their products. Small companies probably will make increasing use of services offered by industrial design consulting firms to compete more effectively with larger firms. All of these factors, in addition to rising per capita income, will contribute to the long-term growth in the employment of industrial designers. However, as in the past, new entrants trained specifically in industrial designing are likely to encounter keen competition for beginning jobs from persons with engineering, architectural, and related educational backgrounds who have artistic and creative talent. Also, since personnel needs in this pro-

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fession are very closely related to general business conditions, any downturn in the economy would tend to affect adversely the employment outlook.

Earnings

Starting salaries for inexperienced industrial designers employed by manufacturing firms ranged from $125 to $150 a week in 1968, according to the limited information available. Beginning salaries for those employed by consulting firms were usually lower. Salaries of experienced industrial designers vary greatly, depending on such factors as individual ability, and size and type of firm in which employed. According to scattered reports, those having several years of experience earned salaries ranging from $8,000 to $14,000 annually. Some large manufacturing firms paid $25,000 or more to experienced and talent designers.

Earnings of industrial designers who own their consulting firms, alone or as members of a partnership, may fluctuate markedly from year to year. In recent years, earnings of most consultants were between $12,000 and $20,000, a few outstanding industrial designers earned as much as $200,000.

Sources of Additional Information

General information about careers in industrial design and a list of schools offering courses and degrees in industrial design may be obtained from:

Industrial Designers Society of America, 60 West 55th St., New York, N.Y. 10019.

INTERIOR DESIGNERS AND DECORATORS

(D.O.T. 142.051)

Nature of the Work

The creative work of interior designers and decorators enhances the attractiveness of our homes and other buildings. Designers and decorators plan the functional arrangement of interior space and coordinate the selection (including colors) of furniture, draperies and other fabrics, floor coverings, and interior accessories. They may work on the interiors of residential or commercial structures, as well as ships and aircraft. Some of them design stage sets used for motion pictures and television. Interior designers are more involved than decorators in space planning and other interior design; they often work for clients on large design projects such as the interior of an entire office building. Generally, their plans include the complete layout of the rooms within the space allowed by the exterior walls and other framework. Sometimes they redesign the interiors of old structures. When their plans have been completed, the architect checks them against his blueprints to assure compliance with building requirements and to solve structural problems. Some interior designers also design the furniture and accessories to be used in interiors and then arrange for their manufacture.

Many professionals in this field have their own establishments, either alone or as a member of a firm with other designers and decorators; they may sell some or all of the merchandise with which they work. Some work independently or as an assistant; others have a large staffs, sometimes including salespeople.

Many of the larger depart-

Interior designer helps clients select fabrics.

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ment and furniture stores have separate departments of interior decorating or interior design, or both, to advise customers on decorating and design plans. The main function of these departments is to help sell the store's merchandise, although materials from outside sources may be used when they are essential to the plans developed for the customer. Department store decorators and designers frequently advise the stores' buyers and executives about style and color trends in interior furnishings.

Interior designers and decorators usually work directly with clients to determine preferences and needs in furnishings. They may do "boardwork," particularly on large assignments, which includes work on floor plans and elevations and creation of sketches, or other perspective drawings in such media as watercolor, pastels, or tempera, so clients can visualize their plans. They also provide cost estimates. After the client approves both the plans and cost estimates, arrangements are made for the purchase of the furnishings; for the supervision of the work of painters, floor finishers, cabinetmakers, carpetlayers, and other craftsmen; and for the installation and arrangement of furnishings.

Places of Employment

More than 15,000 people were engaged full time in interior design and decoration in 1968. About half of them were women. Men, however, predominate in interior design. Many in design and decorating work on a part-time basis.

The majority of all workers in this field are located in large cities. In recent years, large department and furniture stores have become increasingly important sources of employment for professional interior designers and decorators. Some designers and decorators have permanent jobs with hotel and restaurant chains. Others are employed by architects, antique dealers, office furniture stores, industrial designers, furniture and textile manufacturers, other manufacturers in the interior furnishing field, or by peridocals that feature articles on homefurnishings. Some large industrial corporations employ interior designers on a permanent basis.

Training, Other Qualifications, and Advancement

Formal training in interior design and decoration is becoming increasingly important for entrance into this field of work, although many present members of the profession achieved success without this training. Most department stores, well-established design and decorating firms and other major employers will accept only professionally trained people for beginning jobs. Usually, the minimum educational requirement is completion of either a 2- or 3-year course at a recognized art school or institute specializing in interior decorating and design, or a 4-year college course leading to a bachelor's degree with a major in interior design and decoration. The course of study in interior design and decoration usually includes the principles of design, history of art, freehand and mechanical drawing, painting, the study of the essentials of architecture as they relate to interiors, design of furniture and exhibitions, and study of various materials, such as woods, metals, plastics, and fabrics. A knowledge of furnishings, art pieces, and antiques is important. In addition, courses in salesmanship, business arithmetic, and other business subjects are of great value.

Membership in either the American Institute of Interior Designers (AID) or the National Society of Interior Designers (NSID), both professional societies, is a recognized mark of achievement in this profession. Membership usually requires the completion of 3 or 4 years of post-high school education, the major emphasis having been on training in design, and several years of practical experience in the field, including responsibility for supervision of all aspects of decorating contracts.

New graduates having training in interior design and decorating usually serve a training period, either with decorating firms, in department stores, or in the firm of an established designer. They may act as a receptionist, as a shopper with the task of matching materials or finding accessories, or as a stockroom assistant, assistant decorator, or junior designer. In most instances, from 1 to 3 years of on-the-job training is required before a trainee is considered eligible for advancement to the job of decorator. Beginners who do not obtain trainee jobs often work as salespeople for fabric, lamp, or other interior furnishings concerns to gain experience in dealing with customers and to become familiar with the merchandise. This experience often makes it easier to obtain trainee jobs with a decorating firm or department; it also may lead to a career in merchandising.

After considerable experience, decorators and designers with ability may advance to decorating or design department head, interior furnishings coordinator, or to other supervisory positions in department stores or in large

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decorating or design firms; if they have the necessary funds, they may open their own establishments. Talented workers usually advance rapidly.

Artistic talent, imagination, good business judgment, and the ability to deal with people are important assets for success in this field.

Employment Outlook

Talented art school or college graduates who majored in interior design and decoration will find good opportunities for employment through the 1970's. Applicants who can design and plan the functional arrangement of interior space will be in strong demand. Young people without formal training will find it increasingly difficult to enter the field.

A slow but steady increase in employment of interior designers and decorators is anticipated through the 1970's. Population growth, larger expenditures for home and office furnishings, the increasing availability of well-designed furnishings at moderate prices, a growing recognition among middle-income families of the value of decorators' services, and increasing use of design services for commercial establishments should contribute to a greater demand for these workers. In addition to newly created jobs, some openings will arise each year from the need to replace designers and decorators who die, retire, or leave the field for other reasons.

Department and furniture stores are expected to employ an increasing number of trained decorators and designers. These stores also are expected to share in the growing volume of design and decorating work for commercial establishments and public buildings, formerly handled almost entirely by independent decorators. This development will result in increased opportunities in salaried employment. Interior design firms also are expected to continue to expand. However, employment of interior decorators and designers is sensitive to changes in general economic conditions because people often defer these kinds of expenditures when the economy slows down.

Earnings and Working Conditions

Beginning salaries ranged generally from $70 to $90 a week in 1968 for art school or college graduates having formal training in interior design and decoration; some graduates of 3 or 4-year design schools received salaries of $100 or more a week, according to limited data available.

Some designers and decorators are paid straight salaries; some receive salaries plus commissions which usually range from 5 to 10 percent of the value of their sales; others receive commissions only, which may be as much as one-third of the value of their sales.

Many interior decorators having only average skill in this field earn only moderate incomes—from $5,000 to $7,500 a year, even after many years of experience. Talented decorators who are well known in their localities may earn up to $15,000 or more. Designers and decorators whose abilities are nationally recognized may earn well beyond $25,000 yearly.

Self-employed decorators have an especially wide range of earnings; their profits are related to factors such as the volume of business, their prestige as a decorator, economic level of their clients, their own business competence, and the percentage of wholesale prices they receive from the sale of furnishings.

Hours of work for decorators are sometimes long and irregular. They usually adjust their workday to suit the needs of their clients, meeting with them during the evenings or on weekends, when necessary. Designers' schedules follow a more regular workday pattern.

Sources of Additional Information

Information about employment and scholarship opportunities may be obtained from:

National Society of Interior Designers, Inc., 315 East 62nd Street, New York, N.Y. 10021.

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SOCIAL SCIENCES

The social sciences are concerned with all aspects of human society from the origins of man to the latest election returns. Social scientists, however, generally specialize in one major field of human relationships. Anthropologists study primitive tribes, reconstruct civilizations of the past, and analyze the cultures and langauges of all peoples past and present. Economists study how man allocates resources of land, labor, and capital. Geographers study the distribution throughout the world of people, types of land and water masses, and natural resources. Historians describe and interpret the people and events of the past and present. Political scientists study the theories, objectives, and organizations of all types of government. Sociologists analyze the behavior and relationships of groups—such as the family, the community, and minorities—to the individual or to society.

Besides these basic social science fields, there are a number of closely related fields, some of which are covered in separate statements elsewhere in this *Handbook*. (See statements on Statisticians, Psychologists, and Social Workers.)

More than 70,000 people were employed professionally in the basic social sciences in 1968; about 1 out of 10 was a woman. Overlapping among the basic social science fields and the sometimes hazy distinction between these and related fields such as business administration, foreign service work, and high school teaching, make it difficult to determine the exact size of each profession. Economists, however, are the largest social science group, and anthropologists the smallest.

The majority of social scientists are employed by colleges and universities. A large number are employed by the Federal Government and private industry. There is a trend in some industries toward hiring increasing numbers of college graduates who have majored in the social sciences as trainees for administrative and executive positions. Research councils and other nonprofit organizations provide an important source of employment for economists, political scientists, and sociologists.

Employment in the social sciences has been increasing and is expected to grow very rapidly through the 1970's, mainly because of the anticipated rise in college teaching positions. The reasons for this expected increase are discussed in the statement on College and University Teachers. A moderate rise in employment in government also is expected. Employment in government agencies often is greatly affected by changes in public policy. For example, more social scientists will be needed to handle research and administrative functions resulting from the new programs established by Congress to relieve unemployment and remove poverty. The Economic Opportunity Act of 1964 and the Appalachian Regional Development Act of 1965 are recent programs that will increase the demand for social science personnel. A very rapid rise in employment of social scientists in private industry and nonprofit organizations also is expected. In addition, hundreds of social scientists will be needed each year to replace those who leave the field because of retirement, death, or other reasons.

Social scientists having doctor's degrees will find excellent employment opportunities through the 1970's in both teaching and nonteaching positions. For those having less training, the employment situation will differ considerably among the several social science fields. These differences are discussed in the occupational statements that follow.

ANTHROPOLOGISTS

(D.O.T. 055.088)

Nature of the Work

Anthropologists study man, his origins, physical characteristics, traditions, beliefs, customs, languages, material possessions and his structured social relationships and value systems. Although anthropologists may specialize in any one of these aspects of mankind, they are expected to have a general knowledge of them all.

Most anthropologists specialize in cultural anthropology—usually archeology or ethnology. *Archeologists* excavate the places where earlier civilizations are buried to reconstruct the history and customs of the people who once lived there, by studying the remains of homes, tools, clothing, ornaments, and other evidences of human life and activity. For example, archeologists are digging in the Pacific Coast area between northern Mexico and Ecuador to find evidences of trade and migration in the pre-Christian Era. Some archeologists are excavating ancient Mayan cities in Mexico and restoring temples. Others are working in the Missouri River valley to salvage remnants of Indian villages and sites of early military forts and trading posts. *Ethnologists* may spend long periods living among primitive tribes or in other communities, to learn about their ways of life. The eth-

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nologist takes detailed and comprehensive notes describing the social customs, beliefs, and material possessions of the people. He usually learns their langauge in the process. He may make comparative studies of the cultures and societies of various groups. In recent years, his investigations have included complex urban societies. Some cultural anthropologists specialize in *linguistics*, the scientific study of the sounds and structures of languages and of the historical relationships among languages. They study the relationship between the language and the social structure of a people, and may assist archeologists in reconstructing the prehistory of mankind.

Physical anthropologists apply intensive training in human anatomy and biology to the study of human evolution, and to the scientific measurement of the physical differences among the races and groups of mankind. Because of their knowledge of body structure, physical anthropologists occasionally are employed as consultants on projects such as the design of driver seats, space suits, cockpits for airplanes and spaceships, and the sizing of clothing. They also may consult on projects to improve environmental conditions and on criminal cases.

Most anthropologists teach in colleges and universities and often combine research with their teaching. Some anthropologists specialize in museum work, which generally combines management and administrative duties with fieldwork and research on anthropological collections. A few are engaged primarily in consulting, nontechnical writing, or other activities.

Places of Employment

About 3,000 people were employed as anthropologists in 1968. About a fifth of them were women. Most anthropologists were employed in colleges and universities. Several hundred worked in private industry and nonprofit organizations. The Federal Government employed a small number, chiefly in museums, national parks, and in technical aid programs. State and local government agencies also employed some anthropologists, usually for museum work or health research.

Training, Other Qualifications, and Advancement

Young people who are interested in careers in anthropology should obtain Ph. D. degrees. College graduates with bachelor's degrees can obtain temporary positions and assistantships in the graduate departments where they are working for advanced degrees. A master's degree, plus field experience, is sufficient for many beginning professional positions, but promotion to top positions is generally reserved for individuals holding the Ph. D. degree. In many colleges and most universities, only anthropologists holding the Ph. D. degree can obtain permanent teaching appointments.

Some training in both physical and cultural anthropology is necessary for all anthropologists. A knowledge of mathematics is increasingly important since statistical methods and computers are becoming more widely used for research in this field. Undergraduate students may begin their field training in archeology by arranging, through their university department, to accompany expeditions as laborers. They may advance to supervisors in charge of the digging or collection of material and finally may take charge of a portion of the work of the expedition. Ethnologists and linguists usually do their fieldwork alone, without direct supervision. Most anthropologists base their doctoral dissertations on data collected through field research; they are, therefore, experienced fieldworkers by the time they obtain the Ph. D. degree.

Graduate departments of anthropology in the U.S. numbered about 115 in 1968. Most universities having graduate programs also offer undergraduate training in anthropology. The choice of a graduate school is very important. Students interested in museum work should select a school that can provide experience in an associated museum having anthropological collections. Similarly, those interested in archeology should choose a university that offers opportunities for summer experience in archeological fieldwork or should plan to attend an archeological field school elsewhere during their summer vacations.

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Employment Outlook

The number of anthropologists is expected to increase rapidly through the 1970's. The largest increase in employment will be in the college teaching field. Some additional positions will be found in museums, archeological research programs, mental and public health programs, and in community survey work. Opportunities in other fields are likely to be limited largely to the replacement of personnel who retire, die, or leave their positions for other reasons.

Anthropologists holding the doctorate are expected to have excellent employment opportunities through the 1970's. Employment opportunities also should be favorable for those who have fulfilled all requirements for the Ph. D. degree except the dissertation. Graduates with only the master's degree, however, are likely to face persistent competition for professional positions in anthropology and may enter related fields of work. A few who meet certification requirements may secure high school teaching positions. Others may find jobs in public administration and in nonprofit organizations and civic groups, which prefer personnel with social science training as a general background.

Earnings

The average (median) salary of anthropologists employed in 1968 was $12,700. Anthropologists employed by educational institutions received a median salary of $13,500 for the calendar year or $12,000 for the academic year, according to the National Science Foundation's National Register of Scientific and Technical Personnel.

In the Federal Government, the starting salary for anthropologists having an M.A. degree was $8,462 in 1968. Anthropologists having a Ph.D. degree received a starting salary of $10,203. Many experienced anthropologists earned from $12,000 to $20,000 a year.

In general, anthropologists holding the Ph. D. degree earn substantially higher salaries than those with the master's degree. Many anthropologists supplement their regular salaries with earnings from other sources. Summer teaching and research grants are the principal sources of income. Anthropologists employed in colleges and universities are the most likely to have additional earnings.

Sources of Additional Information

Additional information concerning employment opportunities and schools offering graduate training in anthropology may be obtained from the following sources:

Anthropology As A Career, (25 cents) Smithsonian Institution, Washington, D.C. 20560.

The American Anthropological Association, 3700 Massachusetts Ave. NW., Washington, D.C. 20016.

ECONOMISTS

(D.O.T. 050.088)

Nature of the Work

Economists study man's activities devoted to satisfying his material needs. They are concerned with the problems that arise in the utilization of limited resources of land, raw materials, and manpower to provide goods and services. In this connection, they may analyze the relation between the supply of and demand for goods and services, and the ways in which goods are produced, distributed, and consumed. Some economists are concerned

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with practical problems such as the control of inflation, the prevention of depression, and the development of farm, wage, tax, and tariff policies. Others develop theories to explain the causes of employment and unemployment or the ways in which international trade influences world economic conditions. Still others are engaged in the collection and interpretation of data on a wide variety of economic problems.

Economists employed in colleges and universities teach the principles and methods of economics and conduct or direct research. They frequently engage in writing and consulting and formulate many of the new ideas that directly or indirectly influence government and industry planning.

Economists in government plan and carry out studies for use in assessing economic conditions and the need for changes in government policy. Their work may include the collection of basic data, analysis, and the preparation of reports. Most government economists are in the fields of agriculture, business, finance, labor, or international trade and development.

Economists employed by business firms provide management with information for decision-making on such matters as the markets for and prices of company products, the effect of government policies on business or international trade, the advisability of adding new lines of merchandise, opening new branch operations, or otherwise expanding the company's business.

Places of Employment

Economics is the largest of the basic social science fields. About 31,000 economists were employed in 1968. Industry and business employed about one-half; colleges and universities, roughly one-fourth; and government agencies —chiefly Federal—about one-fifth. Most of the remainder worked in private research agencies. A few were self-employed.

Economists are found in all large cities and in university towns. The largest groups are in the New York and Washington, D.C. metropolitan areas. Substantial numbers are employed in foreign countries, mainly by the U.S. Department of State, including the Agency for International Development.

Most economists in private industry are employed in the home office of large corporations.

Training, Other Qualifications, and Advancement

Economists must have a thorough grounding in economic theory, economic history, and methods of economic analysis. An increasing number of universities also emphasize the value of mathematical methods of economic analysis. Since many beginning jobs for economists in government and business involve the collection and compilation of data, a thorough knowledge of basic statistical procedures usually is required.

A bachelor's degree with a major in economics is sufficent for many beginning research jobs in government and private industry, although persons employed in such entry jobs are not always regarded as professional economists. In the Federal Government, candidates for entrance positions must have a minimum of 21 semester hours of economics and 3 hours of statistics, accounting, or calculus.

Graduate training is very important for young people planning to become economists. Students interested in research should select schools that emphasize training in research methods and statistics and provide good research facilities. Those who wish to work in agricultural economics will find good opportunities to gain experience in part-time research work at State universities having agricultural experiment stations.

The master's degree generally is required for appointment as a college instructor, although in large schools graduate assistantships sometimes are awarded to superior students working toward their master's degree. In many large colleges and universities, completion of all the requirements for the Ph. D. degree, except the dissertation, is necessary for appointment as instructor. In government or private industry, economists holding the master's degree usually can qualify for more responsible research positions than are open to those having only the bachelor's degree.

The Ph. D. degree is required for a professorship in a high-ranking college or university and is an asset in competing for other responsible positions in government, business, or private research organizations.

Employment Outlook

Employment of economists will increase very rapidly through the 1970's. Colleges and universities will need hundreds of new instructors annually to handle rapidly increasing enrollments and to replace economists who retire, die, or transfer to other fields of work. Private industry is expected to employ many more economists, as businessmen become more accustomed to rely on scientific methods of analyzing business trends, forecasting sales, and planning purchasing and produc-

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tion operations. Employment of economists at the Federal, State, and local levels also will increase rapidly to meet the need for more extensive data collection and analysis, and to provide the staff for programs aimed at reducing unemployment and poverty.

Economists having the doctorate are expected to have excellent opportunities for employment. The demand for these economists is expected to be considerably greater than the supply through the 1970's. As a result, employment opportunities for economists having a master's degree will be favorable, especially for those with good training in statistics and mathematics. Opportunities for persons having a bachelor's degree will continue to be good in government agencies. Young people having bachelors' degrees in economics also will find employment as management trainees in industry and business firms.

Earnings

According to the National Science Foundation's National Register of Scientific and Technical Personnel, the median salary of economists employed by colleges and universities for calendar year 1968 was $15,700. The median salary for those in business and industry and in non-profit organizations was $18,000.

In the Federal Government, the entrance salary in late 1968 for beginning economists having a bachelor's degree was $5,732; however, those with superior academic records could begin at $6,981. Those having 2 full years of graduate training or experience can qualify for positions at an annual salary of $8,462. The majority of experienced economists in the Federal Government earned from $10,000 to $20,000 a year; some having greater administrative responsibilities earned considerably more.

Economists having Ph.D.'s are paid the highest salaries by each type of employer in comparison with those that have lesser degrees and similar experience. A substantial number of economists supplement their basic salaries by consulting, teaching, and other activities.

Sources of Additional Information

American Economic Association, Northwestern University, 629 Noyes St., Evanston, Ill. 60201.

Additional information on employment opportunities in economics and related fields is given in the following publications:

Careers in the Foreign Service, U.S. Department of State, Publication 7924, Washington, D.C. 20520. Free.

Overseas Assignments, Agency for International Development, Washington, D.C. 20523. Free.

GEOGRAPHERS

(D.O.T. 059.088)

Nature of the Work

Geographers study the physical characteristics of the earth, such

Geographer engraves road lines on film.

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as its terrain, minerals, soils, water, vegetation, and climate. They relate these characteristics to the patterns of human settlements on the earth—where people live, why they are located there, and how they earn a living.

The majority of geographers are engaged in college and university teaching and may combine teaching and research. Their research may include the study and analysis of the distribution of land forms, climate, soils, vegetation, and mineral and water resources, sometimes utilizing surveying and meteorological instruments. They also analyze the distribution and structure of political organizations, transportation systems, and marketing systems. Many geographers spend considerable time in field study, and in analyzing maps, aerial photographs, and observational data collected in the field. There is an increasing use of photographs and other data from remote sensors on satellites. Other geographers construct maps, graphs, and diagrams.

Most geographers specialize in one main branch of geography or more. Those working in *economic geography* deal with the geographic distribution of economic activities—including manufacturing, mining, farming, trade, and communications. *Political geography* is the study of the way political processes affect geographic boundaries on subnational, national, and international scales, and the relationship of geographic conditions to political situations. *Urban geography*, a growing field for geographers, is concerned with the study of cities and community planning. (See statement on Urban Planners.) Specialists in *physical geography* study the earth's physical characteristics. *Regional geography* pertains to all the physical, economic, political, and cultural characteristics of a particular region or area, which may range in size from a river basin or an island, to a State, a country, or even a continent. Geographers in the field of *cartography* design and construct maps, as well as compile data for them.

Many professional workers in the field have job titles which describe their specialization, such as cartographer, map cataloger, or regional analyst, rather than the title geographer. Others have titles relating to the subject matter of their study such as photointelligence specialist or climatological analyst. Still others have titles such as community planner, market or business analyst, or intelligence specialist. Most of those who teach in colleges and universities are called geographers.

Places of Employment

An estimated 3,900 geographers were employed in the United States in 1968; about 10 percent were women.

Approximately two-thirds of all geographers are employed by colleges and universities. Those teaching in institutions which do not have separate departments of geography usually are associated with departments of geology, economics, or other physical or social sciences.

The Federal Government employs a large number of geographers. Among the major agencies employing these workers are the United States Army Topographic Command; the United States Air Force Aeronautical Chart and Information Center; the Central Intelligence Agency; the Defense Intelligence Agency; the Department of the Interior; and the Environmental Sciences Services Administration. State and local governments also employ a small number of geographers, mostly on city and State planning and development commissions.

Most of the relatively small but growing number of geographers employed by private industry work for marketing research organizations, map companies, textbook publishers, travel agencies, manufacturing firms, or chain stores. A few geographers work for scientific foundations and other nonprofit organizations and research institutes. A small number are employed as map librarians.

Training, Other Qualifications, and Advancement

The minimum educational requirement for beginning positions in geography usually is a bachelor's degree with a major in the field. For most positions in research and teaching, and for advancement in many other types of work, graduate training is required.

Training leading to the bachelor's degree in geography was offered by over 300 colleges and universities in 1968. Undergraduate study usually provides a general introduction to geographic knowledge and research methods and often includes some field studies. Typical courses offered are physiography, weather and climate, economic geography, political geography, urban geography, and regional courses, such as the geography of North America, Western Europe, the U.S.S.R., and Asia. Courses in cartography and in the interpretation of maps and aerial photographs are offered also.

Advanced degrees in geography are offered by a relatively small number of schools. In 1968, Ph. D. degrees were awarded by about 40 institutions. For admittance to a graduate program in geography, a bachelor's degree

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with a major in geography is the usual requirement. However, most universities admit students with bachelor's degrees in fields such as economics, geology, or history if they have a good background in geography. Requirements for advanced degrees include field and laboratory work, as well as classroom studies and thesis preparation.

New graduates having only the bachelor's degree in geography usually find positions connected with making, interpreting, or analyzing maps; or in research, either working for the government or private industry. Others enter beginning positions in the planning field. Some obtain employment as research or teaching assistants in educational institutions while studying for advanced degrees. New graduates having the master's degree can qualify for some teaching and research positions in colleges and for many research positions in government and private industry. The Ph. D. degree usually is required for high-level posts in college teaching and research and may be necessary for advancement to top-level positions in other activities.

Employment Outlook

The employment outlook for geographers is likely to be favorable through the 1970's. The demand will be especially strong for geographers having graduate degrees to fill research and teaching positions in colleges and universities and research jobs in industry and government. Geographers with advanced training in fields such as economics or business administration also will be in strong demand.

Colleges and universities are expected to offer the greatest number of employment opportunities as college enrollments increase very rapidly through the 1970's. Rising interest in foreign countries and growing awareness of the value of geography training in several other fields of work, such as the foreign service, should also result in increased enrollments in geography and in a need for additional teachers at the college level. A growing demand for geography teachers in secondary schools also is anticipated.

Employment of geographers in government is also likely to increase. The Federal Government will need additional personnel in positions related to regional development; urban planning; resource management; planning, construction, and interpretation of maps; and in intelligence work. State and local government employment of geographers also will expand, particularly in areas such as conservation, highway planning, and city, community, and regional planning and development.

The number of geographers employed in private industry also is expected to rise. Market research and location analysis should continue to grow rapidly. Opportunities also should increase in private area planning and development work.

Since geography is a relatively small field, job openings are not expected to be numerous in any one year. However, unless the number of persons receiving degrees in the field should grow far beyond current expectations, qualified geographers, particularly those with advanced degrees, should find employment readily through the 1970's.

Employment prospects for women geographers will be best in teaching, especially in junior colleges, women's colleges, and in the larger co-educational institutions. Government agencies also should offer good opportunities for women in mapping and planning work.

Earnings and Working Conditions

In the Federal Government in late 1968, geographers having the bachelor's degree and no experience could start at $5,732 or $6,981 a year, depending on their college record. Geographers having 1 or 2 years of graduate teaching could start at $6,981 or $8,462; and those having the Ph. D. degree, at $10,203.

In colleges and universities, salaries of geographers depend on their teaching rank. (For further information, see statement on College and University Teachers.) Geographers in educational institutions usually have an opportunity to earn income from other sources, such as consulting work, special research projects, and publication of books and and articles.

Working conditions of most geographers are similar to those of other teachers and office workers. Geographic research frequently requires extensive travel in foreign countries, as well as in the United States.

Sources of Additional Information

Association of American Geographers, 1146 16th St. NW., Washington, D.C. 20036.

HISTORIANS

(D.O.T. 052.088)

Nature of the Work

Historians study the records of the past and write books and articles describing and analyzing past

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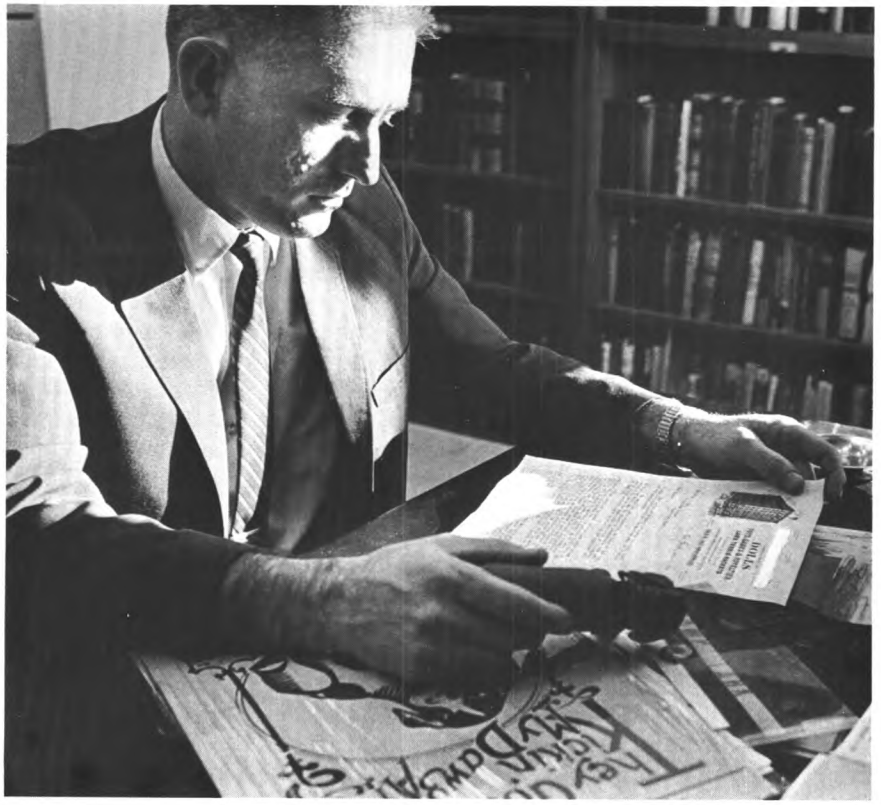

Historian examines new museum acquisitions.

events, institutions, ideas, and people. They may use their knowledge of the past to explain current events. They may specialize in the history of a specific country or region, or in a particular period of time—ancient, medieval, or modern—or in economic, cultural, military, or other phases of history. More historians specialize in either United States or modern European history than in any other field; however, a growing number are now specializing in African, Latin American, Asian, and Near Eastern history. Some are experts in fields such as the history of the labor movement, art, architecture, or other fields of historical interest. The number of specialties is constantly growing. The history of business and the relation between technological changes and other aspects of historical development are among the newest fields.

Most historians are college teachers who also do some research, writing, and lecturing. Some, called *archivists*, specialize in identifying, preserving, and making available documentary materials of historical value. Others edit historical materials, prepare exhibits, write pamphlets and handbooks, and give talks for museums, special libraries, and historical societies. A few serve as consultants to editors, publishers, and producers of materials for radio, television, and motion pictures. Historians employed in government mainly do research and administrative work in connection with research projects; they also prepare studies, articles, and books.

Places of Employment

About 14,000 persons were employed as historians in 1968. Approximately 85 percent of all historians were employed in colleges and universities. About 4 percent were employed in Federal Government agencies, principally the National Archives and the Departments of Defense, Interior, and State. Small but growing numbers were employed by other government organizations (State, local, and international), nonprofit foundations, research councils, special libraries, State historical societies, museums, and by large corporations.

Since history is taught in all institutions of higher education, historians are found in all college communities. About half the historians in the Federal Government, including three-fourths of those working as archivists, are employed in Washington, D.C. Historians in other types of employment usually work in localities which have museums or libraries with collections adequate for historical research.

Training, Other Qualifications, and Advancement

Graduate education usually is necessary for qualification as a historian. A master's degree in history is the minimum requirement for appointment to the position of college instructor; in many colleges and universities, a Ph. D. degree is necessary. The latter is essential for attaining high-level college teaching, research, and administrative positions in the field of history. Most historians in the Federal Government and in nonprofit organizations have a Ph. D. degree or the equivalent in training and experience.

Although a bachelor's degree

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with a major in history is sufficient training for some beginning jobs in Federal, State, and local governments, persons in such jobs may not be regarded as professional historians. These beginning jobs are likely to be concerned with the collection and preservation of historical data so that a knowledge of archival work is helpful. An undergraduate major in history is considered helpful for jobs in international relations and journalism.

Employment Outlook

Employment in this relatively small occupation is expected to continue to increase very rapidly through the 1970's. Hundreds of new history teachers probably will be needed annually to teach new classes made necessary by expanding college enrollments, and to replace those faculty members who retire, die, or leave for other types of work. The number of positions for historians in archival work also is expected to rise, although more slowly than the number in college teaching. Only a slight rise is foreseen in the number of historians in other types of work.

Historians having doctorates are expected to have very good employment opportunities through the 1970's. Historians who have completed all requirements for the Ph. D., except the dissertation, also are expected to have favorable opportunities. However, those with no work beyond the master's degree probably will encounter considerable competition for professional positions. College graduates having only the bachelor's degree will find it difficult to obtain employment as professional historians. On the other hand, history majors who meet certification requirements will find openings in high school teaching. Some also will be able to qualify as trainees in administrative and management positions in government agencies, nonprofit foundations, civic organizations and in private industry.

Earnings

The median salary of historians employed by colleges and universities was about $11,000 in 1968. New assistant professors teaching for the first time had average earnings of about $10,000 a year, according to the American Council on Education. Salaries tended to be lower for those persons employed in junior colleges and teacher's colleges. In the Federal Government, the starting salary for persons having a bachelor's degree was $5,732 in late 1968. Those having a superior academic record or a year of graduate training were eligible for positions at an annual salary of $6,981. The median annual salary for historians employed by the Federal Government in late 1968 was about $12,000.

Some historians, particularly those in college teaching, supplement their income by summer teaching or writing books or articles. A few earn additional income from lectures.

Sources of Additional Information

Additional information on employment opportunities for historians may be obtained from:

American Historical Association, 400 A St. SE., Washington, D.C. 20003.

POLITICAL SCIENTISTS

(D.O.T. 051.088)

Nature of the Work

Political science is the study of government—what it is, what it does, and how and why. Political scientists are interested in government at every level—local, county, State, regional, national, and international. Many of them specialize in one general area of political science, such as political theory, American political institutions and processes, comparative political institutions and processes, or international relations and organizations. Some specialize in a particular type of political institution or in the politics of a specific era.

Political scientists are employed most frequently as college and university teachers. They may combine research, consultation, or administrative duties with teaching. Some teach in foreign universities where they prepare students for careers in public administration and assist in the development of training programs for government personnel. Many political scientists are engaged mainly in research. They may make surveys of public opinion on political questions for private research organizations. They may study proposed legislation for State or municipal legislative reference bureaus or congressional committees. Others may analyze the operations of government agencies or specialize in foreign affairs research, either for government or nongovernment organizations. Still others are engaged in administrative or managerial duties. Some work in budget analysis, personnel, and urban planning, or as legislative aids to congressmen and as staff

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members of congressional committees.

Places of Employment

About 11,400 political scientists were employed in 1968, largely in colleges and universities or in government agencies. Most of the remainder worked in research bureaus, civic and taxpayers associations, and large business firms.

Political scientists are employed in nearly every college in the United States, since courses in political science or government are taught widely. Most other political scientists are located in Washington, D.C., and in other large cities, or in State capitals. Some are employed in overseas jobs, mainly by the U.S. Department of State, particularly for positions with the Agency for International Development and the U.S. Information Agency.

Training and Other Qualifications

Graduate training generally is required for employment as a political scientist. College graduates having a master's degree can qualify for various administrative and research positions in government and in nonprofit research and civic organizations. More than 100 colleges and universities offer graduate degrees in political science, and over 50 offer graduate degrees in public administration. Many of these schools provide field training and offer internships which enable the student to obtain experience in government work. Many universities award graduate degrees in international relations, foreign service, and area studies, as well as political science in general. A master's degree in any of these fields is very helpful in obtaining a position in a Federal Government agency concerned with foreign affairs.

Completion of all requirements for the Ph. D. degree, except the doctoral dissertation, is the usual prerequisite for appointment as a college instructor. The Ph. D. degree generally is required for advancement to the position of professor.

Some young people having only a bachelor's degree in political science may qualify as trainees in public relations or research work, or in jobs such as budget analyst, personnel assistant, or investigators in government or industry. Many students having the bachelor's degree in political science go on to study law; others obtain graduate training in public administration, international relations, or other specialized branches of political science.

Employment Outlook

Employment of political scientists probably will increase very rapidly throughout the 1970's. The greatest increase will be in colleges and universities. The number of political scientists in administrative jobs in government agencies also probably will rise because of a growing recognition of the value of specialized training in developing and planning new programs. Government agencies concerned with foreign affairs will continue to employ many political scientists. A slow growth is anticipated in employment of political scientists in private industry. In addition to those required to staff new positions, many political scientists will be needed to fill positions vacated because of retirements, deaths, or transfers to other fields of work.

New Ph. D. graduates will find very good opportunities in college teaching and good chances for employment in other fields as well. Those who have completed all the requirements for the doctorate, except the dissertation, are also likely to find favorable opportunities in college teaching. Employment opportunities for those having the master's degree will be more limited, but openings will be available to them in Federal, State, and municipal government agencies; research bureaus; political organizations; and civic and welfare agencies. For new graduates having only the bachelor's degree, opportunities for employment in the political science field probably will continue to be very limited. However, those planning to continue their studies in law, foreign affairs, journalism, and other related fields will find their political science background very helpful. Some who meet State certification requirements will be able to enter high school teaching.

Earnings

The median salary of political scientists was $12,000 in 1968, according to the National Register of Scientific and Technical Personnel. Political scientists employed in educational institutions earned a median salary of $10,800 for the academic year and $13,500 for the calendar year. Generally, those persons having the doctorate had the higher salaries.

In the Federal Government, the starting salary for political scientists having a bachelor's degree was $5,732 a year in late 1968. Those having a superior academic record or a year of graduate training were eligible for positions at an annual salary of $6,981. Most of the experienced

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political scientists in the Federal Government earned considerably more.

Some political scientists, particularly those in college teaching, supplement their income by doing summer teaching or consulting work.

Sources of Additional Information

Additional information on employment opportunities in political science and public administration may be obtained from the following organization:

American Political Science Association, 1527 New Hampshire Ave. NW., Washington, D.C. 20036.

SOCIOLOGISTS

(D.O.T. 054.088)

Nature of the Work

Sociologists study the many groups which man forms—families, tribes, communities, and States, and a great variety of social, religious, political, business, and other organizations which have arisen out of living together. They study the behavior and interaction of these groups, trace their origin and growth, and analyze the influence of group activities on individual members. Some sociologists are primarily concerned with the characteristics of social groups and institutions; others are more interested in the ways in which individuals are affected by groups to which they belong. Many work in social organization, social psychology, or rural sociology. Others specialize in intergroup relations, family problems, social effects of urban living, population studies, or analyses of public opinion. Some concentrate on research methodology or the conduct of surveys. Growing numbers apply sociological knowledge and methods in the areas of penology and correction, education, public relations in industry, and regional and community planning. A few specialize in medical sociology—and study the social factors that affect mental and public health.

Most sociologists are college teachers, but, as a rule, these teachers also conduct research. Sociological research often involves the collection of data, preparation of case studies, testing, and the conduct of statistical surveys and laboratory experiments. Sociologists may study individuals, families, or communities in an attempt to discover the causes of social problems—such as crime, juvenile delinquency, or poverty; the normal pattern of family relations; or the different patterns of living in communities of varying types and sizes. They may collect and analyze data from official government sources to illustrate population trends, including changes in age, sex, race, and other population characteristics; and also the extent of population movement among rural, suburban, and urban areas and among different geographic areas. Sociologists may conduct surveys which add to basic sociological knowledge or which may be used in public opinion, marketing, and advertising research. Others are specialists in the use of mass communication facilities, including radio, television, newspapers, magazines, and circulars.

Sociologists are sometimes administrators—supervising research projects or the operation of social agencies, including family and marriage clinics. Others are consultants, advising on such diverse problems as the management of hospitals for the mentally ill, the rehabilitation of juvenile delinquents, or the development of effective advertising programs to promote public interest in particular products.

Places of Employment

It is estimated that about 10,000 persons were employed as sociologists in 1968. Numerous others were employed in positions requiring some training in this field, including many in social, recreation, and public health work.

About three-fourths of all sociologists are employed in colleges and universities. The remainder work in Federal, State, local, or international government agencies, in private industry, in welfare or other nonprofit organizations, or are self-employed.

Since sociology is taught in most institutions of higher learning, sociologists may be found in nearly all college communities. They are most heavily concentrated, however, in large colleges and universities which offer graduate training in sociology and opportunities for employment in research. Medical sociologists are most often employed on the teaching or research staffs of medical colleges and their graduate departments of public health and preventive medicine. They also find employment on hospital staffs and in State and municipal health departments. Rural sociologists most frequently work at State universities where they are likely to have opportunities for research at the State agricultural experiment stations attached to these universities. Some specialists in rural sociology and community development are employed in foreign countries by U.S. Government agencies and private foundations.

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Training, Other Qualifications, and Advancement

A master's degree with a major in sociology usually is the minimum requirement for employment as a sociologist. The Ph. D. degree is essential for attaining a professorship in most colleges or universities, and is commonly required for directors of major research projects, important administrative positions, or consultants.

Sociologists with master's degrees may qualify for many administrative and research positions, provided they are trained in research methods and statistics. They may perform work requiring responsibility for specific portions of a survey or for the preparation of analyses and reports under general supervision. As they gain experience, they may advance to supervisory positions in both public and private agencies. Sociologists with the master's degree may qualify for some college instructorships. Most colleges, however, appoint as instructors only people with training beyond the master's level—frequently the completion of all requirements for the Ph. D. degree except the doctoral dissertation. Outstanding graduate students often can get teaching or research assistantships which will provide both financial aid and valuable experience.

Young people with only a bachelor's degree in sociology are not usually recognized by the profession as sociologists, although they may be able to secure other jobs in this or related fields. They may get jobs as interviewers or as research assistants working under close supervision. Many are employed as caseworkers, counselors, recreation workers, or administrative assistants in public and private welfare agencies. Sociology majors with sufficient training in statistics may obtain positions as beginning statisticians. Those who meet State certification requirements may enter high school teaching.

The choice of a graduate school is very important for people planning to become sociologists. Students interested in research should select schools which emphasize training in research methods and statistics, and provide opportunities to gain practical experience in research work. Professors and chairmen of sociology departments frequently aid in the placement of graduates.

Employment Outlook

Employment opportunities for sociologists are expected to increase substantially through the 1970's. Because of expanding enrollments, the majority of new positions will be in college teaching. However, some openings will result from the growing trend to include sociology courses in the curricula of other professions, such as medicine, law, and education. An estimated 450 teachers may be needed each year, on the average, to fill new positions and to replace college faculty members who leave the profession. A substantial rise in the number of sociologists in nonteaching fields is anticipated to cope with social and welfare problems and to implement educational and social legislation designed to develop human resources.

Sociologists well trained in research methods and advanced statistics will have the widest choice of jobs. Employment opportunities are also expected to be very good for research workers in rural sociology, community development, population analysis, public opinion research, and various branches of medical sociology. Employment opportunities also will increase in other applied fields, such as the study of juvenile delinquency and education. Some openings are anticipated in a relatively new area, the sociology of law.

The number of sociologists holding the doctor's degree is expected to rise less rapidly than the number of positions through the 1970's. As a result, employment opportunities for both Ph. D.'s, and those who have completed all requirements for the doctorate except the dissertation will probably be very good during this period. Inexperienced graduates with only the master's degree—with the exception of those specifically trained in research methods—will probably continue to face considerable competition for positions as professional sociologists.

Earnings

New assistant professors of sociology received a median annual salary of $10,200 for the school year 1968-1969, according to a survey of the American Council on Education. Experienced teaching faculty in sociology earned a median salary of $13,500 in 1968, and sociologists in non-profit organizations and industry had average salaries of $14,500 and $15,000 respectively, according to the National Science Foundation. In the Federal Goverment, the beginning salary in 1968 for sociologists having a

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master's degree and a superior academic record was $8,462 in late 1968. Salaries of experienced sociologists in the Federal Government generally ranged between $10,200 and $19,780 a year.

In general, sociologists with the Ph. D. degree earn substantially higher salaries than those with the master's degree. Many sociologists supplement their regular salaries with earnings from other sources. Summer teaching and consulting work are the principal sources of income. Sociologists employed by colleges and universities are the most likely to have additional earnings.

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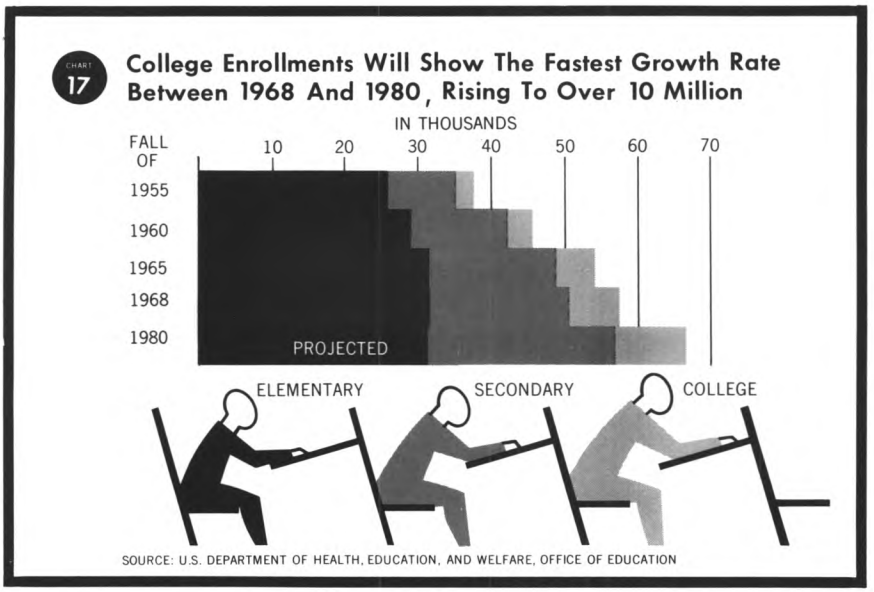
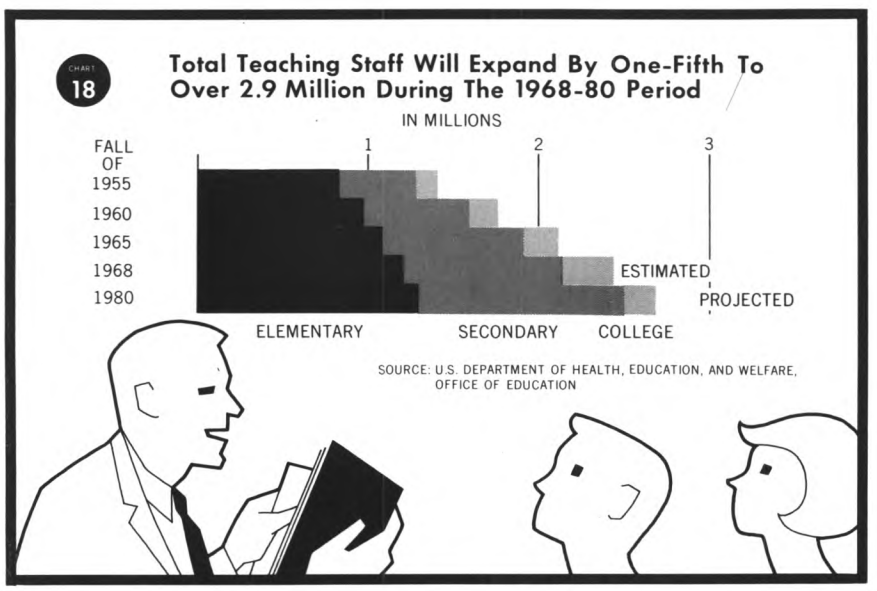
TEACHING

Teaching is the largest of the professions. About 2.5 million men and women were full-time teachers in the Nation's elementary schools, secondary schools, and colleges and universities in the 1968-69 school year. In addition, thousands taught part time, among them were many scientists, physicians, accountants, members of other professions and graduate students. Similarly, large numbers of craftsmen instructed part time in vocational schools. Many other people taught in adult education and recreation programs.





No other profession offers so many employment opportunities for women. About 1.6 million women are teachers, more than twice the number employed in nursing, the second largest field of professional employment for women. Women teachers far outnumber men in kindergarten and elementary schools and hold almost half the teaching positions in secondary (junior and senior high) schools. However, only about one-fourth of all college and university teachers are women.

The number of teachers needed by the Nation's schools depends chiefly on the number of students enrolled. At the beginning of the 1968-69 school year, 57.1 million people—more than one-fourth of the country's total population—were enrolled in the Nation's schools and colleges. Through the 1970's, continued growth of the school and college population and continued increases in high school and college attendance rates are expected to produce a moderate increase in school enrollments and a very rapid rate of increase in college enrollments. Total enrollments in all schools and colleges combined, according to U.S. Office of Education estimates, may reach almost 63 million by 1980.

To staff the new classrooms that must be provided for the rising numbers of students, and to continue to improve the student-teacher ratio, the Nation's full-time teaching staff in 1980 will need to be about one-tenth or almost 280,000 more than in 1968. An even larger number of teachers—perhaps as many as 2.2 million—will be required to replace those who leave the profession.

The outlook for teachers at each educational level—in elementary and secondary schools

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and also in colleges and universities—is discussed in the following statements.

KINDERGARTEN AND ELEMENTARY SCHOOL TEACHERS

(D.O.T. 092.228)

Nature of the Work

Elementary school teaching is the largest field of professional employment for women and is a growing field for men. In the 1968-69 school year, over 1.2 million kindergarten and elementary teachers were employed. In addition, an estimated 60,000 principals and supervisors were working in public and private elementary schools.

Kindergarten teachers conduct a program of education for young children. Most frequently, they divide the schoolday between two different groups, teaching a morning and an afternoon class. Some, however, may work with one group all day. They provide the children with experiences in play, music, artwork, stories, and poetry; and introduce them to science, numbers, language, and social studies. In a variety of ways, kindergarten teachers help to develop children's curiosity and zeal for learning, as well as to stimulate their ability to think. After school hours, kindergarten teachers may plan the next day's work, prepare the children's school records, confer with parents or professional personnel concerning individual children, participate in teachers' in-service activities, and locate and become familiar with teaching resources.

Elementary school teachers usually work with one group of pupils during the entire schoolday, teaching several subjects and supervising various activities such as lunch and play periods. In some school systems, however, teachers in the upper elementary grades may teach one or two subjects to several groups of children. Many school systems also employ special teachers to give instruction and to assist classroom teachers in certain subjects such as art, music, physical education, industrial arts, foreign languages, and homemaking. Teachers in schools which have only a few students, largely in rural areas, may be required to teach all subjects in several grades. Programed instruction, including teaching machines and "talking typewriters," and the increasing use of teacher aids are new developments that are freeing growing numbers of elementary school and kindergarten teachers from routine duties and allowing them to give more individual attention to their students.

Places of Employment

Elementary school teachers are employed in all cities, towns, villages, and in rural areas. As a result of reorganization of school districts, many teachers are employed in consolidated schools in small towns. Only about 6,500 teach in one-room schools.

Training, Other Qualifications, and Advancement

All States require that teachers in the public schools have a certificate. Several States require certification for teachers in parochial and other private elementary schools.

In 1968, 46 States and the District of Columbia issued regular teaching certificates only to persons having at least 4 years of approved college preparation. Teacher certification in most States also requires professional education courses. Eighteen

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States require that teachers work toward a fifth year or master's degree within a certain number of years. Some school systems have higher educational requirements than those for State certification.

In nearly all States, certificates are issued by State departments of education on the basis of transcripts of credits and recommendations from approved colleges and universities. Certificates may be issued to teachers from other States if the prescribed programs have been completed at accredited colleges or if the teachers meet the academic and other requirements of the State to which they are applying. Under certain conditions usually related to a shortage of qualified teachers, most States will issue emergency or temporary certificates to partially prepared teachers. However, these certificates must be renewed annually.

All States have certain additional requirements for public school teaching. For example, they may require a health certificate, evidence of citizenship, or an oath of allegiance. The prospective teacher should inquire about the specific requirements of the area in which he plans to work by writing to the State department of education or to the superintendent of the local school system.

Most institutions of higher education offer teacher preparation. In a 4-year teacher-preparation curriculum, prospective elementary school teachers spend about one-fourth of the time in professional courses—learning about children, the place of the school in the community, and materials and methods of instruction—including student teaching in an actual school situation; the remainder of their time is devoted to liberal arts subjects. Some study of the process of learning and human behavior usually is included.

After gaining experience, teachers will find opportunities for advancement through annual salary increases in the same school system; by transferring to a system with a higher salary schedule which recognizes experience gained in another school system; by appointment to a supervisory, administrative, or specialized position in the school system; or by transferring to higher levels of teaching for which their training and experience may qualify them.

Among the most important personal qualifications for elementary school teaching are an enjoyment and understanding of children. Teachers must be patient and self-disciplined, and have high standards of personal conduct. A broad knowledge and appreciation of the arts, sciences, history, and literature also are valuable. Civic, social, and recreational activities of teachers may be influenced ,and sometimes are restricted, by the customs and attitudes of their community.

Employment Outlook

Young people preparing to teach in elementary schools will find a large number of teaching positions available—an estimated 1.2 million—between 1968 and 1980. By far the largest number of teachers, about 1.1 million, will be needed to replace those who retire, die, or leave the profession for other reasons. Although enrollments in 1980 are expected to be at about the same level as in 1968, teaching positions are expected to grow by about 40,000 during the period to reduce the pupil-teacher ratio. In addition, about 56,500 teachers will be needed to replace persons not meeting certification requirements. Increasing emphasis on the education of very young children, children in low-income areas, the mentally retarded, and other groups needing special attention may result in larger enrollments and smaller student-teacher ratios than indicated above, with an accompanying increase in the number of teachers required.

The number of persons qualified to teach in elementary schools may exceed the number of openings if present enrollment projections and trends in the number of newly trained teachers continues. As a result, young people seeking their first teaching assignment may find schools placing great emphasis on their academic work and the quality of their training. Nevertheless,

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employment opportunities may be very favorable in urban ghettos, rural districts, and in all geographic areas where teaching salaries are low and better paying opportunities are available in other fields in the community. The outlook for teachers who are trained to work with children having various handicaps also will be favorable.

Earnings and Working Conditions

The average salary for classroom teachers in public elementary schools, according to National Education Association (NEA) estimates, was $7,676 in 1968-69. In the four highest paying States (Alaska, California, Michigan, and Illinois), teachers' salaries averaged $8,800 or more; in the six States having the lowest salaries (South Dakota, North Dakota, Mississippi, South Carolina, Alabama, and Idaho), they were less than $6,000. An increasing number of States (31 in the 1968-69 academic year) have established minimum salary levels.

Although the average time spent in the classroom (less than 6 hours) usually is less than the average workday in most other occupations, the elementary school teacher must spend additional time each day giving individual help, planning work, preparing instructional materials, developing tests, checking papers, making out reports, and keeping records. Conferences with parents, meetings with school supervisors, and other professional activities also frequently occur after classroom hours.

Since most schools are in session less than 12 months a year, teachers often take courses for professional growth or work at other jobs during the summer. Some school systems, however, are extending the teachers' working year to 12 months, including a 1-month vacation in the summer.

Employment in teaching is steady and usually is not affected by changes in business conditions. Tenure provisions protect teachers from arbitrary dismissal. Pension and sick leave plans are common, and a growing number of school systems grant other types of leave with pay. An increasing number of teachers are being represented by professional teacher associations or by unions that bargain collectively for them on wages, hours, and other conditions of employment.

Sources of Additional Information

Information on schools and certification requirements is available from the State department of education at each State capital.

Information on the Teacher Corps, internships, graduate fellowships, and other information on teaching may be obtained from:

U.S. Department of Health, Education, and Welfare, Office of Education, Washington, D.C. 20202.

Other sources of general information are:

American Federation of Teachers, 716 North Rush St., Chicago, Ill. 60611.

National Commission on Teacher Education and Professional Standards, National Education Association, 1201 16th St. NW., Washington, D.C. 20036.

SECONDARY SCHOOL TEACHERS

(D.O.T. 091.118 through .228)

Nature of the Work

Secondary school teachers—those employed in junior and

High school language teacher conducts language laboratory.

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senior high schools—usually specialize in a particular subject. They teach several classes every day, either in their main subject, in related subjects, or both. The most frequent combinations are English and history or other social sciences; mathematics and general science; and chemistry and biology or general science. Teachers in some fields, such as home economics, agriculture, commercial subjects, driver education, music, art, and industrial arts, less frequently conduct classes in other subjects. The teaching method may vary from formal lectures to free discussions, depending on the subject and the students' needs and aptitudes. The choice of method usually is left to the teacher.

Besides giving classroom instruction, secondary school teachers plan and develop teaching materials, develop and correct tests, keep records and make out reports, consult with parents, supervise study halls, and perform other duties. The growing use of teaching machines, programmed instruction, and teacher aids relieves the teacher of many routine tasks. Many teachers supervise student activities, such as clubs and social affairs—sometimes after regular school hours. Maintaining good relations with parents and the community is an important aspect of their jobs.

About 940,000 teachers were employed in the Nation's public and private secondary schools in 1968-69. Slightly more than half the classroom teachers in public secondary schools were men. Men far outnumber women in supervisory and administrative positions in both public and private schools.

Places of Employment

The number of grades in secondary schools depends on how the local school system is organized. Many secondary school teachers are employed in 6-year combined junior-senior high schools (grades 7-12); others are in separate junior high schools of either two or three grades (7-8 or 7-9); and the remainder teach in 4-year high schools (grades 9-12) and in senior high schools (grades 10-12).

Training, Other Qualifications, and Advancement

In every State, a certificate is required for public secondary school teaching. To qualify for this certificate, the prospective teacher must have at least the equivalent of one-half year of education courses, including practice teaching, plus professional courses in one or more subjects commonly taught in secondary schools.

Ten States require a fifth year of study or qualification for a master's degree within a specified period following the teacher's beginning employment. Many school systems, especially in large cities, have requirements beyond those needed for State certification. Some systems require additional educational preparation, successful teaching exeperience, or special personal qualifications.

College students preparing for secondary school teaching usually devote about one-third of the 4-year course to their major, which may be in a single subject or a group of related subjects. About one-sixth of the time is spent in education courses—learning about children, the place of the school in the community, and materials and methods of instruction—including student teaching in an actual school situation. The remaining time is devoted to general or liberal arts courses. Accepted teacher-preparation curriculums are offered by universities with schools of education, by colleges with strong education departments and adequate practice-teaching facilities, and by teachers' colleges.

Although certification requirements vary among the States, the person who is well prepared for secondary school teaching in one State usually has little trouble meeting requirements in another State. A well-qualified teacher ordinarily can obtain temporary certification in a State while preparing to meet its additional requirements.

Qualified secondary school teachers may advance to department heads, supervisors, assistant principals, principals, superintendents, or other administrative officers as openings occur. At least 1 year of professional education beyond the bachelor's degree and several years of successful classroom teaching are required for most supervisory and administrative positions. Often, a doctorate is required for appointment as superintendent. Some experienced teachers are assigned as part- or full-time guidance counselors or as teachers of handicapped or other special groups of children. Usually, additional preparation and sometimes special certificates are required for these assignments.

Probably the most important personal qualifications for secondary school teaching are an appreciation and understanding of adolescent children. Patience and self-discipline are desirable traits, as are high standards of personal conduct. In addition to an enthusiasm for the subjects they teach, a broad knowledge and appreciation of the arts, sciences, history, and literature also are desirable. Civic, social, and recreational activities of teachers may be influenced, and sometimes restricted, by the customs and attitudes of their community.

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Employment Outlook

About 1.2 million new secondary school teachers will be needed between 1968 and 1980 for enrollment growth and replacement of teachers who retire, marry, or leave the field for other reasons. The larger group, almost 90 percent of the total, will be required for replacement. In addition, 34,000 will be needed to replace persons who do not meet certification requirements.

A slowing of enrollment growth in secondary schools is expected to be accompanied by a simultaneous increase in the number of college graduates trained for teaching. If the total number of degrees awarded increases as projected by the U.S. Office of Education, and if the proportion of graduates prepared to teach in secondary schools continues through the 1970's, about the same as in the past, the total number of new graduates available for secondary school teaching positions will increase significantly. In addition, many women who wish to reenter teaching after a period of full-time homemaking, will be available to fill teacher vacancies. Thus, it is likely that new graduates may face increasing competition for entry positions in secondary teaching. Young people planning to teach, therefore, are likely to find school boards placing much greater emphasis on the type and quality of an applicant's professional training and academic performance. Even with an improvement in the supply situation, however, opportunities will be very favorable in some geographic areas and in subject fields such as the physical sciences, for which the demand in private industry and government is also great. In addition, increased demands for teachers trained in the education of children who are mentally retarded or physically handicapped are expected. Considerable additional demand for teachers also may be generated by Federal legislation that provides for supplementary educational centers and services and the Teacher Corps. These extensive additions to present teaching services will be available to both public and private school children.

Further specialized training may qualify many teachers who are prepared for secondary school teaching for positions in vocational and technical schools and in junior colleges, where demand for teachers is expected to be especially great in future years.

Earnings and Working Conditions

The average annual salary for all classroom teachers in public secondary schools was about $8,160 in 1968-69, according to estimates by the National Education Association. In Alaska, California, Illinois, and Michigan, average salaries were $9,500 or more. The average was less than $6,200 in three States, Mississippi, Alabama, and South Carolina. At the beginning of the 1968-69 academic year, 31 States had minimum teacher salary laws.

Teachers of vocational education, physical education, and other special subjects often receive higher salaries than other teachers. Under salary schedules in effect in most school systems, teachers in all subject fields get regular salary increases as they gain experience and additional education.

Teachers' salaries usually are lower in towns and small cities than in larger cities or suburbs, but higher educational and experience requirements are likely to prevail in large city school systems. On the average, salaries of principals in the largest cities, where administrative responsibilities are great, are much higher than in towns and small cities. Salaries of superintendents are $30,000 or more in many large school systems.

Teachers often add to their incomes by teaching in summer school, working as camp and recreational counselors, or doing other work. Some teachers supplement their incomes during the regular school year. They may teach in adult or evening classes, work part-time in business or industry, or write for publication.

Some form of retirement is provided for most teachers. Nearly all school systems have some provision for sick leave, and an increasing number grant other types of leave with pay.

According to a recent survey, the average workweek of secondary school teachers is about 46 hours a week, of which 23½ hours are spent in classroom instruction and the remainder in out-of-class instruction and other duties. An increasing number of teachers is represented by professional teacher associations or by unions that bargain collectively for them on wages, hours, and other conditions of employment.

Sources of Additional Information

Information on schools and certification requirements is available from the State department of education at the State capital.

Information on the Teacher Corps, internships, graduate fellowships, and other information on teaching may be obtained from:

U.S. Department of Health, Education, and Welfare, Office of Education, Washington, D.C. 20202.

Other sources of information are:

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American Federation of Teachers, 716 North Rush St., Chicago, Ill. 60611.

National Commission on Teacher Education and Professional Standards, National Education Association, 1201 16th St. NW., Washington, D.C. 20036.

COLLEGE AND UNIVERSITY TEACHERS

(D.O.T. 090.168 and .228)

Nature of the Work

About 600,000 teachers were employed in the Nation's 2,500 colleges and universities in the fall of 1968. Approximately 286,000 were full-time teachers of degree credit courses; in addition, 142,000 taught such courses part-time. The remainder included junior instructional staff (primarily graduate students), and staff who taught non-degree courses and gave instruction by television, radio, or mail.

Most full-time college and university teachers instruct in the social sciences, teacher education, English and journalism, fine arts, mathematics, physical or biological sciences, engineering, or the health professions. Teaching duties may include preparing and delivering lectures, leading class discussions, directing graduate students in teaching freshman courses, preparing tests and instruction materials, counseling and assisting individual students, and checking and grading assignments and tests. Grading sometimes is done by teaching assistants or, for objective tests, by computers. In many 4-year institutions, the usual teaching load is 12 to 15 hours a week. Associate professors and full professors—who advise graduate students and often engage actively in research—may spend only 6 to 8 hours a week in actual classroom work.

In addition to teaching, many college teachers conduct or direct research, write for publication, or aid in college administration. Some act as consultants to business, industrial, scientific, or government organizations.

Places of Employment

About nine-tenths of all full- and part-time teachers were employed by universities and 4-year colleges in 1968, most of the remainder were in 2-year institutions.

Men predominate in college teaching and hold more than nine-tenths of the positions in engineering, the physical sciences, agriculture, and law. However, most teachers in nursing, home economics, and library science are women.

College teachers are concentrated in the States having the largest college enrollments. In the fall of 1968, resident and extension enrollments exceeded 1.1 million in California and were over 700,000 in New York. Seven other States had enrollments of from 200,000 to 400,000; Illinois, Texas, Pennsylvania, Michigan, Ohio, Massachusetts, and Florida.

Training, Other Qualifications, and Advancement

To qualify for most beginning positions, applicants must have at least the master's degree, and for many, they must have completed all requirements for the doctorate except the dissertation. A number of States require State certification to teach in public 2-year colleges. To obtain such a certificate, the master's degree and certain courses in education are required.

To enter college teaching, specialization in some subject field is necessary. In addition, under-

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graduate courses in the humanities, social sciences, natural sciences, and the mastery of at least one foreign language are important. Intensive instruction in the selected field of specialization is given in graduate school. Outstanding graduate students receive valuable experience through part-time teaching assistantships. Some students develop teaching competence by participating in informal seminars or meetings on teaching methods. Some prospective college teachers, especially those in education departments and junior colleges, gain experience in high school teaching.

Most 4-year colleges and universities recognize four academic ranks: Instructor, assistant professor, associate professor, and full professor. A National Education Association survey indicates that about one-quarter of the teaching faculty are professors, another quarter associate professors, over 30 percent are assistant professors, and almost 20 percent are instructors or lecturers.

Few institutions grant tenure (permanent appointment) to instructors having less than 3 years of service. Advancement to associate professorship generally requires considerable teaching experience and often a doctor's degree. In some institutions, research and publication also may be required. A doctor's degree and 7 or more years of teaching experience usually are necessary to become a full professor. Outstanding achievements, generally through research or publications, hastens advancement.

Beginning teachers in fields that are in strong demand, such as engineering, mathematics, and medicine, sometimes are appointed at higher ranks than other teachers having comparable experience and education. A doctor's degree is particularly required for advancement in the biological sciences, physical sciences, psychology, social sciences, philosophy, and religion; it is least likely to be a requirement in business and commerce, engineering, fine arts, health and physical education, and home economics.

Fellowships are available under the National Defense Education Act to candidates for doctoral degrees who plan careers in college or university teaching. The Education Professions Development Act of 1967 authorizes Federally supported fellowships for master's degree study for those planning to enter or already engaged in teaching at two-year colleges, four-year colleges, and universities.

Employment Outlook

College teaching opportunities are expected to be good for those having doctoral degrees or having completed all requirements for the doctorate except the dissertation. Opportunities also will be favorable for new entrants having the master's degree, particularly in 2-year colleges.

A great increase in college enrollment is in prospect. The number of young people in the 18- to 21-year age group is expected to rise by nearly 2.7 million between 1968 and 1980. At the same time, larger proportions of young people of college age will attend college —owing to rising family income, recent Federal legislation to help needy college students, and greater demand for college-trained personnel. The anticipated increase in the number of community colleges and schools offering evening classes also will permit more young people and adults to attend college. If the proportion of young people attending college continues to increase and facilities are available, college enrollments for degree credit will increase from about 6.8 million in 1968 to about 10.2 million in 1980, according to the U.S. Office of Education.

Taking all these factors into account, the Office of Education estimates that the full-time college teaching staff for resident degree credit courses will increase from 286,000 in 1968 to 394,000 in 1980, or by 38 percent. In addition to the teachers needed to take care of the enrollment growth, an annual average of about 8,200 teachers may be needed to replace those who retire or die.

The supply of new college teachers, which consists largely of students receiving graduate degrees, also is expected to grow. The U.S. Office of Education estimates that the number of doctorates conferred through 1980, will average about 37,000 a year, and the number of master's degrees about 235,000 annually. It is difficult, however, to say how many of these will enter teaching. Industry, government, and nonprofit organizations also offer employment opportunities to persons having graduate degrees, often at higher salaries than colleges.

The supply and quality of college teachers may be improved in the years ahead by recent Federal legislation that makes fellowships available to qualifed graduate students, and junior members of the faculty who are interested in teaching in colleges and universities. Nevertheless the number of well-qualified persons available for teaching positions probably will continue to be insufficient to meet the demand in some subject fields through the 1970's.

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Earnings and Working Conditions

The median salary of full-time faculty who were engaged primarily in teaching in 4-year institutions was estimated at $10,885 in 1968-69 (9 mo.), based on National Education Association data. Salaries generally were higher in universities than in colleges, and highest in large universities. Highest median salaries were paid in the Far West and New England. Estimated median salaries by rank were:

Professor	$15,713
Associate Professor	12,151
Assistant Professor	10,064
Instructor or Lecturer	7,905

The median salary paid full-time faculty in public 2-year colleges in 1968-69 was estimated at $9,605. Teachers in nonpublic 2-year colleges received an estimated median salary of $7,662.

Faculty members who teach year round usually receive higher salaries than those employed for the academic year only. Teachers in professional schools (medicine, dentistry, etc.) and graduate schools generally receive higher salaries than teachers in other colleges.

Some faculty members supplement their regular salaries with earnings from a variety of sources. The chief source is additional teaching (often in summer sessions). Consulting work may be a major source of extra income, particularly in engineering and physical sciences; research grants are now common, especially in many large, well-known universities; fees for lecturing and royalties on publications are other possible sources of income. Opportunities for additional income usually increase as the faculty member gains recognition. For most college teachers, additional income is small.

Retirement plans differ considerably among institutions, but an increasing number are participating in the Government social security program, often as an accompaniment to plans of their own. The greatest number of institutions have set 65 years as the normal retirement age, although most of these extend the age limit if desired.

Many colleges and universities provide benefits such as: Sabbatical leaves of absence—typically, 1 year's leave with half salar or a half-year's leave at full salary after 6 or 7 years of employment; other types of leave for advanced study; life, sickness, and accident insurance; reduced tuition charges or cash-tuition grants for children of faculty members; housing allowances; travel funds for attending professional meetings; and other benefits.

Sources of Additional Information

Information on college teaching as a career is available from:

U.S. Department of Health, Education, and Welfare, Office of Education, Washington, D.C. 20202.

American Association of University Professors, 1785 Massachusetts Ave. NW., Washington, D.C. 20036.

American Council on Education, 1785 Massachusetts Ave. NW., Washington, D.C. 20036.

American Federation of Teachers, 716 North Rush St., Chicago, Ill. 60611.

National Education Association, 1201 16th St. NW., Washington, D.C. 20036.

Professional societies in the various subject fields will generally provide information on teaching requirements and employment opportunities in their particular fields. Names and addresses of societies are given in the statements on specific professions elsewhere in the *Handbook*.

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TECHNICIAN OCCUPATIONS

Technician occupations are growing rapidly, steming from the needs of an expanding and increasingly technical economy and the growing recognition of the importance of technicians. This chapter is concerned with the technicians who work with engineers and scientists, and with draftsmen, also usually considered technicians. Information on surveyors, often classified as technicians, and on technical occupations in the health field—including dental laboratory technicians, radiological technologists, and dental hygienists—is presented elsewhere in the *Handbook*.

ENGINEERING AND SCIENCE TECHNICIANS

(D.O.T. .002 through .029)

Nature of the Work

The term "technician," as used here, refers to workers whose jobs require both knowledge and use of scientific and mathematical theory; specialized education or training in some aspect of technology or science; and who, as a rule, work directly with scientists and engineers. There is no generally accepted definition of the term "technician". For example, it is used by employers to refer to workers in a great variety of jobs, requiring a wide range of education and training. The term is applied to employees doing relatively routine work, to persons performing work requiring skills within a limited sphere, and to persons doing highly technical work, among them assistants to engineers and scientists.

The workers' job titles may be descriptive of their technical level (for example, biological aid, or engineering technician) or their work activity (for example), quality-control technician, production analyst, tool designer, materials tester, or time-study analyst). Some employees use the word "technician," preceded by adjectives, such as mechanical, electrical, electronics, or chemical, which describes areas of technology in which their personnel are employed.

The jobs of engineering and science technicians are more limited than those of the professional engineer or scientist, and have a greater practical orientation. Many technician jobs require the ability to analyze and solve engineering and science problems and to prepare formal reports on experiments, tests, or other projects. Most of these jobs require some aptitude in mathematics; others, the ability to visualize objects and to make sketches and drawings. Design jobs often require creative ability. Many technician jobs require some familiarity with one or more of the skilled trades, although not the ability to perform as a craftsman. Others demand extensive knowledge of industrial machinery, tools, equipment, and processes. Some jobs held by these technicians are supervisory and require both technical knowledge and the ability to supervise people.

In carrying out their assignments, engineering and science technicians frequently use complex electronic and mechanical instruments, experimental laboratory apparatus, and drafting instruments. Almost all of the technicians whose jobs are described in this statement must be able to use engineering handbooks and computing devices, such as the slide rule or calculating machine.

Technician prepares radiation study.

Technicians engage in virtually every aspect of engineering and scientific work. In research, development, and design, one of the largest areas of employment, they conduct experiments or tests; set up, calibrate, and operate instruments; and make calculations. They also assist scientists and engineers in developing experimental equipment and models by making drawings and sketches and, under the engineer's direction, frequently do some design work.

Technicians also work in jobs related to production, usually folby the engineer or scientist, but lowing a program course laid out often without close supervision. They may aid in the various phases of production operation, such as working out specifications for materials and methods of manufacture, devising tests to in-

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sure quality control of products, or making time-and-motion studies (timing and analyzing the worker's movements) designed to improve the efficiency of a particular operation. They also may perform liaison work between engineering and production or other departments.

Technicians often do work that might otherwise have to be done by engineers. They may serve as technical sales or field representatives of manufacturers; advise on installation and maintenance problems; or write specifications and technical manuals. (See statement on Technical Writers.)

The following sections describe a number of technological fields in which engineering and science technicians are trained and employed.

Aeronautical Technology. Technicians specializing in this area of technology work with engineers and scientists in many phases of the design and production of aircraft, helicopters, rockets, guided missiles, and spacecraft. Many aid engineers in preparing layouts of structures, control systems, or equipment installations by collecting information, making calculations, and performing many other tasks. They work on projects involving stress analysis, aerodynamics, structural design, flight test evaluation, or weight control. For example, under the direction of an engineer, a technician might estimate weight factors, centers of gravity, and other items affecting load capacity of an airplane or missile. Other technicians working on engineering projects prepare or check drawings for technical accuracy, practicability, and economy.

Technicians sometimes help to estimate the cost of the materials and labor needed to manufacture aircraft and missles. They also may be responsible for liaison between the engineers who do the planning and development work, and the craftsmen who convert the engineers' ideas into finished products. For example, as an aircraft or missile is built, the liaison technician checks it for conformance to specifications, keeps the engineer informed as to progress, and investigates any production engineering problems that arise. He sometimes recommends minor changes in the design, the materials, or the method of fabrication.

Other aeronautical technicians are employed as manufacturer's field service representatives, serving as the link between their company and the military, commercial airlines, and other customers. Technicians often prepare instruction manuals, bulletins, catalogs, and other technical materials. (See statements on Aerospace Engineers and Airplane Mechanics, and chapter on Occupations in Aircraft, Missile, and Spacecraft Manufacturing.)

Air-Conditioning, Heating, and Refrigeration Technology. Air-conditioning technology involves the control of air including its heating, cooling, humidity, cleanliness, and movement. Technicians in this field often become specialists in one area of work, such as refrigeration, and sometimes in a particular type of activity, such as research and development or design of layouts for heating, cooling, or refrigeration systems.

In the manufacture of air-conditioning, heating, and refrigeration equipment, technicians work in research and engineering departments, usually as aids to engineers and scientists. They may be assigned to such jobs as devising methods for testing equipment or analyzing production methods. Technically trained personnel also assist in designing the air-conditioning, heating, or refrigeration systems for a particular office, store, or other location and prepare instructions for their installation. In designing the layout for an air-conditioning or heating system, they must determine the cooling or heating requirements, decide what kind of equipment is most suitable, and estimate costs. Technicians employed as salesmen by equipment manufacturers must be able to supply contractors who design and install systems with information on such technical subjects as installation, maintenance, operating costs, and expected performance of equipment. (See also statement on Refrigeration and Air-Conditioning Mechanics.)

Chemical Technology. Technicians specializing in this area work mainly with chemists and chemical engineers in the development, production, sale, and utilization of chemical and related products and equipment. The field of chemistry is so broad that chemical technicians often become specialists in the problems of a particular industry, such as food processing, or in a particular activity such as quality control.

Most chemical technicians work in research and development, testing, or other laboratory work. They conduct experiments and tabulate and analyze the results. In testing work, technicians make chemical tests of materials to determine whether the materials meet specifications or whether particular substances are present and, if so, in what quantities. They may, for example, analyze steel for carbon, phosphorous, and sulfur content, or water for the amount of silica, iron, and calcium present. They also perform experiments to determine the characteristics of substances such as the specific gravity and ash content of oil. Technicians employed in research or

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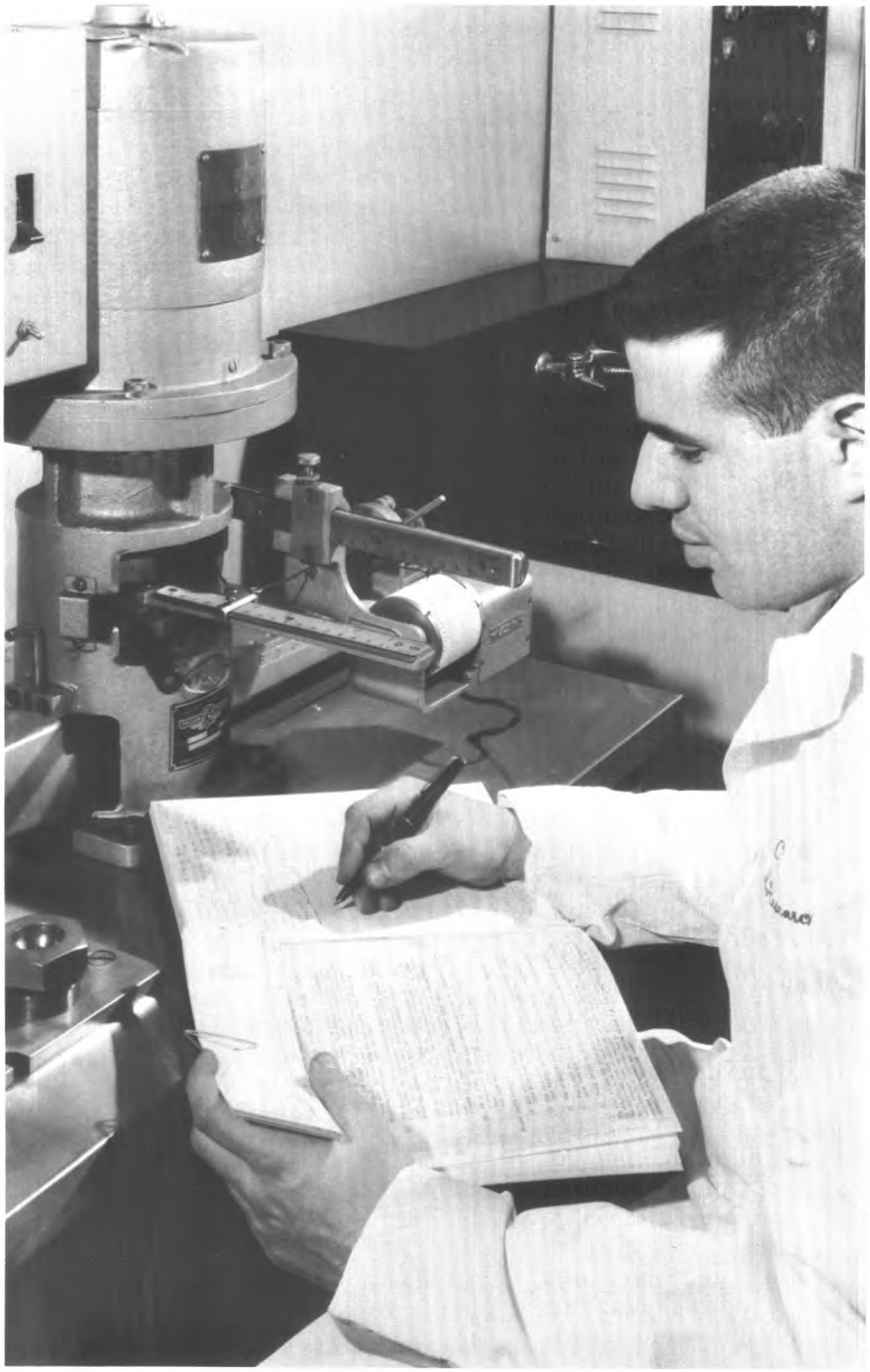
testing laboratories often assemble and use such apparatus and instruments as dilatometers (which measure the dilation or expansion of a substance), analytical balances, and centrifuges.

Outside the laboratory, chemical technicians are sometmes employed to supervise various operations in the production of chemical products and as technical salesman of chemicals and chemical equipment. (See also statements on Chemists and Chemical Engineers, and chapter on Occupations in the Industrial Chemical Industry.)

Civil Engineering Technology. Technicians trained in this area assist civil engineers in performing many of the tasks necessary in the planning and construction of highways, railroads, bridges, viaducts, dams, and other structures. During the planning stage, technicians may help to estimate costs, to prepare specifications for materials, or participate in surveying, drafting, detailing, or designing work. Once the actual construction work has begun, they may assist the contractor or superintendent in scheduling construction activities or inspecting the work to assure conformance to bluepnrints and specifications. (See also statements on Civil Engineers, Draftsmen, and Surveyors.)

Electronics Technology. This field includes radio, radar, sonar, telemetering, television, telephony, and other forms of communication; industrial and medical measuring, recording, indicating, and controlling devices; navigational equipment; missile and spacecraft guidance and control instruments; electronic computers; and many other types of equipment using vacuum tubes, transistors, semiconductors, and printed circuits. Because the field is so broad, technicians generally become specialist in one area—for example, induction or dielectric heating, servomechanisms, automation controls, or ultrasonics.

Technicians working with engineers and scientists in the field of electronics do complex technical work that is more difficult than routine operating and repair work. (For additional information



Engineering technician conducts heavy load test.

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on broadcast technicians see chapter on Occupations in Radio and Television Broadcasting.)

Industrial Production Technology. Technicians trained in this area are sometimes called *industrial technicians* or *production technicians.* They assist industrial engineers on problems involving the efficient use of personnel materials and machines in the production of goods or services. Their work includes preparing layouts of machinery and equipment, planning the flow of work, and making statistical studies and analyses of production costs. The industrial technician also may conduct time-and-motion studies.

In the course of their duties, many industrial technicians acquire experience which enables them to qualify for other jobs. For example, those expert in machinery and production methods may move into the field of industrial safety. Others who specialize in job analysis may become involved in the setting of job standards and in the interviewing, testing, hiring, and training of personnel. Still others may move into production supervision. (See statements on Personnel Workers and Industrial Engineers.)

Mechanical Technology. Mechanical technology is a broad term usually used to cover a large number of specialized fields, including automotive technology, diesel technology, tool design, machine design, and production technology.

Technicians in the above areas of mechanical technology often assist engineers in design and development work by making freehand sketches and rough layouts of proposed machinery and other equipment and parts. They help to determine whether a proposed design change in a product is practical and how much the product will cost to produce. They also may be required to solve design problems such as those involving tolerance, stress, strain, friction, and vibration.

The planning and testing of experimental machines and equipment for performance, durability, and efficiency provide a large area of work for technicians. In the testing procedure, they record data, make computations, plot graphs, analyze results, and write reports. They sometimes make recommendations for design changes to improve performance. Their jobs often require skill in the use of instruments, test equipment and gages, such as dynamometers, as well as the ability to prepare and interpret drawings.

Some mechanical technicians are employed in manufacturing departments to help develop plans for testing and inspecting machines and equipment, or to work with engineers in eliminating production problems. Some obtain jobs as technical salesmen. (See statements on Mechanical Engineers, Automobile Mechanics, Manufacturers' Salesmen, and Diesel Mechanics.)

One of the better known specialties which may be grouped under mechanical engineering technology is that of *tool designer.* The tool designer designs tools and devices for the mass production of manufactured articles. He originates and prepares sketches of the designs for cutting tools, jigs, dies, special fixtures, and other attachments used in machine operations. He also may make detailed drawings of these tools and fixtures or supervise others in making them. Besides developing new tools, designers frequently redesign tools to improve their efficiency.

Machine drafting, with some designing, is another major area of work often grouped under mechanical technology. The work of technicians who are draftsmen is described elsewhere in this chapter.

Some mechanical technicians are employed in manufacturing departments to help develop plans for testing and inspecting machines and equipment, or to work with engineers in eliminating production problems. Some obtain jobs as technical salesmen. (See statements on Mechanical Engineers, Automobile Mechanics, Manufacturers' Salesmen, and Diesel Mechanics.)

As industry becomes increasingly mechanized, new technical occupations continue to emerge. For example, *instrumentation technology* has evolved from the introduction of automatic controls and precision-measuring devices in manufacturing operations. In industrial plants and laboratories, instruments are used to record data, to control and regulate the operation of machinery, and to measure time, weight, temperature, speeds of moving parts, mixtures, volume, flow, strain, and pressure. Technicians in this field work with engineers and scientists who develop and design these highly complex devices, as well as with those who use them for research and development work. (See also statement on Instrument Makers.)

Another new area of work for technicians, which has resulted from recognition of the need for a more scientific approach toward the reduction of industrial hazards, is safety technology. In the rapidly growing atomic energy field, in particular, technicians work with scientists and engineers on problems of radiation safety, inspection, and decontamination. (See chapter on Occupations in the Atomic Energy Field.)

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Places of Employment

An estimated 620,000 engineering and science technicians, not including draftsmen and surveyors, were employed in 1968—about 11 percent were women. Nearly 450,000 of these technicians (more than 7 out of 10) were employed by private industry. The manufacturing industries employing the largest numbers of engineering and science technicians were electrical equipment, chemicals, machinery, and aerospace. In the nonmanufacturing sector, large numbers of technicians were employed in the communications industry and by engineering and architectural firms.

In 1968, the Federal Government employed approximately 85,000 engineering and science technicians; chiefly as engineering aids and technicians, electronic technicians, equipment specialists, cartographic aids, meteorological technicians, and physical science technicians. Of these engineering and science technicians, the largest number worked for the Department of Defense. Most of the others were employed by the Departments of Agriculture, Commerce, and the Interior.

State Government agencies employed over 40,000 engineering and science technicians in 1968 and local governments over 10,000. The remainder were employed by colleges and universities, mostly in university-operated research institutes, and by nonprofit organizations.

Training, Other Qualifications, and Advancement

Young men and women who wish to prepare for careers as engineering or science technicians can obtain the necessary training from a great variety of educational institutions or can qualify for their work right on the job. Most employers, however, seek workers who have had some form of specialized training for more responsible technician jobs. Specialized formal training programs are offered in post-secondary schools—technical institutes, junior and community colleges, area vocational technical schools, and extension divisions of colleges and universities—as well as in technical and technical-vocational high schools. Other ways in which persons can become qualified for technician jobs are by completing an on-the-job training program, through work experience and formal courses taken on a part-time basis in post-secondary or correspondence schools, or through training and experience obtained while serving in the Armed Forces. In addition, many engineering and science students who have not completed all the requirements for a bachelor's degree, as well as some other persons having a college education in mathematics and science, are able to qualify for technician jobs after they obtain some additional technical training and experience. In general, post-secondary school technical training is required for a growing number of engineering and science technician jobs.

Engineering and science technicians usually begin work as trainees or in the more routine positions under the direct supervision of an experienced technician, scientist, or engineer. As they gain experience, they are given more responsibility, often carrying out a particular assignment under only general supervision. Technicians may move into supervisory positions. Those having exceptional ability sometimes obtain additional formal education and are promoted to professional engineering positions.

For admittance to most schools offering post-secondary technician training, a high school diploma is usually required. Some schools, however, admit students without a high school diploma if they are able to pass special examinations and otherwise demonstrate their ability to perform work above the high school level. All engineering and science occupations require basic training in mathematics and science, thus students should obtain a sound background in these subjects when in high school. Many post-secondary schools have arrangements for helping students make up deficiencies in these subjects.

Programs offered by schools specializing in post-high school technical training require 1, 2, 3, or 4 years of full-time study. The majority are 2-year programs, leading to either an associate of arts or science degree. Evening as well as day sessions are generally available. The courses offered in science, mathematics, and engineering are usually at the college level. They include instruction in laboratory techniques and the use of instruments, and emphasize the practical problems met on the job. Students also are instructed in the use of machinery and tools to give them a familiarity with this equipment rather than to develop skills.

Some 4-year bachelor's degree programs in technology place additional emphasis on courses in the humanities and business administration than the 2-year programs, while other 4-year programs emphasize additional technical training.

Because of the variety of educational institutions and the differences in the kind and level of education and training, persons seeking a technical education should use more than ordinary care in selecting a school. Information should be secured

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about the fields of technology in which training is offered, accreditation, the length of time the school has been in operation, instructional facilities, faculty qualifications, transferability of credits toward the bachelor's degree, and the type of work obtained by the school's graduates.

Briefly discussed here are some of the types of post-secondary educational institutions and other sources where young people can obtain training as technicians.

Technical Institutes. Technical institutes offer training designed to qualify the graduate for a specifc job or cluster of jobs immediately upon graduation with only a minimum of on-the-job training. In general, the student receives intensive technical training but less theoretical and general education than is provided in curriculums leading to a bachelor's degree in engineering and liberal arts colleges. A few technical institutes and community colleges offer cooperative programs in which a student spends part of his time in school and part in paid employment related to the occupation for which he is preparing himself.

Some technical institutes are operated as regular or extension divisions of colleges and universities. Others are separate institutions operated by States or municipalities, privately endowed institutions, and proprietary schools.

Junior Colleges and Community Colleges. Many junior and community colleges offer the necessary training to prepare students for technician occupations. Some of these schools offer curriculums that are similar to those given in the freshman and sophomore years of 4-year colleges. Graduates can transfer the junior year into a 4-year college or qualify for some technician jobs. Most large community colleges offer 2-year technical programs, and many employers express a preference for graduates having this more specialized training. Junior college courses in technical fields are often planned around the employment needs of the industries in their locality.

Area Vocational-Technical Schools. Area vocational-technical schools are post-secondary public institutions that are established in central locations to serve students from several surrounding areas. In general, the admission requirements of vocational-technical schools are as rigid as those of other schools offering post-secondary technician training. Area school curriculums are usually designed to train the types of technicians most needed in the area.

Other Training. Some large corporations conduct training programs to meet their need for technically trained personnel. This type of training is primarily technical and rarely includes any general studies.

Training for some occupations in the technician category—tool designer and electronic technician, for example—may be obtained through a formal apprenticeship.

Correspondence schools provide technician training for those who wish to learn more about their jobs.

Technician training is offered by all branches of the Armed Forces. Many of the technicians trained by the military utilize their training in civilian employment, especially in the field of electronics, after they leave the Armed Forces.

Employment Outlook

Employment opportunities for engineering and science technicians are expected to be very good through the 1970's. The demand will be strongest for graduates of post-secondary school technician training programs.

Among the factors underlying the increase in demand for technicians are the anticipated expansion of industry and the increasing complexity of modern technology. As products and the methods by which they are manufactured become more complex, increasing numbers of technicians will probably be required to assist engineers in such activities as production planning, maintaining liaison between production and engineering departments, and technical sales work. Furthermore, as the employment of scientists and engineers continues to grow, increasing numbers of technicians will be needed to assist them. The trend toward automation of industrial processes and the growth of new areas of work, such as that related to space exploration or atomic energy, will probably also add to the demand for technical personnel. In addition to the technicians needed to fill new positions, an average of about 32,000 will be needed each year through the 1970's to replace those who retire, die, or transfer to other occupations.

Another factor supporting the expected increase in demand for engineering and science technicians is the growth anticipated in research and development expenditures. These expenditures have increased rapidly in recent years and are expected to continue to rise through the 1970's, although somewhat more slowly than in the past. Expeditures for the defense and space programs also affect the demand for technical personnel because a large number are engaged in activities related to the defense and space programs. The above outlook for technicians is based on the as-

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sumption that defense activity (as measured by expenditures) in the late 1970's will be somewhat higher than the level prior to the Viet Nam buildup, approximating the level of the early 1960's. If defense activity should differ substantially from that level, the demand for technicians would be affected accordingly.

Well-qualified women technicians should continue to find favorable employment opportunities, chiefly in designing jobs, in chemical and other laboratory work, and in computation and other work requiring the application of mathematics. Over the longrun, it is likely that more women will be trained and will find employment in these and other technician occupations.

Earnings

In general, a technician's earnings depend upon his education and technical specialty, as well as his ability and work experience. Other important factors which influence his earnings are the type of firm for which he works, his specific duties, and the geographic location of his job.

In Federal Government agencies in late 1968, beginning engineering and science technicians were offered $4,600, $5,145 or $5,732, depending upon the type of job vacancy and the applicant's education and other qualifications. Some Federal Government agencies hire high school graduates and train them for technician jobs. Beginning salaries for these jobs are $4,231 a year.

Most technicians can look forward to an increase in earnings as they move to higher positions. In 1968 annual salaries of workers in responsible technician positions in private industry averaged almost $9,800 and approximately one-fourth of the workers had annual salaries above $10,500 according to a Bureau of Labor Statistics survey.

Sources of Additional Information

General information on careers for engineering and science technicians may be obtained from:

American Society for Engineering Education, 2100 Pennsylvania Avenue, NW., Washington, D.C. 20037.

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

National Council of Technical Schools, 1835 K. Street, NW., Room 907, Washington, D.C. 20006.

Information on training opportunities may also be obtained from the Engineers' Council for Professional Development, a nationally recognized accrediting agency for engineering technology programs; the National Council of Technical Schools; and the U.S. Department of Health, Education, and Welfare, Office of Education, Division of Higher Education and/or Division of Vocational and Technical Education, Washington, D.C. 20202.

State departments of education at each State capital also have information about approved technical institutes, junior colleges, and other educational institutions within the State offering post-high school training for specific technical occupations. Other sources include:

American Association of Junior Colleges, 1315 16th St. NW., Washington, D.C. 20036.

National Home Study Council, 1601 18th St. NW., Washington, D.C. 20009.

DRAFTSMEN

(D.O.T. 001. through 019.)

Nature of the Work

In making a space capsule or an electric iron, a nuclear submarine or a television set, a bridge or a typewriter, detailed drawings are needed that give the exact physical dimensions and specifications of the entire object and each of its parts. The workers who draw these plans are draftsmen.

Draftsmen translate the ideas, rough sketches, specifications, and calculations of engineers, architects, and designers into working plans which are used in making a product. Draftsmen may calculate the strength, reliability, and cost of materials. In their drawings and specifications, they describe exactly what materials and process workers are to use on a particular job. To pre-

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pare their drawings, draftsmen use instruments such as compasses, dividers, protractors, and triangles, as well as machines that combine the functions of several devices. They also may use engineering handbooks and tables to assist in solving technical problems.

Draftsmen are often classified according to the type of work they do or their level of responsibility. *Senior draftsmen* use the preliminary information provided by engineers and architects to prepare design "'layouts" (drawings made to scale of the object to be built). *Detailers* make drawings of each part shown on the layout, giving dimensions, material, and any other information necessary to make the detailed drawing clear and complete. *Checkers* carefully examine drawings for errors in computing or in recording dimensions and specifications. Under the supervision of draftsmen, *tracers* make minor corrections and prepare drawings for reproduction by tracing them on transparent cloth, paper, or plastic film.

Draftsmen also may specialize in a particular field of work, such as mechanical, electrical, electronic, aeronautical, structural, and architectural drafting.

Places of Employment

An estimated 295,000 draftsmen were employed in 1968; almost 4 percent were women. The large majority of draftsmen—about 9 out of 10—are employed in private industry. The manufacturing industries that employ large numbers of draftsmen are the machinery, electrical equipment, transportation equipment and fabricated metal products industries. Nonmanufacturing industries employing large numbers of draftsmen are engineering and architectural consulting firms, construction companies and public utilities.

About 22,000 draftsmen worked for Federal, State, and local governments in 1968. Of those employed by the Federal Government, the large majority work for the Departments of the Army, Navy, and Air Force. Draftsmen employed by State and local governments work chiefly for highway and public works departments. Several thousand draftsmen are employed by colleges and universities and by nonprofit organizations.

Training, Other Qualifications, and Advancement

Young persons interested in becoming draftsmen can acquire the necessary training from a number of sources, including technical institutes, junior and community colleges, extension divisions of universities, vocational and technical high schools, and correspondence schools. Other persons may qualify for draftsmen jobs through on-the-job training programs combined with part-time schooling or through 3- or 4-year apprenticeship programs.

The prospective draftsman's training, whether obtained in high school or post-high school drafting programs, should include courses in mathematics and physical sciences, as well as in mechanical drawing and drafting. The study of shop practices and the learning of some shop skills also are helpful, since many higher level drafting jobs require knowledge of manufacturing or construction methods. Many technical schools offer courses in structural design, strength of materials, and physical metallurgy.

Young people having only high school drafting training usually start out as tracers. Those having some formal post-high school technical training can often qualify as junior draftsmen. As draftsmen gain skill and experience, they may advance to higher level positions as checkers, detailers, senior draftsmen, or supervisors of other draftsmen. Some may become independent designers. Furthermore, some draftsmen who take courses in engineering and mathematics are able to transfer to engineering positions.

Qualifications for success as a draftsman include the ability to visualize objects in three dimensions and to do freehand drawing. Although artistic ability is not generally required, it may be very helpful in some specialized fields.

Employment Outlook

Employment opportunities for draftsmen are expected to be favorable through the 1970's. Prospects will be best for those having post-high school drafting training. Well-qualified high school graduates who have had only high school drafting, however, also will be in demand for some types of jobs.

Employment of draftsmen is expected to rise rapidly as a result of the increasing complex design problems of modern products and processes. In addition, as growth of engineering and scientific occupations continues, more draftsmen will be needed as supporting personnel. On the other hand, photoreproduction of drawings and expanding use of electronic drafting equipment are eliminating some routine tasks done by draftsmen and will probably bring about a reduction in the need for some less skilled draftsmen.

In addition to draftsmen needed to fill new positions, many will be required each year to re-

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place those who retire, die, or move into other fields of work.

Earnings

In private industry, persons in beginning drafting positions earned an average of about $410 a month in mid 1968, according to a Bureau of Labor Statistics survey. As they gain experience, draftsmen may move up to higher level positions with a substanial increase in earnings. For example, the earnings of senior draftsmen averaged about $630 a month in mid 1968.

In the Federal Civil Service in late 1968, the entrance salary for high school graduates without work experience who were employed in trainee-draftsman positions was about $350 a month. For those having post-high school education or some experience in drafting, entrance salaries were higher. The majority of experienced draftsmen working for the Federal Government earned between $525 and $640 a month in late 1968.

Sources of Additional Information

General information on careers for draftsmen may be obtained from:

American Institute for Design and Drafting, 305 South Andrews Avenue, Suite 610, Fort Lauderdale, Florida 33301.

American Federation of Technical Engineers, 1126 16th Street, NW., Washington, D.C. 20036.

See also section on Sources of Additional Information in the statement on Engineering and Science Technicians.

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NEWSPAPER REPORTERS

(D.O.T. 132.268)

Nature of the Work

Newspaper reporters gather information on current events and write stories for publication in daily or weekly newspapers. In covering events, they may interview people, review public records, attend news happenings, and do research. As a rule, reporters take brief notes while collecting the facts, and write their stories upon return to the office. Sometimes, to meet deadlines, they telephone their stories to other staff members known as "rewrite men," who write the stories for them.

Large dailies frequently assign some reporters to "beats," such as police stations or the courts, to cover news originating in these places. Other local news, such as a story about a lost child or an obituary of a community leader, is handled by general assignment reporters. Specialized reporters, who are well-versed in a subject matter field as well as in writing increasingly are interpreting and analyzing the news in fields such as medicine, politics, science, education, business, labor, and religion. Reporters on small newspapers get broad experience; they not only cover all aspects of local news, but also may take photographs, write headlines, lay out inside pages, and even write editorials. On the smallest weeklies, they also may solicit advertisements, sell subscriptions, and perform general office work.

Places of Employment

An estimated 37,000 newspaper reporters were employed in the United States in 1968. The majority worked for daily newspapers; most of the others worked for weekly papers. In addition, some reporters were employed by press services and newspaper syndicates.

Reporters work in cities and towns of all sizes throughout the country. Of the 1,750 daily and 9,000 weekly newspapers, the great majority are in medium-size towns. Large numbers of reporters, however, are in cities, since big city dailies employ many reporters, whereas a small-town paper generally employs only a few.

Training, Other Qualifications, and Advancement

Although talented writers who have little or no academic training beyond high school sometimes become reporters on city newspapers, most reporters without college training begin—and usually remain—on rural small-town, or suburban papers. Most newspapers will consider only applicants having a college education, and graduate work is increasingly important. Some editors prefer graduates who have a degree in journalism, which usually provides a liberal arts education, as well as professional training. Other editors consider a degree in liberal arts as equally desirable.

Professional studies leading to a bachelor's degree in journalism can be obtained in more than 150 colleges; about two-thirds of these have separate departments or schools of journalism. The typical undergraduate journalism curriculum is offered during the

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junior and senior years of college, and is divided about equally between cultural and professional subjects. Among the professional courses are reporting, copyreading, editing, feature writing, and the history of journalism.

The master's degree in journalism is awarded by 47 schools; 12 of them offer the doctor's degree.

Young people who wish to prepare for newspaper work through a liberal arts curriculum should take English courses that include writing, as well as subjects such as sociology, political science, economics, history, psychology, and speech. Reading and conversational ability in a foreign language and some familiarity with mathematics also are desirable. Those who look forward to becoming technical writers, or reporters in a special field such as science, should concentrate on course work in their subject matter areas to the maximum extent possible. (See statement on Technical Writers.)

The Armed Forces also provide some training in journalism. The Navy maintains a School of Journalism at Navy Training Center, Great Lakes, Illinois.

Summer internships on newspapers that provide college students an opportunity to learn the rudiments of reporting or editing are available from the Newspaper Fund and individual newspapers. In addition to many loan programs, over 3,700 journalism scholarships, fellowships, and assistantships were offered in 1969 by universities, newspapers, and professional organizations.

Many beginners work on weekly or small daily newspapers. Some college graduates are hired as general assignment reporters; others start on large city papers as copy editors. Beginning reporters usually are assigned to minor news events such as reporting on civic and club meetings, summarizing speeches, writing obituaries, interviewing important visitors to the community, and covering police court proceedings. As they gain experience, they may report more important developments, cover an assigned "beat," or specialize in a particular field of knowledge. Newspapermen also may advance to reporting for larger papers or for press services and newspaper syndicates. Some experienced reporters become columnists, correspondents, editors, top executives, or publishers; these positions represent the top of the field and competition for them is keen. Other reporters transfer to related fields such as writing for magazines, or preparing copy for radio and television news reports.

In competing for regular positions, it is helpful to have had experience as a "stringer"—one who covers the news in a particular area of the community for a newspaper and is paid on the basis of the stories printed. Experience on a high school or college newspaper also may be helpful in obtaining employment.

Personal characteristics of importance are a "nose for news," curiosity, persistence, initiative, resourcefulness, an accurate memory, and the physical stamina necessary for an active and often fast-paced life. Skill in typing generally is required since reporters usually must type their own news stories. On small papers, a knowledge of news photography also is valuable.

Employment Outlook

Well-qualified beginners with exceptional writing talent will find good employment opportunities through the 1970's. In early 1969 editors of large newspapers were actively seeking young reporters with exceptional talent. Other beginners, however, were facing competition for jobs, especially on large city dailies, and probably will continue to do so. In addition to seeking young reporters with exceptional talent, editors also were looking for reporters who were qualified to handle news about highly specialized or technical subjects.

Weekly or daily newspapers located in small towns and suburban areas will continue to offer the most opportunities for beginners entering newspaper reporting. Openings arise on these papers as young people gain experience and transfer to reporting jobs on larger newspapers or to other types of work. Moreover, the number of newspapers in suburban areas is increasing, and many of the existing ones are expanding their staffs to satisfy the need for more detailed community news. Preference in employment on small papers is likely to be given to beginning reporters who are able to help with photography and other specialized aspects of newspaper work and are acquainted with the community.

Large city dailies will provide some openings for the inexperienced with good educational backgrounds and a flair for writing to enter as reporter trainees. Some opportunities may continue to be available for young people who enter as copy boys and advance to reporting jobs.

In addition to jobs in newspaper reporting, new college graduates who have journalism training may enter related fields such as advertising, public relations, trade and technical publishing, radio, and television. The broad field of mass communication, which has grown rapidly in recent years, will continue to expand in the future. Factors pointing toward this continuing expansion include rising levels of education

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and income; increasing expenditures for newspaper, radio, and television advertising; and a growing number of trade and technical journals and various types of company publications. As newspapers share in this growth, employment of reporters is expected to increase moderately. Many job opportunities will be found in teaching journalism. The greatest number of job openings, more than a thousand each year, will continue to arise from the need to replace reporters who are promoted to editorial or other positions, transfer to other fields of work, retire, or leave the profession for other reasons.

Earnings and Working Conditions

Many daily newspapers have negotiated, with the American Newspaper Guild, contracts which set minimum wages based on experience and provide for annual salary increases. In late 1968, the minimum starting salaries on most daily newspapers with Guild contracts ranged between $95 and $125 a week for reporters having no previous experience. On a few small dailies, the Guild minimum starting salaries were less than $80 a week; on a few large dailies, Guild minimum rates for beginning reporters exceeded $140 a week. Young people working as copy boys earn less than new reporters; minimum Guild rates for copy boys with some experience ranged from about $60 to $100 a week.

On most dailies, minimum Guild rates for reporters who have some experience (usually for those with 4 to 6 years) ranged from $150 to $200 a week in late 1968. Contract minimums for experienced reporters on a few small dailies were less than $140 a week; on a few large dailies, they were over $200 a week. Papers under Guild contracts often pay salaries higher than the minimum rates called for in their contracts. Particularly successful, experienced reporters on city dailies may earn over $300 a week.

Newspaper reporters on big city papers frequently work 7 to 7½ hours a day, 5 days a week; most other reporters generally work an 8-hour day, 40-hour week. Many of those employed by morning papers start work in the afternoon and finish about midnight. Many newspapers pay overtime rates for work performed after the regularly scheduled workday, or for more than 40 hours of work a week; they often provide various employee benefits such as paid vacations, group insurance, and pension plans.

Sources of Additional Information

Information about opportunities with daily newspapers may be obtained from:

American Newspaper Publishers Association, 750 Third Ave., New York, N.Y., 10017.

Information on opportunities in the newspaper field, as well as a list of scholarships, fellowships, assistantships, and loans available at colleges and universities, may be obtained from:

The Newspaper Fund, Inc., Box 300, Princeton, N.J. 08540.

Theta Sigma Phi, 106 Lantern Lane, Austin, Texas 78731.

Information on union wage rates is available from:

American Newspaper Guild, Research Department, 1126 16th St. NW., Washington, D.C. 20036.

General information on journalism opportunities may be obtained from:

American Council on Education for Journalism, School of Journalism, University of Missouri, Columbia, Missouri 65201.

Association for Education In Journalism, 425 Henry Mall, University of Wisconsin, Madison, Wisconsin 53706.

Sigma Delta Chi, 35 East Wacker Drive, Chicago, Illinois 60601.

Names and locations of daily newspapers and a list of departments and schools of journalism are published in the *Editor and Publisher International Yearbook*, available in most large newspaper offices and public libraries.

TECHNICAL WRITERS

(D.O.T. 139.288)

Nature of the Work

The many technical and scientific developments of recent years have created a growing demand for writers skilled in interpreting these developments. The technical writer organizes, writes, and edits material about science and technology so that it is in a form most useful to those who need to use it—be it a technician or repairman, a scientist or engineer, an executive, or a housewife. When writing for the nonspecialist, he must present his material in a simple, clear, and factual manner; for the specialist, he must include technological detail, using a highly specialized vocabulary. Regardless of what kind of writing he does, the technical writer serves to establish easy communication between scientists, engineers, and other technical specialists, and the users of their information.

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The technical writer's product takes many forms, such as a publicity release on a company's scientific or technical ahchievement or a manufacturer's contract proposal to the Federal Government. It may be a manual that explains how to operate, assemble, disassemble, maintain, or overhaul components of a missile system or a home appliance. Technical writers also write for scientific and engineering periodicals and for popular magazines.

Technical writers, as defined in this statement, include only those people primarily employed to interpret, write about, or edit technical or scientific subject matter. It excludes those primarily employed as scientist, engineers, or other technical specialists who also do a considerable amount of writing.

Before starting a writing assignment, a technical writer usually must research his subject. This process involves studying reports, reading technical journals, and consulting with the engineers, scientists, and other technical personnel who have worked on the project. Then he prepares a rough draft that may be revised several times before it is in final form. Technical writers usually arrange for the preparation of tables, charts, illustrations, and other artwork, and in so doing may work with technical illustrators, draftsmen, or photographers.

Places of Employment

About 30,000 technical writers and editors were employed in 1968. Most technical writers are employed in the electronics and aerospace industries. Many work for research and development firms or for the Federal Government—mainly in the Departments of Defense and Agriculture the Atomic Energy Commission, and the National Aeronautics and Space Administration. Some work in firms that specialize in technical writing. Others are in business for themselves as freelance technical writers.

Technical writers are employed all over the country, but primarily in the Northeastern States, Texas, and California. They are concentrated in the Washington, D.C., Los Angeles-Long Beach, Houston, Fort Worth-Dallas, Chicago, New York, Boston, St. Louis, Kansas City, Denver, and Philadelphia metropolitan areas.

Training, Other Qualifications, and Advancement

The bachelor's degree is the desirable minimum entrance requirement for work in this field, although talented and experienced writers having less academic training may qualify. Employers do not agree on the most appropriate kind of college training needed by technical writers, but graduates usually must have a combination of courses in writing and scientific and technical subjects. Some employers prefer applicants who have degrees in engineering or science who have had courses in writing. Others seek graduates who majored in English or journalism and have taken some courses in scientific

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and technical subjects. Regardless of the college training they prefer, all employers place great emphasis on writing skills.

An increasing number of schools offer formal undergraduate programs leading to a bachelor's degree in technical writing or technical journalism. Some schools now offer graduate work and degrees in the field. In addition, about 170 colleges and universities provide professional education leading to a bachelor's degree in journalism; most of these offer at least one course in technical writing or technical journalism as part of the regular curriculum. Liberal arts colleges and some engineering schools offer English and other courses that sharpen writing skills. Many colleges and universities conduct short-term summer workshops and seminars for technical writers.

When still in high school young people who plan to become technical writers should supplement the required science and mathematics courses with as many elective courses in grammar and composition as possible. They also may gain helpful experience by working as editors or writers for their school papers.

In addition to the ability to write well, technical writers must be able to think logically. They should have an interest in scientific and technological developments and be able to work and communicate well with others.

Beginners often assist experienced technical writers by doing library research, by editing, and by preparing drafts of portions of reports. Experienced writers in organizations that have large technical writing staffs may become technical editors or progress to supervisory and administrative positions. After gaining experience and contacts, a few may open their own job shops.

It also is possible to advance by becoming a specialist in a particular scientific or technical subject. These writers sometimes prepare syndicated newspaper columns or articles for popular magazines.

Employment Outlook

Well-qualified and experienced technical writers are expected to find very good employment opportunities through the 1970's. Beginners who have good writing ability and appropriate education also should find many opportunities; those who have minimum qualifications will find stiff competition for jobs. The greatest demand probably will be for technical writers with backgrounds in electronics and communications to work in the aerospace and related industries, particularly in research and development activities.

The employment of technical writers is expected to increase moderately during the 1970's because of the need to put the increasing volume of scientific and technical information into language that can be understood by management for decisionmaking and by technicians for operating and maintaining complicated industrial equipment. Also, since many products will continue to be assembled from components manufactured by different companies, technical writers will be in demand to describe, in simple terms, the interrelationships of these components. The growth in this occupation also will be accelerated by the need for improved and simplified operating and maintenance instructions for new consumer products .

The demand for technical writers will continue to be related to research and development expenditures. These expenditures are expected to remain at high levels in the aerospace industry and to increase somewhat in medical and other fields.

Technical writers who have training in journalism also will find opportunities in other fields that employ writers, such as advertising, public relations, trade publishing, and radio and television broadcasting. In addition to new opportunities resulting from the moderate growth expected in this profession, hundreds of technical writers will be needed each year to replace those who retire, die, or transfer to other occupations.

Earnings and Working Conditions

In 1968, inexperienced technical writers having bachelor's degrees were hired in private industry at starting salaries ranging from $5,000 to $7,000 a year; those who have moderate experience earned from $7,000 to $10,000 a year; highly experienced writers earned from $11,000 to $15,000; and those in supervisory and management positions, up to $20,000. Differences in the earnings of experienced writers depended not only on their ability and prior experience, but also on factors such as the type, size, and location of their employing firms. Earnings of freelance technical writers vary greatly and are related to the writer's reputation in the field.

In the Federal Government in late 1968, inexperienced technical writers with a bachelor's degree and credit for about five science courses could start at either $5,732 or $6,981 a year, depending on their college records. Those who have 2 years' experience could begin at $8,462, and those having 3 years' experience could start at $10,203 or $12,174

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a year, depending on the caliber of the experience.

Technical writers usually work the standard 40-hour week. They may work under considerable pressure, frequently working overtime when a deadline has to be met on a publication or report.

Where To Go for More Information

Additional information on this occupation, including a list of schools offering accepted courses of study and specific training programs in accredited colleges and universities, may be obtained from:

Society of Technical Writers and Publishers, Inc., Suite 421, 1010 Vermont Ave. NW., Washington, D.C. 20005.

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OTHER PROFESSIONAL AND RELATED OCCUPATIONS

AIRLINE DISPATCHERS

(D.O.T. 912.168)

Nature of the Work and Places of Employment

Dispatchers (sometimes called flight superintendents) are employed by the airlines to coordinate flight schedules and operations within an assigned area; they also make sure that all Federal Aviation Administration (FAA) and company flight and safety regulations are observed. After examining weather conditions, the dispatcher makes a preliminary decision as to whether a flight may be undertaken safely. He frequently must arrange to notify the passengers and crew if there is any change from the scheduled departure time. The dispatcher confers with the captain about the quantity of fuel needed, the best route and altitude at which the plane will fly, the total flying time, and the alternate fields that may be used if landing at the scheduled airport is hazardous. The dispatcher and the captain must agree on all details of the flight before the plane leaves the airport. In some instances, the dispatcher is also responsible for keeping records and checking matters such as the availability of aircraft and equipment, the weight and balance of loaded cargo, the amount of time flown by each aircraft, and the number of hours flown by each crew member based at his station.

After the flight has begun, the dispatcher plots the plane's progress as reported at regular intervals by the captain on the radio, and keeps the captain informed of changing weather and other conditions that might affect his flight.

The assistant dispatcher helps the dispatcher plot the progress of flights, secure weather information, and handle communications with aircraft.

In 1968 only about 1,200 dispatchers and assistants were employed in scheduled domestic and international operations, primarily at large airports in the United States. An even smaller number worked for large certificated supplemental airlines, and for private firms which offer dispatching services to small airlines.

Training, Other Qualifications, and Advancement

Dispatchers are required to have an FAA dispatcher certificate. An applicant for such a certificate may qualify if he has spent at least a year engaged in dispatching work under the supervision of a certificated dispatcher. He also may qualify by completing an FAA-approved dispatcher's course at a school or an airline training center. If an applicant has neither schooling nor experience, he also may qualify if he has spent 2 of the previous 3 years in air traffic control work, or in airline jobs such as dispatch clerk, assistant dispatcher, or radio operator, or in similar work in military service.

Airline dispatcher assists pilot in preflight planning.

An applicant for an FAA dispatcher certificate must pass a written examination on subjects such as Federal aviation regulations, weather analysis, air-navigation facilities, radio procedures, and airport and airway traffic procedures. In an oral test, he also has to demonstrate his ability to interpret weather information, his knowledge of landing and cruising speeds and other aircraft operational characteristics, and his familiarity with airline routes and navigational facilities. A licensed dispatcher is checked periodically by his employer to make sure that he is maintaining the skills required by Federal regulations. All qualified dispatchers are given additional instruction by their airlines at special training centers so that they may become familiar with new flight procedures and with characteristics of new aircraft. Each year, he also is required to "fly the line" as an observer over the portion of the system which he services, to maintain his first hand familiarity with airline routes and flight operations.

For assistant dispatcher jobs, which may not require certification, airlines prefer men who have at least 2 years of college or an equivalent amount of time working in some phase of air transportation, such as communications. Preference is given to col-

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lege graduates who have had courses in mathematics, physics, and related subjects. Some experience in flying, meteorology, or business administration is also helpful.

Most airlines fill assistant dispatcher positions by promotion or transfer from within the company. Men are preferred who have had long experience in ground operations work. As a result, most openings are filled by men who have been dispatch clerks, meteorologists, or radio operators; a few jobs are filled by men who have been pilots.

Employment Outlook

The number of workers in this very small occupation is not expected to change much during the 1970's. Most new workers will be hired as assistant dispatchers or dispatch clerks. Job openings for dispatchers will be filled mainly by promoting or transferring experienced persons already employed by the airlines.

The need for some additional dispatchers will result from the increase in air traffic, the addition and extension of routes, and the extra difficulties in dispatching jet aircraft. However, these factors will be largely offset by improved radio and telephone communication facilities which allow dispatchers at major terminals to dispatch aircraft at other airports and over large geographic areas. Foreign-flag airlines, which fly between overseas points and cities in the United States, also will provide a few job opportunities for dispatchers.

Earnings and Working Conditions

Beginning dispatchers earned between $800 and $850 a month in 1968. Dispatchers having 10 years' service earned between $1,100 and $1,500 a month. Assistant dispatchers earned $550 and over a month to begin and up to $850 a month after 3 years. Assistant dispatchers who have FAA certificates may earn $25 a month extra. Most dispatchers are members of the Air-Line Dispatchers Association.

Sources of Additional Information

Air Line Dispatchers Association, 929 West Broad St., Falls Church, Va. 22130.

(See introductory section for additional sources of information and for general information on supplementary benefits and working conditions.)

ARCHITECTS

(D.O.T. 001.081)

Nature of the Work

Architects plan and design buildings and other structures. Their goal is to design structures which are safe, useful, and pleasing in appearance. Architects also work with other professionals, such as engineers, urban planners, and landscape architects in the designing of cities and towns and in the planning and improvement of an overall physical environment.

When an architect receives a commission to design a building, he meets with the client to discuss the purpose, requirements,

Architect discusses building plans with clients.

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and cost limitations of the structure, as well as the client's preferences as to style and plan. Subsequently, the architect must make hundreds of decisions, considering not only the requirements of the building, but also local and State building codes, zoning laws, fire regulations, and other ordinances. For example, in planning a school, the architect must decide, among other things, the amount of corridor and staircase space required to enable students to move easily from one class to another; the type and arrangement of storage space; and the location, size, and interior arrangements of the classrooms, laboratories, lunchroom, gymnasium, and administrative offices.

The architect makes preliminary drawings of the structure and meets with the client to develop a final design. This design includes floor plans, as well as details of the interior and exterior of the building. The final design then is translated into working drawings, which show the exact dimensions of every part of the structure and the location of the plumbing, heating, electrical, air-conditioning, and other equipment. Consulting engineers usually prepare detailed drawings of the structural, plumbing, heating, and electrical work. Engineers' drawings are coordinated with the architect's working drawings, and specifications are prepared listing the construction materials to be used, the equipment, and, in some cases, the furnishings.

The architect then assists his client in selecting a building contractor and in negotiating the contract between client and contractor, and he acts as the client's advisor and representative in dealings with the contractor. As construction proceeds, the architect makes periodic visits to the construction site to see if the design is being followed, and that the materials specified in the contract are being used. The architect's work is not completed until the project is finished, all required tests are made, and guarantees are received from the contractor.

Most self-employed architects plan and design a wide variety of structures, ranging from homes to churches, hospitals, office buildings, and airports. Architects also plan and design multibuilding complexes for urban renewal projects, college campuses, industrial parks, and new towns. Some architects, however, specialize in one particular type of structure or project. When working on large-scale projects or for large architectural firms, architects frequently specialize in one phase of the work, such as design, drafting, specification writing, or construction contract administration (insuring that a structure is built according to plans and specifications.)

Places of Employment

An estimated 34,000 registered (licensed) architects were employed in the United States in late 1968. In addition, many other architectural school graduates who are unlicensed were working in positions requiring a knowledge of architecture. About 4 percent of all architects are women.

Approximately two-fifths of all architects are self-employed, either practicing individually or as partners. Most of the others work for architectural firms. Some architects work for engineers, builders, real estate firms, and for other businesses having large construction programs. Others are employed by government agencies, often in fields such as city and community planning and urban redevelopment. About 1,500 of these are employed by the Federal Government.

Architects are employed in all parts of the country. However, they are concentrated in those States with large metropolitan areas. Nearly half of all architects are employed in six States—California, New York, Illinois, Texas, Pennsylvania, and Ohio.

Training, Other Qualifications, and Advancement

A license for the practice of architecture is required by law in all States and the District of Columbia, mainly to insure that architectural work which may affect the safety of life, health, or property is done by qualified architects. Requirements for admission to the licensing examination are set by the individual States. These generally include graduation from an accredited professional school followed by 3 years of practical experience in an architect's office. As a substitute for formal training, most States accept longer periods of practical experience (usually 10 to 12 years) for admission to the licensing examination.

In 1968, professional training in architecture was offered by 87 colleges and universities in the United States, 63 of which were accredited by the National Architectural Accrediting Board. The great majority of these schools offered a 5-year curriculum leading to the bachelor of architecture degree. Many architectural schools also offered graduate education leading to the master's degree, and a few schools offered the Ph. D. degree. Although graduate training is not essential for the practice of architecture, it is often desirable for research and teaching positions.

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Most schools of architecture admit qualified high school graduates who meet the entrance requirements of the college or university with which the school of architecture is associated. Some schools require 1 or 2 years of college education before admitting the student to a 3- or 4-year architectural training program. In general, architectural schools prefer that students' preparation include mathematics, science, social studies, language, and art. A typical curriculum includes not only architectural courses but also other subjects—usually English, mathematics, physics, chemistry, sociology, economics, and a foreign language.

Among the personal qualifications needed by persons planning a career in architecture are a capacity to master technical problems, a gift for artistic creation, and a flair for business and for human relations. Students are frequently encouraged to work for architects or for building contractors during summer vacations to gain some knowledge of practical problems.

New graduates usually begin as junior draftsmen in architectural firms where they make drawings and models of building projects or draft details in the working drawings. As they gain experience, they are given more complex work. After several years, they may progress to chief or senior draftsman, with responsibility for all the major details of a set of working drawings and for the supervision of other draftsmen. Other architects may work as designers, construction contract administrators, or specification writers. An employee who is particularly valued by his firm may be designated an associate and may receive, in addition to his salary, a share of the profits. Usually, however, the architect's goal is to establish his own practice.

Employment Outlook

The outlook is for continued rapid growth of the profession through the 1970's. Employment opportunities are expected to be good both for experienced architects and for new architecture graduates.

A major factor contributing to this favorable outlook is the expected growth in the volume of nonresidential construction—the major area of work for architects. Moreover, the increasing size and complexity of modern nonresidental buildings, as well as the homeowners' growing awareness of the value of architects' services, are likely to bring about a greater demand for architectural services. Urban redevelopment and city and community planning projects, other growing areas of employment for architects, also are expected to increase considerably in the years ahead. (See statement on Urban Planners.) In addition, expanding college enrollments will create a need for additional architects to teach architectural courses.

Besides those needed to fill new positions due to growth, deaths and retirements will account for about 1,000 new openings every year.

Along with the anticipated rise in demand for architects, an increase is expected in the number of architectural graduates. If graduations in this field follow the trend expected in all college graduations, the number of architectural degrees awarded each year during the 1970's should be considerably greater than the estimated 3,200 degrees awarded in 1968. However, many architectural graduates utilize their training in fields such as sales and administration in the building industry and do not enter the profession. Thus, those who choose to enter the field should have good employment opportunities through the 1970's.

Earnings and Working Conditions

Starting salaries of architectural school graduates were generally between $100 and $150 a week in 1968, according to available information. Draftsmen having 3 years' experience or more earned between $135 and $180 a week; job captains, specification writers, and other senior employees usually earned from $150 to $250 a week. Senior employees often receive yearly bonuses in addition to their salaries.

After architects have become well established in private practice, they generally earn much more than high-paid salaried employees of architectural firms. The range in their incomes is very wide, however. Some architects that have many years of experience and good reputations earn well over $25,000 a year. Young architects starting their own practices may go through a period when their expenses are greater than their income.

Most architects work in well-lighted, well-equipped offices and spend long hours at the drawing board. However, their routine often is varied by interviewing clients or contractors or discussing the design, construction procedures, or building materials of a project with other architects or engineers. Architects involved in construction contract administration frequently work out of doors during inspections at construction sites.

Sources of Additional Information

General information about careers in architecture is included in a number of publications of the

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American Institute of Architects; a catalog of publications is available, as well as two free publications, "Designing a Better Tomorrow" and "Your Building, Your Architect." They can be obtained from:

The American Institute of Architects, 1735 New York Ave. NW., Washington, D.C. 20006.

COLLEGE PLACEMENT OFFICERS

(D.O.T. 166.268)

Nature of the Work

College placement officers provide job placement services to students and alumni. They interview job applicants, analyze their education and work records, and may administer or arrange for vocational and psychological tests to help applicants evaluate their special abilities. They furnish information on full-time, part-time, and summer job openings and arrange for job interviews.

College placement officer and student discuss employment offers.

College placement officers arrange for employer representatives to visit the campus to discuss their firms' personnel needs and to interview qualified applicants. Placement officers may provide information about students to employer representatives and assist them in appraising the qualifications of students. They also make new contacts with employers to develop additional employment opportunities. In addition they may suggest improvements in employer recruitment literature and inform the college staff of any change in job requirements that might warrant adjustment in curriculum..

Many college placement officers assemble and maintain a library of career guidance information and recruitment literature from public and private sources for the use of students and alumni. Such material includes information on the nature of various occupations, together with data on current opportunities, educational requirements, earnings, advancement, and the long-term outlook.

Placement officers may specialize in such areas as law, teaching, part-time and summer work, or other specific group placements. However, the extent of specialization usually depends upon the size and type of the college, as well as the size of the placement staff.

Places of Employment

Placement services are offered in nearly all colleges and universities. Large colleges may employ several placement officers working under a director of placement activities; in many institutions, however, a combination of placement functions is performed by one officer and his clerical staff. In some colleges, especially the smaller ones, the functions of placement officers may be performed on a part-time basis by members of the faculty or administrative staff. Universities frequently have placement offices for each major branch or campus. In most universities, there is a central office which coordinates the work of all placement officers; in some, each office works as a separate unit.

An estimated 2,500 placement officers were employed in 4-year colleges and universities in 1968, most of them on a full-time basis. Of this total number, about one-fourth were women. In addition, an increasing number of placement officers were being employed full time or part time in 2-year colleges.

College placement officers are located in all parts of the country, although they are concentrated in the metropolitan areas where many colleges and universities are situated.

Training, Other Qualifications, and Advancement

A bachelor's degree generally is considered the minimum requirement for entry into the field. Important undergraduate courses for the prospective placement officer include psychology, sociology, counseling, and personnel administration or related business subjects. At present, however, no specific educational specialty exists for college placement officers.

In 1968, more than 100 colleges and universities offered programs leading to a graduate degree in college student personnel work. These programs included such placement oriented subjects as vocational development theory, techniques of interviewing, career

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counseling, occupational and educational information, group dynamics, and college student personnel administration.

Many people enter college placement after working in other areas. A broad background of business or industrial experience, teaching experience, previous placement training, experience in public or private employment agencies, or knowledge of personnel and guidance techniques are all useful backgrounds for college placement work. In some instances, an alumnus who has displayed a strong interest in his college, and exhibits ability in working effectively with people, will be employed as an assistant in the placement office and may advance to more responsible positions as he gains experience.

A person who would like to enter the college placement field should have an interest in people, as well as the ability to gain the confidence of students, faculty, and employers. The ability to develop a keen insight into the employment problems of both employers and students and to maintain honest and confidential communications also is important in college placement work.

Advancement for college placement officers usually is through promotion to placement director, director of student personnel services, or to some other higher level administrative position. However, the extent of such opportunity usually depends upon the type of college or university and the size of the staff.

Employment Outlook

The number of job opportunities in the college placement field is expected to rise very rapidly through the 1970's. In general, employment prospects will be best for new or recent college graduates seeking beginning positions, particularly at their own alma maters.

Among the factors expected to contribute to the favorable outlook for college placement officers are the increasing number of college graduates, and the expansion in the number of college students from lower income families who will seek part-time jobs during their college years to help finance their education. Demand for college placement officers also will increase as a result of the trend among colleges and universities toward more emphasis on the student personnel service aspect of higher education. This emphasis has already resulted in increased placement activity for graduate students and alumni, and for undergraduates seeking summer and part-time employment. The increasing number of junior colleges and technical schools—the fastest growing segment of higher education—also will increase the demand for placement personnel.

The recent trend toward increased budget allocations for placement activities is expected to continue, thus leading to a growing demand for college placement officers in most parts of the country. In addition, regional college placement associations, through their coordinating organization, the College Placement Council, are expanding their programs to improve operations in existing placement offices of member colleges and to encourage the establishment of placement services where none presently exist.

Some openings also will occur each year as placement officers transfer to other positions, retire, or leave the field for other reasons.

Earnings and Working Conditions

In 1967, annual earnings of placement office directors ranged from less than $5,000 to a high of over $23,500, with the average (median) salary being about $10,600 according to a National Education Association survey of 990 public and private colleges and universities. In general, the larger institutions paid the highest salaries.

College placement officers normally work a 40-hour week; irregular hours and overtime frequently are necessary during the "recruiting season." Most placement personnel are employed on a 12-month basis. They are paid for holidays and vacations, and receive the same benefits as other professional personnel employed by colleges and universities.

Sources of Additional Information

The College Placement Council, Inc., P.O. Box 2263, Bethlehem, Pa. 18001.

COOPERATIVE EXTENSION SERVICE WORKERS

(D.O.T. 096.128)

Nature of the Work

Extension Service workers are engaged in educational work in agriculture, home economics, youth activities, and community resource development. They are employed jointly by State land-grant universities and the U.S. Department of Agriculture. Extension workers must be proficient in both subject matter and teaching methods.

County Agricultural agents are interested in improving the efficiency of agricultural production and marketing, including the development of new market outlets. County home economics

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agents work closely with women in home management, nutrition, and other phases of family living. There are 4-H extension agents who work with youth. In some counties, special agents concentrate on community resource development.

Extension workers help people analyze and solve their farm and home problems and aid in community improvement. Much of this educational work is carried on in groups, through meetings, tours, demonstrations, and local voluntary leaders. Individual assistance is given on problems that cannot be solved satisfactorily by group methods. Extension workers rely heavily on mass communication media such as newspapers, radio, and television.

The county extension staff is supported by State extension specialists in subject-matter fields such as agronomy, livestock, marketing, agricultural economics, home economics, horticulture, and entomology. Each of these specialists keeps abreast of the latest research in his particular field and works with agents in applying this information to local needs and problems.

Places of Employment

Extension agents are located in nearly every county in the United States. Counties having many farmers who produce a variety of crops may have as many as 10 agents or more, each specializing in a particular field such as dairying, poultry production, crop production, or livestock. There is an increasing number of area agents who work on specialized problems in several counties.

Training and Other Qualifications

Extension agents must have a bachelor's degree in agriculture, home economics, sociology, or other training that equips them for the particular type of audiences with whom they work. In most States, the Extension Service maintains an in-service training program to keep agents informed of the latest developments in agricultural research, of new programs and policies that affect agriculture and of new teaching techniques. To be successful, extension workers must like to work with people.

In most instances, specialists on the State staff are expected to have a master's degree and special training in their particular lines of work.

County agricultural agent and farmer discuss methods for improving pasture.

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Employment Outlook

Employment of Extension Service workers had grown to 15,000 in 1968. The demand for additional workers is expected to continue, especially in depressed rural areas. As agricultural technology becomes more complicated, and as farm people become more aware of the need for organized activity, more help will be sought from trained Extension Service personnel. The Extension Service also is being extended to new segments of the population, as residents recognize the value of their assistance, particularly in helping the disadvantaged.

Counterparts of the Cooperative Extension Service are being established in many countries, and Extension Service personnel often are recruited to help initiate and organize these programs.

Earnings and Working Conditions

The salaries of extension agents vary from State to State and county to county. In 1968, starting salaries for new agents averaged about $7,200.

Ordinarily, the assistant agent is promoted rapidly to a more responsible job, either in the county where he works or in another county in the State. In 1968, salaries for experienced agents averaged about $10,500. Extension specialists' salaries averaged about $12,500.

Sources of Additional Information

Additional information may be obtained from County Extension Offices; State Director of the Cooperative Extension work located at each Land-Grant University; or the Federal Extension Service, U.S. Department of Agriculture, Washington, D.C. 20250. (Also see statement on Home Economists.)

FBI SPECIAL AGENTS

(D.O.T. 375.163)

Nature of the Work

Federal Bureau of Investigation (FBI) Special Agents investigate many types of violations of Federal laws, such as bank robberies, kidnappings, frauds against the Government, thefts of Government property, espionage, and sabotage. The FBI, which is part of the U.S. Department of Justice, has jurisdiction over more than 180 Federal investigative matters. Special Agents may be assigned to any type of case, but those having specialized training in accounting are likely to be assigned chiefly to cases involving complex financial records; for example, frauds involving Federal Reserve Bank records.

The FBI is a fact-gathering and fact-reporting agency, and its Special Agents function strictly as investigators. (Its authority does not include affording personal protection to individuals nor does it include police functions to assure that the law is obeyed. Such matters are within the purview of local and State law enforcement agencies.) To perform their duties, Special Agents may interview people, observe the activities of suspects, and participate in raids; their duties may involve extensive travel. Because of the highly confidential nature of the FBI's work, Special Agents may not disclose any of the information which they gather in the course of their official duties to unauthorized persons, including members of their families. Special Agents may have to testify in court about cases that they investigate, but they do not make recommendations pertaining to prosecution, express opinions concerning the guilt or innocence of suspects, nor issue "clearances" of any kind.

In most assignments, Special Agents work alone but must maintain continued contact with their superiors by radio or telephone. For potentially dangerous duties, such as arrests and raids, two agents or more are assigned to work together.

Places of Employment

Most of the more than 6,600 Special Agents employed in mid-1968 were assigned to the FBI's 58 field offices located throughout the Nation and in Peurto Rico. These agents work either in the city where the field office headquarters is located or in resident agencies (suboffices) established under the supervision of the field office to provide prompt and economic handling of investigative matters arising throughout the field office territory. Some agents are assigned to the Bureau headquarters staff in Washington, D.C., which supervises all FBI activities.

Employment Outlook

The FBI has experienced a substantial expansion in its jurisdiction over the years. Although it is impossible to forecast Special Agent personnel requirements,

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employment may be expected to increase with growing FBI responsibilities.

The FBI provides a career service and its rate of personnel turnover is traditionally low. Nevertheless, the FBI is always interested in applications from qualified men who would like to be considered for the position of Special Agent.

Earnings and Working Conditions

The entrance salary for FBI Special Agents as of late 1968 was $9,297 a year. FBI Special Agents are not appointed under Federal Civil Service regulations, but, like other Federal employees, they receive periodic within-grade salary raises if their work performance is satisfactory, and they can advance in grade as they gain experience. The top salary for regular field Special Agents as of late 1968 was about $18,700. Agents in supervisory and administrative positions received higher salaries.

Special Agents are subject to call 24 hours a day and must be available for assignment at all times and places. They frequently work longer than the customary 40-hour week and, under certain specified conditions, receive overtime pay up to a maximum of $2,329 a year. They are granted paid vacations, sick leave, and annuities on retirement.

Sources of Additional Information

The Federal Bureau of Investigation, U.S. Department of Justice, Washington, D.C. 20535.

FLIGHT ENGINEERS

(D.O.T. 621.281)

Nature of the Work and Places of Employment

The flight engineer monitors the operation of the different mechanical and electrical devices aboard the airplane. Before take-offs, he may inspect the tires and other outside parts of the plane and make sure that the plane's fuel tanks have been filled properly. Inside the plane, he assists the pilot and copilot in making preflight checks of instruments and equipment. Once the plane is airborne, the flight engineer watches and operates many instruments and devices to check the performance of the engines and the air-conditioning, pressurizing, and electrical systems. In addition, he keeps records of engine performance and fuel consumption. He reports any mechanical difficulties to the pilot and, if possible, makes emergency repairs. Upon landing, he makes certain that mechanical troubles that may have developed are repaired by a mechanic. Flight engineers employed by the smaller airlines may have to make minor repairs themselves at those few airports where mechanics are not stationed.

Flight engineers or second officers are required by the Federal Aviation Administration (FAA), to be on almost all three- and four-engine aircraft and some two-engine jet aircraft. An evaluation of the aircraft and the functions to be performed by the crew determines the need for a flight engineer. In 1968 about 8,000 workers were employed to perform flight engineers' duties. Most of them worked for the major scheduled airlines and were stationed in or near large cities where long-distance flights originate and terminate.

Training, Other Qualifications, and Advancement

All flight engineers must be licensed by the FAA. A man can qualify for a flight engineer's certificate if he has had 2 years of training or 3 years of work experience in the maintenance, repair, and overhaul of aircraft and engines, including a minimum of 6 months' training or a year of experience on four-engine piston and jet planes. He also may qualify with at least 200 hours of flight time as a captain of a four-engine piston or jet plane, or with 100 hours of experience as a flight engineer in the Armed Forces. The most common method of qualifying is to complete a course of ground and flight instruction approved by the FAA.

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In addition to such experience or training, an applicant for a license must pass a written test on flight theory, engine and aircraft performance, fuel requirements, weather as it affects engine operation, and maintenance procedures. In a practical flight test on a four-engine plane, he must demonstrate his skill in performing preflight duties and normal and emergency in-flight duties and procedures. He also must pass a rigid physical examination every year. Most scheduled airlines now require applicants for flight engineer positions to have a commercial pilot's license. This qualification generally is not required by the nonscheduled airlines.

Young men can acquire the knowledge and skills necessary to qualify as airline flight engineers through military training as aircraft pilots, mechanics, or flight engineers. They also may attend a civilian ground school and then gain experience as an airplane mechanic.

For jobs as flight engineers, airlines generally prefer men 21 to 35 years of age, from 5 feet 6 inches to 6 feet 4 inches tall, and in excellent physical condition. They require a high school education but prefer men who have 2 years of college or more. Airlines prefer to hire young men who already have a flight engineer certificate and a commercial pilot's license, although they do select applicants who have only a commercial pilot's license and give them additional training.

A flight engineer can become a chief flight engineer for his airline. Advancement possibilities usually depend on his qualifications and the seniority provisions established by airline union-management agreements. The flight engineer with pilot qualifications, generally called the second officer, advances on the basis of his seniority to copilot, and then follow the regular line of advancement open to other copilots. Flight engineers without pilot qualifications can advance from less desirable to more desirable routes and schedules as they gain seniority.

Employment Outlook

Employment of flight engineers is expected to increase rapidly during the 1970's as the number of heavier jet-powered aircraft, requiring flight engineers, increases. This development will contribute to employment growth in this field, since, in most cases, the third required crew member will be a qualified pilot serving as a flight engineer until his promotion to copilot. (See also the *Handbook* statement for Pilots and Copilots.)

Earnings and Working Conditions

The earnings of flight engineers in 1968 ranged from $600 to $625 a month for new employees to approximately $2,200 for experienced flight engineers on jet aircraft on international flights. Many flight engineers earned between $1,200 and $1,800 a month. Average monthly earnings for all flight engineers in domestic operations was nearly $1,500; those employed on international flights averaged nearly $1,800. The earnings of flight engineers depend upon factors such as size, speed, and type of plane; hours and miles flown; length of service; and the type of flight (such as night or international). Engineers are guaranteed minimum monthly earnings, which represent a substantial proportion of their total earnings. Their flight time is restricted, under the Federal Aviation Act, to 85 hours a month. Flight engineers in international operations are limited to 100 hours a month, 300 hours every 90 days, or 350 hours every 90 days, depending on the size of the flight crew.

Most flight engineers who are not qualified pilots belong to the Flight Engineers' International Association or the International Association of Machinists and Aerospace Workers. Those who are qualified pilots (Second Officers) are represented by the Air Line Pilots Association, International.

Sources of Additional Information

Flight Engineers' International Association, 100 Indiana Ave. NW., Washington, D.C. 20001.

(See the introductory section for additional sources of information and for general information on supplementary benefits and working conditions.)

HOME ECONOMISTS

(D.O.T. 096.128)

Nature of the Work

Improving products, services, and practices that affect the comfort and well-being of the family is the primary function of home economists. These professional workers have a broad knowledge of the field or are specialists in a particular area, such as food, clothing and textiles, housing, home furnishing and equipment, child development, household management, or family economics.

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Teachers make up the largest group of home economists. Secondary school teachers instruct classes in food, nutrition, clothing, textiles, child development, family relations, home furnishings, home management, and consumer education. In addition, they may sponsor local chapters of Future Homemakers of America and conduct related activities. Other work done by home economics teachers is similar to that described in the statement on Secondary School Teachers, elsewhere in this Handbook. Teachers in adult education programs help homemakers to increase their understanding of family relations and to improve their homemaking skills. They also train those who wish to prepare for jobs requiring skills in home economics. College teachers may combine teaching and research, and often specialize in one particular area of home economics.

Home economist gives consumer education pointers to teenagers on buying used cars.

Private business firms and trade associations employ home economists to promote the development, use, and care of specific home products. These home economists may do research and test products; prepare advertisements and booklets with instructional materials; plan, prepare, and present programs for radio and television; serve as consultants; give lectures and demonstrations before the public; and conduct classes for such workers as salesmen and appliance servicemen. They also may study consumer needs and help manufacturers translate these needs into useful products.

Home economists employed by food manufacturers often work in test kitchens or laboratories to improve products or help create new products; they also may publicize the nutritional value of specific foods. Those employed by utility companies often give advice on household problems, in addition to describing the operation and benefits of products and services. Home economists employed by manufacturers of kitchen and laundry equipment may work with engineers on product development. Those engaged in communications work for magazines, newspapers, radio and television stations, advertising and public relations agencies, trade associations, and other organizations. They usually prepare articles, advertisements, and speeches about home products and services. Their work may include product testing and analysis, and the study of consumer buying habits. Still other home economists work for dress-pattern companies, department stores, interior design studios, and other business firms that design, manufacture, and sell products for the home. A small number of home economists are employed in financial institutions, giving cus-

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tomers advice on spending, saving, and budgeting.

Some home economists are engaged in research for the Federal Government, State agricultural experiment stations, colleges, universities, and private organizations. The U.S. Department of Agriculture employs the largest group of these workers, some of whom study the buying and spending habits of farm families and then develop budget guides. A few in other Federal agencies are engaged in research on space travel, working on such problems as food needs in outer space.

Cooperative Extension Service home economists conduct adult education programs for women and 4-H Club programs for girls in such areas as home management, consumer education, family relations, and nutrition.

Home economists employed on social-welfare programs by State, county, city, and private welfare agencies may act as advisers and consultants on household budgets and improved homemaking. They may help handicapped homemakers and their families adjust to physical limitations by changing the arrangements in the home and revising methods of work. Other home economists in welfare agencies supervise or train workers who provide temporary or part-time help to households disrupted by illness.

Places of Employment

About 100,000 persons were employed in home economics occupations in 1968. This figure includes an estimated 30,000 dietitians and approximately 5,000 extension workers who are discussed in separate statements on Dietitians and Cooperative Extension Service Workers in the *Handbook*. About 58,000 home economists were teachers. Approximately 40,000 were primarily secondary school teachers. About 13,500 were adult education instructors, some of whom also taught part-time in secondary schools. In addition, there were about 3,500 college and university teachers. The remainder taught in elementary schools, kindergartens, nursery schools, recreation centers, and other institutions. More than 5,000 home economists were in private business firms and associations. Several hundred were primarily government research workers, and a smaller group worked in social welfare programs. A few were self-employed.

Although home economics is generally considered a woman's field, a growing number of men are employed in home economics positions. Most men specialize in foods and institution management, though some are in the family relations and child development field, applied arts, and other areas.

Training, Other Qualifications, and Advancement

Approximately 400 colleges and universities offer training leading to a bachelor's degree in home economics, which qualifies graduates for most entry positions in the field. A master's or doctor's degree is required for college teaching, for certain research and supervisory positions, for work as an extension specialist or supervisor, and for some jobs in the nutrition field.

The undergraduate curriculum in home economics gives students a strong background in science and liberal arts and also includes courses in each of the areas of home economics. Students majoring in home economics may specialize in various subject-matter areas. Advanced courses in chemistry and nutrition are important for work in foods and nutrition; science and statistics for research work; and journalism for advertising, public relations work, and all other work in the communications field. To teach home economics in a high school, a student must complete the professional education courses and other State requirements for a teacher's certificate.

Scholarships, fellowships, and assistantships are available for undergraduate and graduate study. Although colleges and universities offer most of these financial grants, government agencies, research foundations, businesses, and the American Home Economics Association provide additional funds.

Home economists must be able to work with people of various living standards and backgrounds and should have a capacity for leadership, including an ability to inspire cooperation. Good grooming, poise, and an interest in people also are essential, particularly when dealing with the public.

Employment Outlook

Home economists are expected to have very good employment opportunities through the 1970's. The greatest demand will stem from the need to fill teaching positions in secondary schools and in colleges and universities. Many business establishments also are becoming increasingly aware of the contributions that can be made by professionally trained home economists and probably will hire more of them to promote

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home products and to act as consultants to customers. Increased national focus on the needs of low-income families may also increase the demand for home economists. In addition, the need for more home economists in research is expected to increase because of the continued interest in improving home products and services.

Many home economists will be needed to replace those who die, retire, or leave the field because of family responsibilities or other reasons through the 1970's. Opportunities for those who leave the profession but later wish to return will be good, especially as part-time teachers in adult education programs.

Earnings and Working Conditions

Home economics teachers in public schools generally receive the same salaries as other teachers, as most school districts have a single-salary schedule, based on education and experience. In school districts of 100,000 pupils or more, the median salary of beginning teachers who have a bachelor's degree was $5,880 for the school year 1967-68, according to a National Education Association survey; in districts of 50,000 to 99,999 enrollment, the median starting salary was $5,500; and in districts of 25,000 to 49,999 enrollment, $5,633. The median salary of home economics instructors teaching in colleges and universities was about $7,458 a year in 1967-68.

In 1967, average annual salaries received in the Cooperative Extension Service were as follows: inexperienced county extension home economists, $6,850; experienced county extension home economists, $7,900; State supervisory home economists, $13,000; and State specialists, $10,800.

The Federal Government paid inexperienced workers who have a bachelor's degree in home economics $5,732 or $6,981 in late 1968, depending on their scholastic records. For those having additional education and experience, salaries generally ranged from $8,500 to $14,400 a year, depending upon the type of position and level of responsibility.

Many home economists work a regular 40-hour week or less. Those in teaching and extension positions, however, frequently work longer hours as they are expected to be available for evening lectures, demonstrations, and other work falling outside the regularly scheduled hours. Most home economists receive fringe benefits, such as paid vacation, sick leave, retirement pay, and insurance benefits.

Sources of Additional Information

A list of schools granting degrees in home economics is available from:

Home Economics Education, Bureau of Adult, Vocational, and Library Programs, Office of Education, U.S. Department of Health, Education, and Welfare, Washington, D.C. 20202.

Additional information about careers in this profession, the types of home economic majors offered in each school granting degrees in home economics, and graduate scholarships may be obtained from:

American Home Economics Association, 1600 20th St. NW., Washington, D.C. 20009.

INSURANCE AGENTS AND BROKERS

(D.O.T. 250.258)

Nature of the Work

Insurance agents and brokers sell policies or contracts which protect individuals and businesses against future losses and financial pressures. They also provide their customers with many services related to the insurance they sell. They may, for example, assist in planning the financial protection which best meets the special needs of a customer's family; advise about the types of insurance best suited for the protection of an automobile, home, business establishment, or other property; or help a policyholder in obtaining settlement of an insurance claim.

Two basic types of insurance are available—life insurance, and property and liability (or casualty) insurance. Agents and brokers usually specialize in selling one of these types of insurance. Policies sold by life insurance agents provide payment to survivors in the event of the policyholder's death; they also may provide annuities, funds for the education of children when they reach college age, and other benefits which the policyholder has arranged in anticipation of a future need for these funds. Property and liability insurance policies protect policyholders from financial losses which they might otherwise incur because of automobile accidents, fire and theft, or other hazards. Agents selling either of these two types of insurance also may sell health insurance.

An insurance agent may be either an insurance company employee or an independent busi-

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nessman who is under contract to act as the authorized representative of one insurance company or more. A broker occupies a somewhat different position; he is not under contract to any particular company but places the policies he sells with whatever insurance company he feels best meets his clients' needs. In other repects, agents and brokers do much the same kind of work.

Agents and brokers spend most of their time discussing different types of insurance policies with prospective customers. Some time must be spent in office work—planning insurance programs that are specially tailored to prospects' needs, preparing reports, maintaining records, and drawing up lists of prospective customers. Because an agent's or a broker's success depends on his ability to make sales, he must have the initiative to locate new prospects. He also must have a thorough knowledge of insurance fundamentals to be able to evaluate his clients' insurance needs and explain policy terms clearly. Equally important is the ability to establish friendly relations and maintain the confidence of his clients, who often seek advice as well as information about their insurance requirements.

(See chapter on Occupations in the Insurance Business for additional information about life and property and liability insurance companies.)

Places of Employment

More than 400,000 agents and brokers sold insurance in 1968. About half of them were engaged primarily in selling life insurance, and the remainder sold property and casualty insurance. Nine out of ten agents and brokers were men. Many additional agents—both men and women—sold insurance on a part-time basis.

Insurance agents and brokers are employed in all parts of the country, but the greatest number work in large cities.

Training, Other Qualifications, and Advancement

Although employers seldom specify age limits or formal educational requirements, practically all agents hired in recent years have been at least 21 years of age, and more than half of them have had some college training. Many were college graduates. College training, although not essential, may be an aid to the agent in grasping insurance fundamentals and in establishing good personal relationships with prospective clients. Courses in accounting, economics, finance, and business law, as well as courses in insurance subjects, are considered helpful. A liberal arts curriculum may be equally desirable in preparing the prospective agent. Sales ability also is important. Some skill in salesmanship can be acquired through experience and from a study of the principles and techniques of selling, but much comes from natural aptitude. A capacity for meeting and talking easily with strangers, a cheerful personality, self-confidence, and enthusiasm also are valuable assets to the prospective agent or broker.

All insurance agents and most brokers must obtain licenses in the States where they plan to sell insurance. In most States, licenses are issued only to appli-

Insurance agents go to client.

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cants who pass written examinations covering insurance fundamentals and the State insurance laws.

Before new agents sell, they usually receive training at insurance company home offices or at the agencies and brokerage firms where they will be working. Some insurance companies sponsor classes in sales problems and insurance principles. This instruction may be given over a period of several weeks or a few months. In other cases, training takes the form of working on the job under the supervision of experienced sales personnel.

Agents and brokers have opportunities to broaden their knowledge of the insurance business by enrolling in intermediate and advanced courses available at many colleges and universities and by attending institutes, conferences, and seminars sponsored by insurance organizations. As an agent or broker acquires experience and broadens his knowledge of the life insurance business, he can qualify for the designation, Chartered Life Underwriter (CLU) by passing a series of examinations given by the American Society of Chartered Life Underwriters. In much the same way, a property and liability agent, by passing an examination given by the American Institute for Property and Liability Underwriters, Inc., will qualify for the Chartered Property Casualty Underwriter (CPCU) designation. The CLU and CPCU designations are recognized marks of achievement in their respective fields.

Insurance agents who demonstrate sales ability and leadership qualities may be promoted to positions as sales or agency managers in district offices or to other managerial positions in home offices of insurance companies. A few may advance to top positions as agency superintendents or company vice-presidents or presidents. Many agents who have built up a good clientele prefer to remain in sales work. Some, particularly in the property and liability field, eventually establish their own independent agencies or brokerage firms.

Employment Outlook

Over 16,000 job openings for insurance agents and brokers are expected to arise each year through the 1970's. Some will be news jobs created as employment expands, and others will be to replace agents and brokers who retire or stop working for other reasons. Because the rate of turnover is high among beginners in this occupation, many workers also will be needed to replace insurance agents who enter other types of employment.

The number of insurance agents and brokers is expected to grow moderately. As population and incomes rise and life expectancy increases, more families will depend on life insurance and on policies which provide protection in the form of retirement income, medical care, and funds for a college education. Expansion in industrial plant and equipment and increases in major consumer purchases, such as a home or automobile, will contribute to increased sales of property and liability insurance. Despite the expected increase in the number of policies issued, however, insurance selling will remain a keenly competitive field.

Earnings and Working Conditions

Beginners in this occupation often are guaranteed moderate salaries or advances on commissions while they are learning the business and building up a clientele. Thereafter, most agents are paid on a commission basis. The size of the commission varies, depending on the type and amount of insurance sold, and on whether the transaction involves a new policy or the renewal of a policy already in force. After a few years, an agent's commissions on new policies sold and on renewals may range from $8,000 to $20,000 annually. A number of established and highly successful agents and brokers earn $30,000 a year or more.

Agents and brokers generally pay their own automobile and traveling expenses. In addition, those who own and operate independent businesses must pay office rent, clerical salaries, and other operating expenses out of their earnings.

Although insurance agents usually are free to arrange their own hours of work, they often schedule appointments during evenings and weekends for the convenience of clients. Some agents spend more than the customary 40 hours a week on the job.

Sources of Additional Information

General information on the occupation of insurance agent and broker may be obtained from the home office of many life insurance and property and liability insurance companies. Information on State licensing requirements may be obtained from the department of insurance at any State capital.

Additional information about life insurance agents may be obtained from:

Institute of Life Insurance, 277 Park Ave., New York, N.Y. 10017.

Life Insurance Agency Management Association, 170 Sigourney St., Hartford, Conn. 06105.

The National Association of Life Underwriters, 1922 F St. NW., Washington, D.C. 20006.

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Information about property and liability agents and brokers can be obtained from:

Insurance Information Institute, 110 William St., New York, N.Y. 10038.

National Association of Insurance Agents, Inc., 96 Fulton St., New York, N.Y. 10038.

LANDSCAPE ARCHITECTS

(D.O.T. 019.081)

Nature of the Work

Everyone enjoys walking through an attractively designed park or taking a drive along a scenic road. Landscape architects plan, design, and supervise the arrangement of these outdoor areas for people to use and enjoy. The attractiveness of parks, highways, housing projects, campuses, and country clubs reflects the skill of these architects in designing landscapes that are useful and pleasing. Their knowledge of site planning allows landscape architects to serve many types of clients, from a real estate firm embarking on a new suburban development to a city preparing to build an airport.

Landscape architects may plan the entire arrangement of a site and supervise the grading, construction, and planting required to carry out the plan. Whether they perform all or only part of these services on a particular project, however, depends on the client's wishes and the available funds.

To plan a site, landscape architects first study the nature and purpose of the client's project, and the various types of structures needed. Next, they study the site itself, observing and mapping features such as the slope of the land and the position of existing buildings and trees. They also consider the parts of the site that will be sunny or shaded at different times of the day, the structure of the soil, existing utilities, and many other factors. Then, after consultation with the architect and engineer working on the project, they draw up preliminary plans for the development of the site. After the client approves the preliminary plans, working drawings are made which show all existing and proposed features such as buildings, roads, walks, terraces, grading, and drainage structures in planted areas. Landscape architects outline in detail the methods of constructing features such as walks and terraces and draw up lists of materials to be used. Landscape contractors then are invited to submit bids for the work.

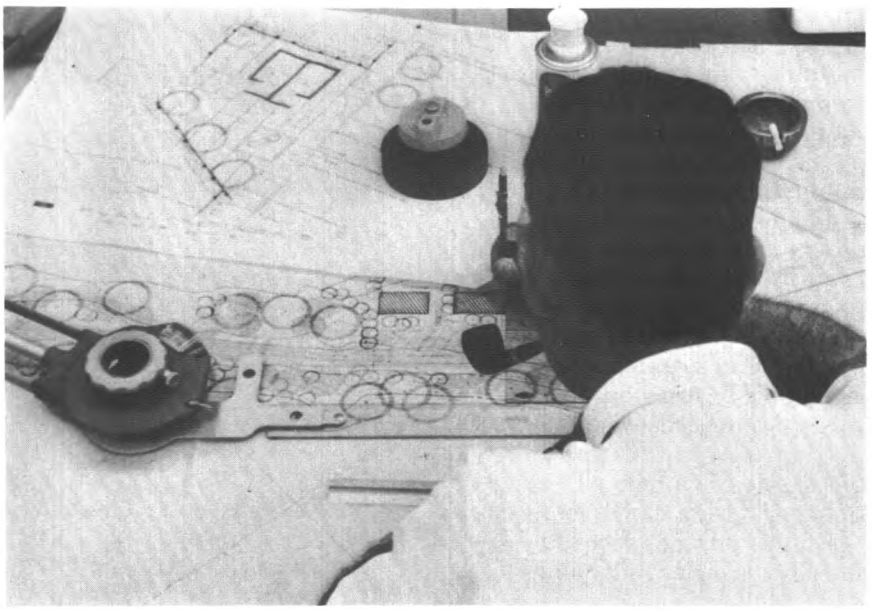
Firms of landscape architects usually handle a wide variety of assignments. Some, however, specialize in projects such as parks and playgrounds, campuses, hotels and resorts, shopping centers, roads, or public housing.

Places of Employment

An estimated 8,500 landscape architects were employed in 1968. The majority were self-employed or worked for other landscape architects in private firms. About one-third of all landscape architects were employed by government agencies concerned with public housing, city planning, urban renewal, highways, and parks and recreational areas. Some were on the staffs of engineering firms; others were employed by landscape contractors and a few taught in colleges and universities.

Training, Other Qualifications, and Advancement

A bachelor's degree in landscape architecture is usually the minimum requirement for entering the profession. This training is offered in at least 30 colleges and universities, of which 20 have



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been accredited by the American Society of Landscape Architects. Another 30 schools offer courses in landscape architecture but not a complete 4-year program. The curriculum for the bachelor's degree requires 4 to 5 years of study, depending on the institution. Fifteen universities also offer master's degrees in landscape architecture.

Entrance requirements for the landscape architecture course are usually the same as those for admission to the liberal arts college of the same university. Some schools also require completion of a high school course in mechanical or geometrical drawing, and most schools advise high school students to take courses in art and more mathematics than the minimum required for college entrance.

Courses in design, including architecture and drawing as well as landscape design, constitute over half of the typical curriculum in landscape architecture. Other major fields of study are civil engineering and horticulture. In addition, courses in English, science, the social sciences, and mathematics usually are required. A bachelor's degree in landscape architecture provides a good background for graduate work in city planning.

Young people who plan to become landscape architects should be interested in both art and nature, for the profession demands a talent for design and an understanding of plant life, as well as technical ability. Successful practice as an independent landscape architect also requires a good business sense and the ability to deal with people.

Working for landscape architects or landscape contractors during summer vacations will help the student to discover the phases of landscape architecture that interest him most and may better qualify him for employment upon graduation.

New graduates usually begin as junior draftsmen, or designers tracing drawings and doing other simple drafting work. As their skill increases, they progress to more responsible work. After 2 or 3 years, they are usually known as landscape architects and are qualified to carry a design through all stages, from preliminary sketches to finished working drawings. Experienced draftsmen often handle other aspects of landscape architects' work also, such as preparing specifications and detailing methods of construction. Employees who demonstrate ability for all phases of work may become associates of the firm; landscape architects who progress this far often open their own offices.

A license is required for the independent practice of landscape architecture in 16 States—Arizona, California, Colorado, Connecticut, Florida, Georgia, Kansas, Louisiana, Massachusetts, Michigan, Nebraska, New York, Ohio, Oregon, Pennsylvania, and Utah. Candidates for the licensing examination are usually required to have 6 to 8 years' experience, or a degree from an accredited school of landscape architecture plus 2 to 4 years' experience.

Employment Outlook

Employment opportunities for graduates that have professional training in landscape architecture are expected to be favorable throughout the 1970's. The profession probably will continue to expand in the years ahead as a result of the continued growth of metropolitan areas with their needs for parks and recreational areas, the growing population's requirements for outdoor recreational facilities, the continued increase in public construction (including public housing), and the rising interest in city and regional planning. The expected increase in homeownership, coupled with rising per capita incomes and living standards, also will spur the demand for landscape architects.

Women represent between 5 and 10 percent of all landscape architects. Well-trained and competent women landscape architects can look forward to interesting and worthwhile careers in the profession, particularly as specialists in garden and planting design.

Earnings and Working Conditions

In 1968, starting salaries in private offices for new graduates having bachelors' degrees in landscape architecture ranged from about $7,000 to $9,000 annually; holders of master's degrees generally earned starting salaries between $10,000 and $12,000. Experienced persons employed by private firms typically earned from about $12,000 to $18,000 a year, although it was not unusual for especially well-qualified people to receive annual salaries of more than $20,000.

Landscape architects in independent practice often earn more than salaried employees with considerable experience, but their earnings may vary widely and may fluctuate from year to year.

In the Federal Civil Service in late 1968, newly graduated landscape architects were paid annual entrance salaries of either $7,456 or $9,078 depending on their qualifications. Others with advanced degrees earned between $10,154 and $12,580. The salary schedule also provides for periodic increases above this amount.

Salaried employees in both the government and in landscape architectural firms usually work regular hours. Self-employed per-

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sons often work long hours, especially during the latter stages of a project. Salaried employees in private firms may also work overtime during seasonal rush periods.

Sources of Additional Information

Additional information on the profession and a list of colleges and universities offering accredited courses of study in landscape architecture may be obtained from:

American Society of Landscape Architects, Inc., 2013 I St., NW., Washington, D.C. 20006.

For information on a career as a landscape architect in the Forest Service, write to:

U.S. Department of Agriculture, Forest Service, Washington, D.C. 20250.

LAWYERS

(D.O.T. 110.108, .118 and 119.168)

Nature of the Work

Most people, at some time in their lives, need legal advice and help. Therefore, they retain lawyers, who advise them of their legal rights and obligations and, when necessary, represent them in courts of law. In addition, lawyers (also called *attorneys)* negotiate settlements out of court and represent clients before quasi-judicial and administrative agenices of the government, such as the Internal Revenue Service and the Social Security Administration. They may act as trustees, guardians, or executors. Government attorneys play a large part in developing and administering Federal and State laws and programs; they prepare drafts of proposed legislation, establish law enforcement procedures, and argue cases.

Most lawyers are engaged in general practice, handling all kinds of legal work for clients. However, a significant number specialize in one branch of law, such as corporation, criminal, labor, patent, real estate, tax, or international law. Some attorneys devote themselves entirely to trying cases in the courts. Others never appear in court but spend all their time drawing up wills, trusts, contracts, mortgages, and other legal documents; conducting out-of-court negotiations; and doing the investigative and other legal work necessary to prepare for trials. Still others are primarily engaged in teaching, research, writing, or administrative activities.

Many people who have legal training are not employed as lawyers but are in other occupations where they can use their knowledge of law. They may, for example, be insurance adjusters, tax collectors, probation officers, credit investigators, or claims examiners. A legal background also is a valuable asset to people seeking or holding public office.

Lawyer discusses legal rights with client.

Places of Employment

More than 270,000 lawyers were employed in early 1968, the great majority working full time. Of the total number, more than 3 out of 4 were in private practice. More than half of the private practitioners were in practice by themselves, and about 47 percent were in partnership or worked for other lawyers or law firms.

Government agencies employ the greatest number of salaried attorneys. In 1967, approximately 16,300 attorneys worked for the Federal Government, chiefly in the Department of Justice, the Department of Defense, the Treasury Department, and the

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Veterans Administration. About 7,500 attorneys were employed by State governments, and 7,600 held positions with city or county governments. Other salaried lawyers are employed by private companies, including large manufacturing firms, banks, insurance companies, real estate firms, and public utilities. Most of the remainder teach in law schools. Some lawyers in salaried legal positions also have an independent practice; others do legal work on a part-time basis working primarily in another occupation. Although lawyers practice in all parts of the country, most of them are in cities and in the States which have the greatest population.

Training, Other Qualifications, and Advancement

Before a person can practice law in the court of any State, he must be admitted to the bar of that State. In all States, applicants for bar admission must pass a written examination; however, a few States waive this requirement for graduates of their own in-State law schools. Other usual requirements are U.S. citizenship and good moral character. If a lawyer has been admitted to the bar in one State, he can usually be admitted to practice in another State without taking an examination, provided he meets the State's standards of good moral character and has a specified amount of legal experience. The special rules of each court or agency control the right to practice before Federal courts and agencies.

To qualify for the bar examinations in the majority of States, an applicant must have completed a minimum of 3 years of college work and, in addition, must be a graduate of a law school approved by the American Bar Association or the proper State authorities. Some States will accept study in a law office instead of, or in combination with, study in a law school—although this method of training is now rare. A few States will accept study of the law wholly in a law office; only two States will accept study of the law by correspondence. A number of States require registration and approval by the State Board of Examiners before students enter law school or during the early years of legal study. In a few States, candidates must complete a period of clerkship in a law office before they are admitted to the bar.

As a rule, 7 years of full-time study after high school is necessary to complete the required college and law school work. The most usual preparation for becoming a lawyer is 4 years of college study followed by 3 years in law school. However, many law schools admit students after 3 years of college work. A few schools may accept students after 2 years of college work. On the other hand, an increasing number of law schools are requiring applicants to have a college degree. Law schools seldom specify the college subjects which must be included in students' prelegal education. However, English, history, economics and other social sciences, logic, and public speaking are all important for prospective lawyers. In general, their college background should be broad enough to give them an understanding of society and its institutions. Students interested in a particular aspect of the law may find it helpful to take related courses; for example, engineering and science courses would be useful to the prospective patent attorney, and accounting would be useful to the future tax lawyer.

Of the 167 law schools in existence in 1969, 138 were approved by the American Bar Association and the others—chiefly night schools—were approved by State authorities only. A substantial number of full-time law schools have night divisions designed to meet the needs of part-time students; some law schools have only night classes. Four years of part-time study are usually required to complete the night-school curriculum. In 1968, about one-fifth of all law students in ABA-approved schools were enrolled in evening classes.

The first 2 years of law school are generally devoted to fundamental courses such as contracts, criminal law, and property. In the third year, students may elect courses in specialized fields such as tax, labor, or corporation law. Practical experience is often obtained by participating in legal aid activities sponsored by the school, in the school's practice court where the students conduct trials under the supervision of experienced lawyers, and by writing on legal issues for the school's law journal. Upon gradution, the degree of juris doctor (J.D.) is awarded by many schools, although some schools confer the bachelor of laws (LL.B.) as the first professional degree. Advanced study is often desirable for those planning to specialize in one branch of the law or to engage in research and law-school teaching.

Most beginning lawyers start in salaried positions, although some go into independent practice immediately after passing the bar examination. Young salaried attorneys usually act as assistants (law clerks) to experienced lawyers or judges. Initially, their work is limited to research such as checking points of law; they rarely see a client or argue a case in court. After several years of progressively responsible sala-

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ried employment, during which time they can obtain experience and funds and become better known, many lawyers go into practice for themselves. Some lawyers, after years of practice, become judges.

Employment Outlook

Graduates from widely recognized law schools and those who rank high in their classes will have very good employment prospects through the 1970's. They are expected to have good opportunities for obtaining salaried positions with well-known law firms, on the legal staffs of corporations and government agencies, and as law clerks to judges. Graduates of the less well-known schools and those who graduate with lower scholastic ratings may experience some difficulty in finding salaried positions as lawyers. However, numerous opportunities will be available for law school graduates to enter a variety of other types of salaried positions requiring a knowledge of law. Young attorneys who open their own law offices after being admitted to the bar will, as in most other independent professions, generally face a period of low earnings while they establish their practice.

Prospects for establishing a new practice will probably continue to be best in small towns and expanding suburban areas. In such communities, competition with other lawyers is likely to be less than in big cities; also, office rent and other business costs may be somewhat lower, and young lawyers may find it easier to become known to potential clients. On the other hand, opportunities for salaried employment will be limited largely to big cities where the chief employers of legal talent —government agencies, law firms and big corporations—are concentrated. For able and well-qualified lawyers, good opportunities to advance will be available in both salaried employment and private practice.

Although the majority of employment opportunities for new lawyers will arise from the need to replace those who retire, die, or otherwise leave the field, the total number of lawyers is expected to grow moderately over the long run. However, continuing a recent trend, the number of lawyers in independent practice may remain stable or decline somewhat. Most of the growth will result from the continuing expansion of business activity and population. In addition, the increased use of legal services by low- and middle-income groups will add to the long-term growth in demand for lawyers. For example, expansion of legal services for low-income groups has come about through the Community Action Programs authorized under the Economic Opportunity Act of 1964. The growing complexity of business and government activities is expected to create a steadily expanding demand for lawyers who have extensive experience in corporation, patent, adminstrative, labor, and international law.

Earnings and Working Conditions

The average salary of lawyers having 1 year's experience employed by manufacturing and other business firms was more than $9,600 a year in early 1968; those having a few years experience earned average salaries of $11,800. Average (median) starting salaries of lawyers employed by cities and counties were about $8,900 in early 1968; those having experience earned average (median) salaries of $11,000, according to the limited data available. In the Federal Government, the annual starting salary for attorneys who had passed the bar was either $8,462 or $10,203 in late 1968, depending upon personal qualifications.

Beginning lawyers working for small law offices or engaged in legal aid work usually receive the lowest starting salaries. New lawyers starting their own practices may earn little more than expenses during the first few years and may find it necessary to work part time in another occupation.

Lawyers' earnings generally rise with increased experience. Those employed on a salaried basis receive increases as they demonstrate their ability to assume greater responsibilities. In early 1968, the average annual salary of attorneys in private industry who were in charge of legal staffs was more than $27,000. Incomes of lawyers in private practice usually grow as their practices develop. Private practitioners who are partners in law firms generally have greater average incomes than those who practice alone.

Lawyers often work long hours and under considerable pressure when a case is being tried. In addition, they must keep abreast of the latest laws and court decisions. However, since lawyers in private practice are able to determine their own hours and workload, many stay in practice until well past the usual retirement age.

Sources of Additional Information

The specific requirements for admission to the bar in a particular State may be obtained from the clerk of the Supreme Court or the secretary of the Board of Bar Examiners at that State capitol. Information on law schools

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and on law as a career is available from:

The American Bar Association, 1155 East 60th St., Chicago, Ill. 60637.

Association of American Law Schools, 1521 New Hampshire Ave. NW., Washington, D.C. 20036.

LIBRARIANS

(D.O.T. 100.118 through .388)

Nature of the Work

Making information available is the job of librarians. Librarians select and organize collections of books, pamphlets, manuscripts, periodicals, clippings, and reports, and assist readers in their use. In many libraries, they also may make available phonograph records, maps, slides, pictures, tapes, films, paintings, and braille and talking books. In addition to classifying and cataloging books and other loan items, they publicize library services, study the reading interests of people served by the library, and provide a research and a reference service to various groups. Librarians also may review and abstract published materials and prepare bibliographies.

In a small library, a librarian performs a great variety of tasks. In a large library, each librarian may perform only a single function, such as cataloging, publicizing library services, or providing reference service, or he may specialize in a subject area such as science, business, the arts, or medicine.

Librarians may be classified by the type of library in which they are employed: Public library, school library, college or university library, or special library. In each of these types, there are two principal kinds of library work—reader services and technical services. Those who perform reader services—for example, reference librarians and children's librarians—work directly with the public. Librarians who perform technical services, such as catalogers or acquisition librarians, deal less frequently with the public.

Public librarians serve all kinds of readers—children, students, teachers, research workers, and others. Increasingly, librarians are providing special materials and services to culturally and educationally deprived people. The professional staff of a large public library system may include the chief librarian, an assistant chief,

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and several division heads who plan and coordinate the work of the entire library system. This system also may include librarians who supervise branch libraries, and other librarians who are specialists in certain areas. The duties of some of these specialists are briefly described as follows: *Acquisition librarians* purchase books and other library materials recommended by staff members, keep a well-balanced library in quantity and quality, make sure that the library receives what it orders, and maintain close contact with book jobbers and publishers. *Catalogers* classify books under various subjects and otherwise describe them so they may be located through catalogs on cards or in other forms. *Reference librarians* aid readers in their search for information—answering specific questions or suggesting sources of information. This work requires a thorough understanding of bibliographic material and a general knowledge of library materials in various subject fields. *Children's librarians* plan and direct special programs for young people. Their duties include helping children find books they will enjoy, instructing them in the use and content of the library, giving talks on books, and maintaining contact with schools and community organizations. Often, they conduct regular story hours at the library and sometimes on radio or television. *Adult services librarians* may select materials for and advise mature readers. They are often asked to suggest reading materials, and to cooperate in or plan and conduct educational programs on such topics as community development, public affairs, creative arts, problems of the aging, or home and family life. *Young adult services librarians* may select books and other materials for young people of junior high school and high school age and guide them in the use of these materials. They may arrange book or film discussion groups, concerts of recorded popular and classical music, and other programs related to the interests of young adults. They also may help to coordinate the services of the school libraries and the local public library. *Bookmobile librarians* take library materials to people who live in areas where other public library services are nonexistent or inadequate.

School librarians instruct students in the use of the library and visit classrooms to familiarize students with library materials relating to the subjects being taught. They also work with teachers and school supervisors who plan the curriculum. They prepare lists of printed and audiovisual materials on certain subjects; meet with faculty members to select materials for school programs; and select, order, and organize library materials. Many school librarians are employed by school district central offices as supervisors to plan and coordinate library services for the entire school system, as catalogers and as librarians to administer professional libraries for teachers. Very large high schools may employ several professional librarians, each responsible for a special aspect of the library program or for special subject materials.

College and university librarians work with students, faculty members, and research workers in general reference work or in a particular field of interest, such as law, medicine, economics, or music. In addition, they may teach one or more classes in the use of the library. Some specialize in acquisition and cataloging. A few librarians who are employed in university research projects operate documentation centers. Computers and other modern devices are being increasingly used to record and retrieve specialized information.

Special librarians work in libraries maintained by commercial and industrial firms, such as pharmaceutical companies, banks, advertising agencies, and research laboratories; professional and trade associations; government agencies; and other types of organizations such as hospitals and museums. These librarians plan, acquire, organize, catalog, and retrieve information from collections designed to provide intensive coverage of information resources about subjects of special interest to the organization. The special librarian utilizes his extensive knowledge of the subject matter, as well as of library science, in building library resources, advising and assisting library users, abstracting, and routing available materials. Literature searching and the preparation of summaries, translations, bibliographies, and special reports are among the major duties of special librarians. These operations may involve the use of electronic data processing equipment.

Science information specialists, like special librarians, work in technical libraries maintained by commercial and industrial firms. However, they must possess a more extensive technical and scientific background than special librarians. They not only perform many of the duties of special librarians, but they also develop coding and programing techniques for using electronic and electromechanical information storage devices and abstract complicated information into short, readable form, and interpret and analyze data for a highly specialized clientele.

Information on a related occupation, library technician, is found in a separate statement in the *Handbook*.

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Places of Employment

In 1968, about 106,000 people were employed as professional librarians. Most of them worked full time. School librarians accounted for about two-fifths of all librarians; public librarians represented one-fourth; librarians in colleges and universities and those employed in special libraries (including libraries in government agencies), each accounted for about one-sixth. A small number of librarians were employed as teachers and administrators in schools of library science.

About 85 percent of all librarians are women. Men are more frequently employed than women in executive and administrative positions in large library systems and in special libraries concerned with science and technology.

Most librarians work in cities and towns. Those attached to bookmobile units serve widely scattered population groups, mostly in suburban or rural areas. Rural, suburban, and town public libraries are being organized increasingly into county and multicounty systems, including centralized reference and technical services.

Training, Other Qualifications, and Advancement

To qualify as a professional librarian, one must ordinarily have completed a course of study in a graduate library school. This usually means at least 5 years of college—4 to meet the requirements for a bachelor's degree and a fifth year or more of specialized study in library science, after which the master's degree is conferred. A growing proportion of the persons in administrative and other high-level library positions have this training. A Ph. D. degree is an advantage to those who plan a teaching career in library schools or who aspire to a top administrative post, particularly in a college or university library or in a large school library system. For those who are interested in the special libraries field, a doctorate in the subject of the library's specialization also would be highly desirable.

In 1968, 41 library schools in the United States were accredited by the American Library Association. Many other colleges offer courses within their 4-year undergraduate programs, as well as at the graduate level, which prepare students for some types of library work.

Entrance requirements to graduate schools of library science commonly include (1) graduation from an accredited 4-year college or university, (2) a good undergraduate record, and (3) a reading knowledge of at least one foreign language. Some schools also require introductory undergraduate courses in library science. Most library schools emphasize the importance of a liberal arts undergraduate program with a major selected from one of the following: Social sciences, physical and biological sciences, the arts, or comparative literature. Some schools require entrance examinations.

Special librarians and science information specialists must have extensive knowledge of their subject matter as well as training in library science. In libraries devoted to scientific information, librarians must know well one foreign language or more. They also must be well informed about new equipment, methods, and techniques used in storing and recalling technical information.

Many students attend library schools under cooperative work-study programs, combining their academic program with practical work experience in a library. Most library schools make every effort to arrange the student's schedule to permit him to take the necessary courses while working part-time. Scholarships for training in library science are available under certain State and Federal programs and from library schools, as well as from a number of the large libraries and library associations. Numerous loans, assistantships, and financial aids also are available.

School librarians must be certified in most States as having met the requirements for both librarians and teachers. Sometimes local, county, or State authorities establish other requirements, that are based on different combinations of education and experience. In the Federal Government, beginning positions require completion of a 4-year college course and all the work required for a master's degree in library science or the equivalent in experience.

In addition to an appropriate educational background, a person interested in becoming a librarian should have above-average intelligence, an interest in people, intellectual curiosity, an ability to express himself clearly, a desire to search for and use recorded materials, and an ability to work harmoniously with others.

Experienced librarians may advance to administrative positions or to specialized work. Promotion to these higher positions may be limited, however, to those who have completed graduate training in a library school, or to those who have had specialized training.

Employment Outlook

The employment outlook for trained librarians is expected to be excellent through the 1970's. A nationwide shortage existed in 1968 and is expected to continue

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despite the anticipated rise in the number of library school graduates. The best opportunities probably will be in school and college and university libraries, especially in research, subject specialties, and some languages.

Persons who have only a bachelor's degree with a major in library science, probably will continue to find employment opportunities in libraries. Many part-time positions also will be available for persons trained in library work.

The demand for fully qualified professional librarians to meet the requirements of a growing and increasingly well-educated population will be intensified by the vast and continuing expansion in the volume and variety of materials which must be processed for reader use. Also, because of the ever-increasing demands upon high-level executives in business and industry, management will rely more heavily on the services of special librarians and science information specialists to keep abreast of new developments. The increase of Federal aid through the Library Services and Construction Act of 1964, the Elementary and Secondary Education Act of 1965, and the Higher Education Act of 1965, as amended, may further increase the demand for librarians. Improved standards for school and college libraries and the expanding student population will also necessitate the employment of a growing number of fully trained librarians. Furthermore, as new methods of storing and retrieving information by means of computer equipment are developed, demand for science information specialists will be very great. Some librarians will probably continue to find some opportunities for employment in the Armed Forces and U.S. Information Agency overseas. Several thousand librarians also will be needed each year to fill positions vacated by young women who leave their jobs to care for their families, and to replace librarians who transfer to other types of work, retire, or leave the field for other reasons. Opportunities for women wishing to reenter the field are favorable

Earnings and Working Conditions

The annual starting salary of new library school graduates averaged about $7,500 in 1968. The degree of responsibility and technical skill required, as well as geographic location, size, and type of library, are important factors determining individual salaries. The higher paying positions generally are found in college, school, and special libraries. College and university libraries offered an average beginning salary of about $8,000 in 1968. The starting salary offered by school libraries was about $7,900. New graduates employed in special libraries received about $7,700; those employed in public libraries averaged about $7,000. Librarians having extensive experience and information specialists having a Ph. D. degree in a subject matter field generally earned between $10,000 and $15,000 a year.

In the Federal Government, the annual entrance salary for librarians having at least 1 year of graduate study leading to a degree in library science was $6,981 or $8,462 in late 1968, depending on their academic records. Experienced librarians generally earned from $10,200 to $19,800. A few had salaries ranging from about $23,000 to $30,000.

The typical workweek for librarians is 5 days, ranging from 35 to 40 hours. The work schedule of public and college librarians may include some Saturday, Sunday, and evening work. School librarians generally have the same workday schedule as classroom teachers. A 40-hour week during normal business hours is common for government and other special librarians.

The usual paid vacation after a year's service is 3 to 4 weeks. Vacations may be longer in school libraries, and somewhat shorter in those operated by business and industry. Many librarians are covered by sick leave; life, health, and accident insurance; and pension plans.

Sources of Additional Information

Additional information, particularly on accredited schools, certification requirements, and scholarships or loans may be obtained from:

American Library Association, 50 East Huron St., Chicago, Ill. 60611.

Information on requirements and placement of special librarians may be obtained from:

Special Libraries Association, 235 Park Ave., South, New York, N.Y. 10003.

Information on Federal assistance for library training under the Higher Education Act of 1965 may be obtained from:

Division of Library Services and Educational Facilities, Office of Education, U.S. Department of Health, Education, and Welfare, Washington, D.C. 20202.

Individual State library agencies can furnish information on scholarships available through their offices, on requirements for certification and general information about career prospects in their regions. State boards of education can furnish information on certification requirements and job opportunities for school librarians.

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LICENSED MERCHANT MARINE OFFICERS

Nature of the Work

The Coast Guard licenses ship's professional and supervisory personnel consisting of deck, engine, and radio officers. In command of every ocean-going vessel is the *captain* (D.O.T. 197.168) or *master* who is the shipowner's sole representative. He is responsible and has complete authority for the operation of the ship including discipline and order, and the safety of the crew, passengers, cargo, and vessel.

While in port, the captain may function as the agent for the ship owners by conferring with custom officials. In some cases, he may act as paymaster for the ship. Although not technically a member of a specific department, he generally is associated with the deck department, from whose ranks he was promoted.

Deck Department. Acting under supervision of the master, licensed deck officers or "mates" as they are traditionally called, direct the navigation and piloting of the ship and the maintenance of the deck and hull. While at sea, deck officers stand watch, take navigational observations, and supervise emergency drills. From his position on the bridge, the watchstanding deck officer is responsible for the ship's navigation. American vessels contain the most modern navigational devices, such as gyrocompass, radar, sonar, Fathometer, Loran, and radio directional finders. Deck officers must be familiar with these and other instruments as part of their duties in the safe and efficient operation and navigation of the ship.

While on duty, the deck officer maintains the authorized speed and course; plots the vessel's position at frequent intervals; posts lookouts when required; records his watch in the ship's "log" of the voyage; and immediately notifies the master of any unusual occurrences.

Besides acting as watch officer, each deck officer performs other duties. The *chief mate* (D.O.T. 197.133), or first mate or chief officer, as he is also known, acts as the captain's key assistant in assigning duties to the unlicensed deck crew, maintaining order and discipline, and by seeing that the deck crew, maintaining order and and orderly. He also plans and carries out the loading, unloading, and stowing of cargo, and assists the captain in taking the ship in and out of port. On some ships he also may be in charge of first aid treatment.

By tradition, the *second mate* (D.O.T. 197.133) is the navigating officer. He sees that the ship is provided with the necessary navigation charts and that navigating equipment is maintained properly.

The *third mate* (D.O.T. 197.133), the most junior-rated deck officer, is responsible for the care and the maintenance of the navigating bridge and the chartroom. He functions as the signal officer and is in charge of all signaling equipment and assists in the supervision of cargo loading and unloading operations. Third mates frequently inspect life boats and other lifesaving equipment to be sure they are ready to use for a fire, shipwreck, or other emergency.

Engine Department. A ship is equivalent to a self-contained seagoing city, because it manufactures its own lights, water, and power. Marine engineers operate and maintain all engines and machinery aboard the ship. The *chief engineer* (D.O.T. 197.130) who supervises the engine department, is responsible for the operating efficiency of engines and for all other mechanical equipment. He oversees the operation of the main power plant and auxiliary equipment while the vessel is underway and is responsible for the log of equipment performance and fuel consumption.

Chief mate directs speed and course of cargo ship from bridge.

The first *assistant engineer* (D.O.T. 197.130), supervises engine room personnel and directs operations such as starting, stopping, and controlling the speed of the main engines. He oversees and inspects the lubrication of engines, pumps, electric motors and generators, and other machinery; directs the installation of

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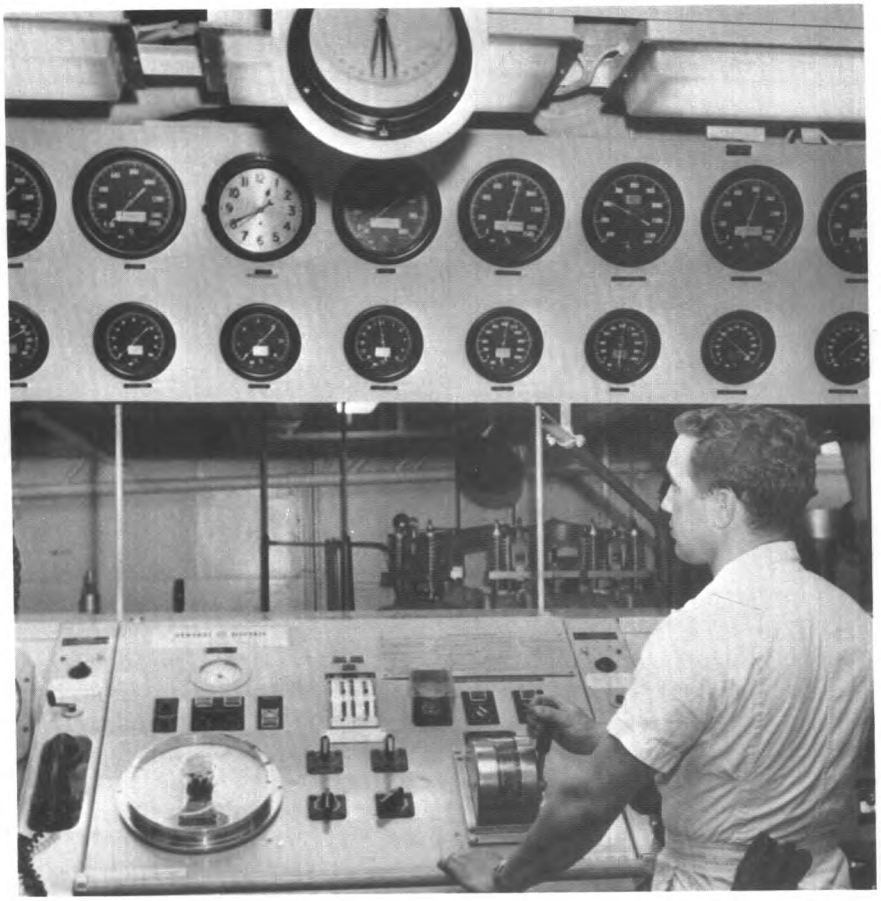

Marine engineer controls running speed of main engine.

steam and water pipes and electric wiring; and with the aid of the chief engineer directs all types of repairs.

As with the deck department, the engineroom is operated on a 24-hour basis and officers are assigned watch periods. The chief engineer and/or first assistant engineer appoints the second assistant engineer and two of the third assistant engineers to a watch period during which they are responsible for the operation of the ship's propulsion plant and auxiliary machinery and the supervision of unlicensed engine department personnel. Marine engineers on watch must notify the chief engineer of any unusual occurrence and keep a record of equipment performance.

Each member of the licensed engineering staff performs specific duties. The *second assistant engineer* (D.O.T. 197.130) has direct charge of the boiler and associated equipment, such as the water-feed system, pumps, and fuel oil heater system. He is responsible for the maintenance of proper steam pressure and oil and water temperatures. He supervises the cleaning of the boilers and is usually responsible for their operation and the operation of the steam generator.

The *third assistant engineer* (D.O.T. 197.130) supervises the operation and maintenance of the lubrication system and engineroom auxiliaries. At least one third assistant engineer is employed as a day man (nonwatchstander) and is responsible for the electrical and/or refrigeration systems aboard ship.

Other officers. A ship maintains contact with shore and other vessels through its *radio officer* (D.O.T. 193.282), who is also responsible for maintaining this equipment. A passenger ship carries three to six operators; the average cargo vessel employs one. He sends and receives messages by voice or Morse code. He periodically receives and records time signals, weather reports, position reports, and other navigation and technical data. The radio operator may also maintain depth recording equipment and electronic navigation machinery.

Some cargo and tanker vessels and all passenger vessels carry *pursers* (D.O.T. 197.168). The purser or staff officer performs the extensive paperwork required to enter and clear a vessel in each port, prepare payrolls, and assist passengers as required. In recent years, the Staff Officers Association has established a program designed to train pursers to act also as Pharmacist Mates. This instruction would improve the medical care aboard all dry cargo and tankers and facilitate the obtaining of Public Health clearance when a vessel arrives in port. All passenger vessels must carry licensed doctors and nurses.

Places of Employment

About 15,000 officers were employed aboard U.S. Flag oceangoing vessels during mid-1968. Licensed deck officers and engineering officers each account for about two-fifths of total employment. The remaining one-fifth is made up of radio and staff officers.

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Training, Other Qualifications, and Advancement

Persons applying for the first time for an officer's license in the deck and engineering departments of oceangoing vessels must meet certain major legal requirements. Masters, chief and second mates, chief and first assistant engineers are required to be at least 21 years of age. The minimum age for third mates, third assistant engineers, and radio operators is 19. In addition, applicants must present documentary proof of United States citizenship and obtain a U.S. Public Health Service certificate attesting to their vision, color perception, and general physical condition.

In addition to legal and medical requirements, candidates for deck officer rating must pass Coast Guard examinations that require extensive knowledge of seamanship, navigation, cargo handling, and the operations of the deck department in all its phases. Marine engineering officer candidates must demonstrate in-depth knowledge of propulsion systems, electricity, plumbing and steam fitting, metal shaping and assembly, and ship structure. To progress to a higher rating, officers are required to complete successfully their examinations.

For a Coast Guard license as a radio officer, applicants must have a first or second-class radiotelegraph operator's license issued by the Federal Communications Commission. For a license to serve as the sole radio operator aboard a cargo vessel, the Coast Guard also requires 6 months of radio experience at sea.

Unlike most professions, no educational requirements have been established to become a merchant marine officer. Anyone who has served for 3 years in the deck or engine department may apply for either a third mate's license or for a third assistant engineer's license. However, the complex machinery, navigational, and electronic equipment on modern vessels require that officers have extensive technical knowledge.

To pass the Coast Guard's examination for an officers' license generally requires formal training. The fastest and surest way to become a well-trained officer is through an established officer training program. Such training programs are available at the U.S. Merchant Marine Academy at Kings Point, New York and at five State merchant marine academies: California Maritime Academy, Vallejo, Calif.; Maine Maritime Academy, Castine, Maine; Massachusetts Maritime Academy, Hyannis, Mass.; Texas Maritime Academy, Galveston, Tex.; and New York Maritime College, Fort Schuyler, New York, N.Y. Approximately 600 students graduate each year from the six schools; about one-half are trained as deck officers and one-half as marine engineers. Entrance requirements for each of the academies are very high. Admission to the Federal academy is through nomination by a member of Congress, whereas entrance to the other academies is made through written application directly to the school.

Each of the academies offers 3- or 4-year courses in nautical science or marine engineering, as well as practical experience at sea. Subjects include navigation, mathematics, electronics, seamanship, propulsion systems, electrical engineering, languages, history, and shipping management. Each student receives a subsistence allowance and a bachelor of science degree upon graduation. After Coast Guard examinations are passed, licenses are issued for either third mate or third assistant engineer. In addition, graduates may receive commissions as ensigns in the U.S. Naval Reserve.

Because of their thorough grounding in theory and its practical application, academy graduates are in the best position to move up to master and chief engineer ratings. Their well-rounded education also qualifies them for shoreside jobs such as marine superintendent, operating manager, or shipping executive.

A number of trade unions in the maritime industry provide officer training. These unions include the International Organization of Masters, Mates and Pilots; the Seafarers' International Union; the Brotherhood of Marine Officers, and the National Marine Engineers' Beneficial Association. Most union programs are designed to upgrade unlicensed seamen to the licensed ratings although some programs accept inexperienced young men. For example, the National Marine Engineers' Beneficial Association (MEBA) District 1-Pacific Coast District operates the Calhoon MEBA Engineering School in Baltimore, Maryland, which offers high school graduates a 2-year apprenticeship training program in preparation for a third assistant engineer's license. The program consists of both classroom instruction and sea experience and provides free room, board, medical care, and text books in addition to a monthly grant. Trainees must agree to serve at least three years in the U.S. Merchant Marine after the 2-year training period.

Advancement for deck and engine officers is along well-defined lines and depends primarily upon specified sea experience, passing a Coast Guard examination, and leadership ability. Deck officers start as third mates. After 1 year's service they are eligible to

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take a second mate examination. To rise to chief mate, a candidate must have served as second mate at least 1 year or 2 years as a watch officer while holding a license as a second mate. The chief mate may apply for master's license after 1 year of service, or after 2 years of service as second mate while holding a chief mate's license. An officer in the engine department starts as third assistant engineer. After 1 year of service, he may apply for a second assistant's license. After further experience, he may apply for first assistant's license and finally a chief engineer's license.

Employment Outlook

Employment of ship officers is expected to decline moderately during the 1970's. However, because pensions are improved and the average age of officers is high, a few thousand replacements will be needed each year. Other officers are expected to quit the sea for shore-side employment. The primary factors responsible for the expected decline are the continued decline in the absolute size of the fleet and the smaller crew sizes required because of mechanization. The level of employment of licensed officers in the industry in the final analysis will depend upon government policy with respect to a vessel replacement program and its determination of the level of U.S. flag participation in the U.S. water-borne foreign commerce.

Earnings and Working Conditions

The level of wages paid to officers depends upon rank and the size and type of vessel. Wages are highest on multiple-screw passenger vessels. The accompanying tabulation shows monthly base wages for officers aboard an average freighter. Additional payments for overtime, supplemental pay and "penalty pay" generally average about 50 percent of base pay. A monthly sum in lieu of overtime is paid to master, chief mate, chief engineer and first and third assistant engineers who do not stand watch. In 1968, this was equal to $218.40 per month.

	Base pay[1]
Master	$1,821
First mate	1,102
Second mate	780
Third mate	720
Radio officer	884
Purser	[2]656
Chief engineer	1,696
First assistant engineer	1,102
Second assistant engineer	780
Third assistant engineer	720

[1]East Coast wages in August 1968 aboard a 12,000-17,000 power ton single screw ship.
[2]Purser/pharmacist mate, $806.

Licensed officers and their dependents enjoy substantial benefits from noncontributory pension and welfare plans. For example, licensed deck officers are eligible for a monthly pension of $325 after 20 years of service, and up to one-half their monthly rate after 25 years of service. Partial pensions are provided for those men forced to retire prematurely due to a permanent disability. Comprehensive medical care and hospitalization are provided licensed officers and their families through union programs.

While at sea, officers stand two watches each day. In port, the normal workday is from 8 a.m. to 5 p.m., Monday through Friday. Aboard the ship, each officer has a private room with hot and cold running water. He dines with fellow officers in a dining salon separate from the messhall in which unlicensed crewmen eat. A bedroom steward cleans his room each morning.

A number of labor organizations represent merchant marine officers. The two largest are the International Organization of Masters, Mates and Pilots representing deck officers and the National Marine Engineers' Beneficial Association representing engineering officers. Licensed unions for Officers may require initiation fees as high as $1,000.

The Brotherhood of Marine Officers represents licensed deck and engine personnel on about 70 vessels. The Staff Officers Association represents pursers on all Atlantic and Gulf Coast passenger vessels and certain freight ships. Radio officers are represented by the American Radio Association and the Radio Officers Union. In addition, a number of independent unions represent licensed and/or unlicensed personnel on tanker vessels.

MANUFACTURERS' SALESMEN

(D.O.T. 260. through 289.458)

Nature of the Work

Practically all manufacturers—whether they make electronic computers or everyday can openers—employ salesmen. Manufacturers' sales representatives sell mainly to other businesses—factories, railroads, banks, wholesalers, and retailers. They also sell to hospitals, schools, and other institutions. The manner in

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which they go about this depends to a large extent on whether they are selling technical products such as factory machinery, metals, or chemicals, or nontechnical products such as clothing, canned foods, or stationery.

The great majority of manufacturers' salesmen sell nontechnical products; their customers are chiefly wholesalers, and less often big retail stores. Salesmen in this kind of work must be well informed about their firms' products, which sometimes number in the hundreds, and also about the special requirements of their customers. When a salesman visits firms in his assigned territory, he uses a sales approach adapted to the particular line of merchandise he carries. Thus, a salesman of crackers or cookies may emphasize the wholesomeness of his manufacturer's products, the attractive way they are packaged, and the many kinds available. A clothing salesman, on the other hand, may stress style, design, fabrics, and the details of manufacture. Sometimes salesmen promote sales of their companies' products by setting up displays in hotels and holding conferences with wholesalers and other customers.

A salesman of highly technical products, such as electronic equipment, often is called a *sales engineer* or an *industrial salesman.* In addition to having a thorough knowledge of his firm's products and the art of selling, he must be able to help prospective buyers with technical problems. For example, he may spend days or weeks analyzing a firm's manufacturing problems to determine the kinds of equipment and materials best suited to its operation. He then presents his solution to company officials and tries to negotiate the sale. Often, sales engineers work with the research and development departments of their own companies in devising ways to adapt products to a customer's specialized needs. Salesmen of technical products sometimes train their customers' employees in the operation and maintenance of new equipment, and make frequent return visits to be sure that it is giving the desired service.

Although manufacturers' salesmen spend most of their time visiting prospective customers, they also do some paperwork. They must write sales reports, plan their work schedules, make appointments, compile lists of prospects, conduct some sales correspondence, make out expense accounts, and study literature relating to their products. They also may be required to write reports on sales prospects in their territories, or on their competitors' products, or customers' credit ratings.

Places of Employment

About 500,000 manufacturers' salesmen were employed in 1968; nearly 35,000 were sales engineers in manufacturing industries. Some manufacturers' salesmen work out of company "home of-

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fices," which often are located at manufacturing plants. The majority, however, work out of branch sales offices, which usually are in big cities where the greatest numbers of prospective customers are found.

More salesmen work for companies which produce food products than for any other industry. Industries which also employ large numbers of salesmen include printing and publishing, chemicals, fabricated metal products, and electrical and other machinery. The largest employers of sales engineers are companies producing transportation equipment, fabricated metal products, and heavy machinery. About 10 percent of all manufacturers' salespeople are women, most of whom are employed in industries producing food products.

Training, Other Qualifications, and Advancement

College graduates sometimes are preferred for training as manufacturer's salesmen because certain employers find that a college education is helpful in dealing with company officials. However, many persons with little or no training beyond high school who are well qualified in other respects can achieve successful careers as manufacturers' salesmen.

Manufacturers of nontechnical products often prefer college graduates who have a degree in liberal arts or business administration. Training at a college of pharmacy usually is required for jobs as drug salesmen. As a rule, the sales engineer or industrial salesman who sells complicated equipment needs a technical education. For example, manufacturers of electrical equipment, heavy machinery, and some types of chemicals prefer to hire college-trained engineers or chemists. (Information on chemists, engineers, and other professionally trained workers who may be employed as industrial salesmen is given elsewhere in the *Handbook.*)

Although prospective salesmen often are hired by applying directly to sales offices or manufacturing concerns, many are recruited by manufacturers who send representatives to interview students who will soon graduate from college. Recruiters look for students who are well qualified academically and who have participated in extracurricular activities. As salesmen, they must be able to meet and get along well with many types of people. Recruiters also consider the student's personality traits and appearance. Preference is likely to be given to those with pleasant but forceful personalities who make a favorable impression in manner, speech, and dress. A recruiter may hire directly for his company or he may arrange for those applicants he feels are qualified to be interviewed by company officials before final selections are made.

Beginning salesmen are given specialized training before they start on the job. Some companies, especially those manufacturing complex technical products, have formal training programs lasting 2 years or longer. In some of these programs, trainees are rotated among jobs in several departments of the plant and office to learn all phases of production, installation, and distribution of the product. Other trainees receive formal instruction in classes at the plant; sometimes, this preparation is followed by intensive on-the-job training in a branch office under the supervision of field sales managers.

Sales representatives who have good sales records and leadership ability may advance to positions such as sales supervisors, branch managers, or district managers. Those having unusual ability and managerial skill eventually may advance to sales manager or other executive positions; many top executive jobs in industry are filled by men who started as salesmen.

Because salesmen have frequent contacts with businessmen in other firms, they often find opportunities to transfer to better jobs. Some salesmen go into business for themselves as manufacturers' agents selling similar products of several manufacturers. Experienced salesmen often find opportunities in advertising, market research, and other fields related to selling.

Employment Outlook

Employment opportunities for manufacturers' salesmen are expected to be very good during the 1970's. More than 30,000 openings will occur annually as employment in this occupation rises and as existing jobs become vacant because of retirements or deaths. Still other vacancies will occur as salesmen leave their jobs to enter other types of employment.

The number of manufacturers' salesmen is expected to rise very rapidly, partly because of general economic growth, and also because maufacturers will be placing greater emphasis on their sales activities. The development of new products and improvements in marketing techniques probably will heighten competition between the manufacturers. Because of the increase in the volume of business transacted with some customers—modern industrial complexes, chain store organizations, and large institutions of many kinds—competition between the manufacturers supply-

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ing these organizations will further the need for effective sales organizations. Despite the fact that they will be filling thousands of sales jobs each year, manufacturers are expected to be selective in hiring. They will look for ambitious young people who are both well trained and temperamentally suited for their jobs. As markets for technical products expand, the demand for technically trained salesmen is likely to be particularly strong.

Earnings and Working Conditions

According to the limited data available, starting salaries for beginning salesmen averaged about $8,000 a year in 1968. By including commissions and bonuses most salesmen earned more than this amount annually. The highest starting salaries generally were paid by manufacturers of electrical and electronic equipment, construction materials, hardware and tools, and scientific and precision instruments.

Some manufacturing concerns pay experienced salesmen a straight commission, based on their dollar amount of sales; others pay a fixed salary; and still others—the majority—use a combination salary-plus-commission plan. The amount earned through commissions varies according to the salesman's efforts and ability, the percentage commission, location of his sales territory, nature of the products sold, types of customers, and other factors. In 1968, the salary of many experienced salesmen was between $16,000 and $22,000 annually. Most earned considerably more because of bonuses and commissions.

Some manufacturers' salesmen have large territories and do considerable traveling. Others usually work in the neighborhood of their "home base." For example, a salesman of heavy industrial equipment may be assigned a territory covering several States and often may be away from home for days or weeks at a time. On the other hand, a salesman of food products may work in a small area which is within commuting distance of his home.

When on business trips, salesmen are reimbursed for expenses such as transportation costs, hotel bills, meals, tips, telephone calls, and stenographic services. Some companies either provide a car or pay an allowance to salesmen who use their own cars.

Salesmen often work irregular hours. They make calls at the time most convenient to their customers, and may have to travel at night or on weekends to meet their schedules. Frequently, they spend evening hours writing reports and planning itineraries. However, some salesmen are able to plan their work schedules so that they can take time off when they want it. Most salesmen who are not paid on a straight-commission basis receive paid vacations of from 2 to 4 weeks, depending on their length of service. They usually share in company benefit programs, including life insurance, pensions, and hospital, surgical, and medical benefits.

Sources of Additional Information

For more information on the occupation of manufacturers' salesman, write to:

Sales and Marketing Executives—International, Youth Education Division, 630 Third Ave., New York, N.Y. 10017.

MODELS

(D.O.T. 297.868 and 961.868)

Nature of the Work

Models convey the idea that life can become happier, more glamorous, adventuresome, or secure if people will buy the products or use the services advertised by them. The attractive female model or the athletic male model seeks to furnish the indispensable image that can trigger public demand for a new look or product.

Most models specialize in some line of either fashion or photographic work.

Fashion models employed by apparel designers, manufacturers, and wholesalers are called showroom or wholesale models. Prospective buyers from retail stores are shown garments and accessories quickly and effectively.

Fashion models wear clothing and accessories gracefully and exhibit an air of distinction. As they walk, pivot, and turn to the back and side, they reveal the highlights of each garment for prospective buyers. On some jobs, they may stop before a prospective purchaser to mention the price and the style number of the garment that identifies it for that season.

At peak seasons, showroom models are on duty constantly. During slack periods, when the showroom is empty for many hours each day, they may perform various clerical jobs. Fashion models employed in department stores, custom salons, and other retail and specialty shops, are called informal models. This type of modeling is conducted for customers and promotional purposes.

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It is usually carried at a more leisurely pace than in showrooms.

In the other major branch of modeling—photographic—the work usually is done for either advertising or editorial purposes. Photographic models generally are employed by advertising agencies or free-lance photographers who supply pictures for magazine and newspaper ads or features, as well as for catalogs and pamphlets. For editorial features, the model's work is much the same as in fashion photography, except that newspaper or magazine fashion editions use pictures to illustrate fashion news, the latest hair styles, clothing, and accessories.

To a degree, photographic models must have acting ability, for facial expression is important to create the desired mood. To show pleasure, dissatisfaction, or surprise with realism under bright lights in a hard-to-hold pose is not easy.

Photographic models may work in a neighborhood photographers' studio, or they may be asked to fly to such places as Miami Beach or even Bangkok to obtain photographs against an authentic background. The long trip, however, is not the usual experience of models.

Some types of modeling do not fit into either fashion or photographic work. For example, models demonstrate new products and services at manufacturers' exhibits and industry trade shows, in commercial or fashion films, or on television. Some are hired by designers for fittings. Others pose for artists and sculptors.

Places of Employment

Many of the more than 50,000 models employed in the United States in 1968 worked part time, and about 4 out of 5 were women or girls. Although models are employed in most major population centers throughout the country, the largest number is in New York City, center of the fashion industry in the United States. Large numbers also work in Chicago, Dallas, Detroit, Los Angeles, Miami, San Francisco, and Washington, D.C.

A sizeable number work in their hometowns doing local fashion shows, modeling for manufacturers' representatives, and participating in trade shows and product promotions.

Manufacturers, designers, and wholesalers employ the largest number of full-time models. In New York City's garment district, for example, thousands of firms and designers permanently employ from one to four models. Other large numbers work for advertising agencies, retail stores, mailorder houses, and magazines, as well as for commercial artists, sculptors, illustrators, fashion artists, and art schools.

Training, Other Qualifications, and Advancement

Employers prefer to hire models who have had training or experience. Prospective models therefore, should attend a modeling school to learn the proper way to walk and stand, how to style hair and use makeup, and to select the appropriate clothing and accessories. In photo modeling courses, students are taught how to pose for the photographer and how to express different emotions through facial expressions. Classes in developing personality and poise are helpful.

Placement offices at modeling schools provide jobs for many students. Some jobseekers find employment by registering at a model agency. The agency usually asks the applicant to have photos made in a number of modeling poses. These are arranged in a portfolio and shown to prospective clients. Department stores sometimes hold auditions to discover modeling talent and then give inexperienced models an opportunity to display the stores' newest styles. Some part-time, model-related jobs in department stores also provide useful experience; among them are advising customers on back-to-school clothing, and selling jobs that provide opportunities to handle clothing, observe customers, and occasionally to model. Sometimes experience can be gained in local charity fund-raising fashion shows.

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Although no formal educational requirements are necessary for many jobs, some employers require a high school diploma; a few prefer some college. Courses in art, speech, drama, dancing, fashion design and salesmanship are useful. The job demands not only perfect grooming, poise, and a pleasant personality, but also physical stamina and a generous helping of determination. The wise aspirant also should take typing, shorthand, or other practical courses as income insurance during lean times that may occur between modeling assignments.

Young fashion models must not only have a flair for style, but in most cases must be well proportioned and slim, since they are likely to model manufacturers' samples—usually small sizes. Many models, however, work for manufacturers who specialize in apparel for particular types of individuals, such as sportsmen, toddlers, the short, the tall, or the stout. A female shoe model generally must be able to wear size 5, and a hosiery model must have very long and graceful legs. The male model in most cases should be able to wear trim clothing—usually a size 40 or 41 long suit. In short, a fashion model is hired to fit the clothing.

Not all attractive people have physical characteristics acceptable for commercial photography. Women photographic models, for instance, usually must be long-waisted and at least 5 feet 6 inches tali, have good teeth, and a face that is either pretty or reflects the style demand of the period.

Modeling can serve as a steppingstone to other jobs in the fashion field such as fashion coordinator, editor on the staff of a fashion magazine, or fashion consultant. A few models, who serve as doubles or stand-ins in movies or television, may become actors or actresses. Some work their way through art school by modeling and are then in a position to qualify for jobs as fashion illustrators.

Employment Outlook

Full-time modeling should remain highly competitive through the 1970's. The glamour attached to it makes this occupation attractive to young people and, for this reason, the number of job hunters is expected to continue to be much larger than the number of full-time jobs. Employment opportunities for part-time work, however, are expected to be favorable.

Employment of models is expected to increase moderately through the 1970's. Expanded employment is anticipated in such industries as apparel manufacturing, wholesale and retail trade, and advertising—the major employers of models. The competition to gain a greater share of the expected growing volume of business will increase emphasis on product promotion, which in turn will increase the demand for models.

Most openings for models will result from the need to replace those who leave the field. The work span of most models is relatively short—particularly in high fashion modeling where the accent is on youth. Others are eased out of the field because the work with which they are identified becomes outdated or their pictures have been seen too often. Many girls also leave modeling to marry and raise a family. For these reasons, female models seldom work more than 8 years. The working life of the male model, on the other hand, is generally much longer—often 20 years or more.

Earnings and Working Conditions

A model's earnings depend on such factors as the type and place of employment and the nature, frequency, and duration of assignments. Although the earnings of a few top models are high, ranging to $20,000 or more a year, most models earn much less. According to the limited information available beginning fashion models who work full time for manufacturers or wholesalers generally earned from $85 to $90 a week in 1968. Those having experience had weekly earnings of $90 to $125. Beginning models employed by retail stores were usually paid from $50 to $80 a week, whereas experienced retail models earned from $90 to $100. Retail models often supplement their weekly salaries by modeling in fashion shows which pay from $15 an hour in some cities to $60 an hour for experienced photographic models in the New York City area.

Beginning photographic models earned from $15 to $25 an hour in 1967. This rate is deceptive when considered on a weekly or annual basis because many models—especially beginners—work only a few hours each week. Although photographic modeling often pays well, it can be an "expensive" career. In many cases, models must provide their own accessories and pay for other expenses. Occasionally, a complete outfit is needed to get a job.

Television models earn at least $75 an appearance as an extra, and at least $125 an appearance as a principal character, plus an additional amount for each rerun. They must be members of a union—either the Screen Actors Guild, Inc., or the American Federation of Television and Radio Artists.

Manufacturers, wholesalers, and retailers usually employ models on a permanent basis. They work a

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5-day week and receive a 2-week vacation and other supplementary benefits. Those who work through agencies or on a freelance basis, however, receive no supplementary benefits. Models are usually paid time and a half for work after 5:30 p.m. on weekdays, and for any time worked on Saturdays and Sundays. The client pays travel expenses outside the city. Additional compensation also is received for hazardous assignments, such as striking a friendly pose with a lion or alligator, or climbing a ship's rigging.

Modeling may influence the model's personal life. For example, the camera highlights the effects of keeping late night hours. In addition, a woman model must devote part of each evening to beauty care, and sometimes must prepare clothing and accessories for the next day's assignment. To stay in the profession, the high fashion model must remain very slender.

Sources of Additional Information

Young people interested in attending a professional modeling or charm school can write to the Department of Education in their State for a list of approved modeling schools.

Catalogs describing the program, entrance requirements, and tuition costs, at particular modeling schools may be obtained by writing to their directors.

General information on training opportunities and modeling is available from:

The American Model Festival, P.O. Box 100, Croton-on-Hudson, N.Y. 10520.

Modeling Association of America, Suite 8, 145 East 53d St., New York, N.Y. 10022.

SYSTEMS ANALYSTS

(D.O.T. 033.187, 012.168, 020.081 and 020.088)

Nature of the Work

Systems analysts are concerned with the planning, scheduling, and coordination of activities which are required to develop systems for processing data and obtaining solutions to complex business, scientific, or engineering problems. The methods of systems analysis require that the individual parts of a problem be viewed within the context of the overall problem. Although a system can be developed to process data manually, mechanically, or with electronic computers, most systems analysts are concerned with developing methods for computer usage. (This statement discusses only the work of systems analysts who devise systems which use electronic computers to process data and solve problems.)

Systems analysts employed by large business firms may be engaged in developing methods to process accounting, inventory, sales, and other business information by using electronic computers. With the assistance of managers or subject matter specialists, they determine the exact nature of the data-processing problem. The systems analysts then define, analyze, and structure the problem in a logical manner so that a system to eliminate the problem and obtain the desired results can be developed. They obtain all of the data needed and define exactly the way it is to be processed. They prepare charts, tables, and diagrams to describe the processing system and the steps necessary to make it operate. Systems analysts may use various techniques, such as cost accounting, sampling, and mathematical methods, as tools of analysis. After analyzing the problem and devising a system for processing data, systems analysts may recommend the type of equipment to be used and prepare instructions for programers. They also may interpret final results and translate them into terms which are understandable to management, subject matter specialists, or customers.

The number and type of data-processing problems are so vast and solution processes so varied and complex that many systems analysts tend to concentrate on particular subject matter areas. For example, in business offices, analysts may specialize in accounting or inventory control. Systems analysts who work for scientific or engineering organizations may specialize in problems such as determining the flight path of a space vehicle. Other analysts may develop systems for planning and forecasting sales or marketing research.

Systems analysts also improve existing systems and develop entirely new data-processing methods and applications. When working with systems already in use, they are concerned with improving and adapting the system to handle additional or different types of data. Analysts engaged in research are concerned with finding or devising new techniques and methods of systems analysis. Often this work is described as "advanced" systems design, and analysts engaged in this type of activity usually have mathematical, scientific, or engineering backgrounds.

Some systems analysts may have managerial and administrative duties. They are responsible for overall systems design and feasibility, and for assigning analysts to various phases of a project. They also may plan, or-

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Systems analyst reviews computer "run".

ganize, and control systems analysis throughout the organization in which they are employed and prepare reports of their work.

Places of Employment

About 150,000 persons were estimated to be employed as systems analysts in 1968. They work mainly for insurance companies, manufacturing concerns, banks, wholesale and retail businesses, and the Federal Government. A growing number of systems analysts are employed by universities and independent service organizations which furnish computer services to business firms and other organizations on a fee basis. Systems analysts work chiefly in large cities.

Training, Other Qualifications, and Advancement

There is no universally acceptable way of preparing for work in systems analysis. Some employers prefer that candidates have a bachelor's degree and experience in mathematics, science, engineering, accounting, or business. Other employers stress a graduate degree.

Educational preparation and experience often determine the kinds of job opportunities available to applicants. For example, employers are likely to seek a systems analyst who has a background in business administration to work in finance or similar systems areas; those having an engineering background are likely to be sought for engineering or scientifically oriented systems. Applicants also may qualify for work solely on the basis of professional experience obtained in scientific, technical, or managerial occupations, or practical experience in such data processing jobs as computer operator or programer.

Most employers prefer to hire people who have had some experience in computer programing. A young person can learn to use electronic data-processing equipment on the job or can take special courses offered by colleges, computer manufacturers, or their employers. In the Federal Government, for example, systems analysts usually begin their careers as programers. After gaining some experience, they may be promoted to systems analyst trainees so they may qualify as systems analysts.

In large electronic data-processing departments, a person who begins as a junior systems analyst may be promoted to a position of greater responsibility as he gains experience. Responsible positions in this field include those of senior or lead systems analyst. Systems analysts having proven leadership ability also can advance to positions as manager of systems analysis, electronic data-processing department manager, or other managerial positions.

Employment Outlook

Employment opportunities for systems analysts should be excellent through the 1970's. Systems analyst ranked among the fastest growing professional oc-

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cupations in recent years. Employers have experenced difficulty in recruiting qualified systems analysts because of the demand for people with similar backgrounds especially from the science and mathematics fields.

A growing demand for systems analysts will result from the rapid expansion occurring in the number of electronic data-processing systems used by businesses, government agencies, and other organizations. Additional opportunities for systems analysts will arise as computers and peripheral equipment become more sophisticated and are made capable of solving more complex problems in a wider variety of fields. Greater emphasis will be placed on developing computer systems which will retrieve information more efficiently and economically; solve complex business, scientific, and engineering problems; and monitor and control industrial processes. These developments and others, such as the extension of computer technology to small businesses, the use of systems analysts in market research and in determining the locations of plants and stores, and the growth of computer centers to serve individual clients on a fee basis, signify a very rapid rise in future employment levels of systems analysts.

In addition to the many employment opportunities resulting from growth in the field, some openings will occur as systems analysts advance to more responsibility positions or leave their jobs to enter other types of emplyoyment. Because many of the workers are young, relatively few positions will be available because of retirement or death.

Earnings and Working Conditions

In 1968, beginning salaries of systems analysts averaged between $6,400 and $9,100 a year, according to a private survey which covered more than 37,000 workers in business, government, and educational data-processing installations in all parts of the country. Earnings of experienced systems analysts averaged $12,000 annually, and in some cases they were paid $22,000 or more a year.

The great majority of systems analysts employed by the Federal Government in late 1968 earned from $8,462 to approximately $14,400 a year. Top salaries for experienced systems analysts ranged up to about $18,700 per year, although top managerial positions pay even higher salaries.

The workweek for systems analysts is usually the same—about 40 hours—as for other professional and office workers. Unlike many computer-oriented workers, such as console operators who work on two or three shifts, systems analysts usually work only during the day. Occasionally, evening or weekend work may be necessary to complete emergency or rush projects.

Sources of Additional Information

Additional information about the occupation of systems analyst may be obtained from the following sources:

American Federation of Information Processing Societies, 210 Summit Avenue, Montvale, N.J. 07645.

Data Processing Management Association, 505 Busse Highway, Park Ridge, Ill. 60068.

A list of reading materials on career opportunities in the data processing field may be obtained from:

Association for Computing Machinery, 1133 Avenue of the Americas, New York, N.Y. 10036.

PILOTS AND COPILOTS

(D.O.T. 196.168, .228, .268, and .283)

Nature of the Work

The men who have the responsibility for flying a multimillion dollar plane and transporting safely as many as 200 passengers or more are the pilot and copilot. The pilot (called "captain" by the airlines) operates the controls and performs other tasks necessary for flying a plane, keeping it on course, and landing it safely. He supervises the copilot, flight engineer, and flight attendants. The copilot is second in command. He assists the captain in air-to-ground communications, monitoring flight and engine instruments, and in operating the controls of the plane.

Both captain and copilot must do a great deal of planning before their plane may take off. They confer with the company meteorologist about weather conditions and, in cooperation with the airline dispatcher, they prepare a flight plan along a route and at altitudes which offer the best weather and wind conditions so that a safe, fast, and smooth flight may be possible. This flight plan must be approved by Federal Aviation Administration (FAA) air traffic control personnel. The copilot plots the course to be flown and computes the flying time between various points. Prior to takeoff, both men check the operation of each engine and the functioning of the plane's many instruments, controls, and electronic and mechanical systems.

During the flight, the captain or copilot reports by radio to ground control stations regarding their altitude, air speed, weather conditions, and other flight details. The captain also supervises

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the navigation of the flight and keeps close watch on the many instruments which indicate the plane's fuel load and the condition of the engines, controls, electronic equipment, and landing gear. The copilot assists in these duties.

Before landing, the captain or the copilot recheck the operation of the landing gear and request landing clearance from air traffic control personnel. If visibility is limited when a landing approach is being made, the captain may have to rely primarily on instruments such as the altimeter, air speed indicator, artificial horizon, and gyro compass and instrument landing system. Both men must complete a flight report and file trip records in the airline office when the flight is ended.

Some pilots, employed by airlines as "check pilots," make at least two flights a year with each captain to observe his proficiency and adherence to FAA flight regulations and company policies. Airlines employ some pilots to fly planes leased to private corporations. Airlines also employ pilots as instructors to train both new and experienced pilots in the use of new equipment.

Although pilots employed in general aviation usually fly planes smaller than those used by the scheduled airlines, their preflight and flight duties are similar to those of airline pilots. These pilots seldom have the assistance of flight crews. In addition to flying, they may perform minor maintenance and repair work on their planes. In some cases, such as in business flying, they may mingle with and act as host to their passengers. Pilots who are self-employed, such as airtaxi operators, in addition to flying and doing some maintenance work, have duties similar to those of other small businessmen.

Places of Employment

The scheduled airlines employed over 24,000 pilots and copilots in 1968. In addition, approximately 1,600 pilots were employed by the certificated supplemental airlines (airlines that provide charter and nonscheduled service).

An estimated 25,000 pilots and copilots were employed full-time in general aviation in 1968. Several thousand worked in business flying and air-taxi operations. About 1,500 pilots were employed in aerial application flying. The Federal Government employed approximately 1,200 pilots (about half in the FAA) to perform a variety of services such as examining applicants for pilots' licenses, inspecting navigation facilities along Federal airways, testing planes that are newly designed or have major modifications, enforcing game laws, fighting forest fires, and patrolling national boundaries. In addition, State and local governments employed about 800 pilots. Several thousand pilots were employed by companies to inspect pipelines and installations for oil companies, and to provide other aerial services such as private flight instruction, and flights for sightseeing and aerial photography. A small number worked for aircraft manufacturers as test pilots. In addition, an estimated 35,000 pilots were employed on a part-time basis. These workers were distributed among all the various general aviation activities.

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Training, Other Qualifications, and Advancement

To do any type of commercial flying, pilots or copilots must be licensed by the FAA. Airline captains must have an "airline transport pilot's" license. Copilots, and most pilots employed in general aviation, must have a "commercial airplane pilot's" license. In addition, pilots who are subject to FAA instrument flight regulations or who anticipate flying on instruments when the weather is bad, must have an "instrument rating." Pilots and copilots also must have a rating for the class of plane they can fly (single-engine, multi-engine, or seaplane), and for the specific type of plane they can fly, such as DC-6 or Boeing 707.

To qualify for a license as a commercial pilot, applicants must be at least 18 years old and have at least 200 hours of flight experience. To obtain an instrument rating, applicants must have at least 40 hours of instrument time, 20 hours of which must be in actual flight. Applicants for an airline transport pilot's license must be at least 23 years old and have a total of 1,200 hours of flight time during the previous 8 years, including night flying and instrument flying time.

Before a person may receive any license or rating, he must pass a physical examination and a written test given by the FAA covering subjects such as principles of safe flight operations, Federal Aviation Regulations, navigation principles, radio operation, and meterology. He also must submit proof that he has completed the minimum flight-time requirements and, in a practical test, demonstrate flying skill and technical competence. His certification as a professional pilot remains in effect as long as he can pass an annual physical examination and the periodic tests of his flying skills required by Government regulation. An airline transport pilot's license expires when the pilot reaches his 60th birthday.

A young man may obtain the knowledge, skills, and flight experience necessary to become a pilot through military service or from a private flying school. Graduation from flying schools approved by the FAA satisfies the flight experience requirements for licensing. Applicants who have appropriate military flight training and experience are required to pass only the Federal Aviation Regulations examination if they apply for a license within a year after leaving the service. Those trained in the armed services have the added opportunity to gain experience and accumulate flying time on large aircraft similar to those used by the airlines.

As a rule, applicants for a copilot job with the airlines must be between 20 and 35 years old, although preference is given to applicants who are between ages 21 and 28. They must be 5 feet 6 inches to 6 feet 4 inches tall and weigh between 140 and 210 pounds. All applicants must be high school graduates; some airlines require 2 years of college and prefer to hire college graduates. Physical requirements for pilots, especially in scheduled airline employment, are very high. They must have at least 20/100 vision corrected to 20/20, good hearing outstanding physical stamina, and no physical handicaps that would prevent quick reactions. Since flying large aircraft places great responsibilities upon a pilot, the airlines use psychological tests to determine an applicant's alertness, emotional stability and maturity, and his ability to assume responsibility, command respect, and make quick decisions and accurate judgments under pressure.

Men hired by the scheduled airlines (and by some of the larger supplemental airlines) usually start as flight engineers, although they may begin as copilots. An applicant for a flight crew member job with a scheduled airline often must have more than the FAA minimum qualifications for commercial pilot licensing. For example, although the FAA requires only 200 flying hours to qualify for such a license, the airlines generally require from 500 to 1,000 flying hours. Airlines also require a "restricted" radio-telephone operator permit, issued by the Federal Communications Commission, which allows the holder to operate the plane's radio.

Pilots employed in business flying are required to have a commercial pilot's license. In addition, some employers require their pilots to have instrument ratings, and some require pilot applicants to have air transport pilot ratings. Because of the close relationship between pilots and their passengers, employers look for job applicants who have pleasant personalities.

All newly hired airline copilots go through company orientation courses. In addition, some airlines give beginning copilots or flight engineers from 3 to 10 weeks of training on company planes before assigning them to a scheduled flight. Trainees also receive classroom instruction in subjects such as flight theory, radio operation, meteorology, Federal Aviation Regulations, and airline operations.

The beginning copilot generally is permitted only limited responsibility, such as operating the flight controls in good weather over a route that is easy to navigate. As he gains experience

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and skill, his responsibilities are increased gradually, and he is promoted to copilot on larger, more modern aircraft. When he has proved his skill, accumulated sufficient experience and seniority; and passed the test for an airline transport pilot's license, a copilot may advance to captain as openings arise. A minimum of 2 or 3 years' service is required for promotion but, in actual practice, advancement often takes at least 5 to 10 years or longer. The new captain works first on his airline's smaller equipment and, as openings arise, he is advanced to larger, more modern aircraft.

A few opportunities exist for captains who have administrative ability to advance to chief pilot, flight operations manager, and other supervisory and executive jobs. Most airline captains, however, spend their entire careers flying. As they increase their seniority, they obtain a better selection of flight routes, types of aircraft, and schedules which offer higher earnings. Some pilots may go into business for themselves if they have adequate financial resources and business ability. They may operate their own flying schools or air-taxi and other aerial services. Pilots also may shift to administrative and inspection jobs in aircraft manufacturing and Government aviation agencies, or become dispatchers for an airline when they are no longer able to fly.

Employment Outlook

A rapid rise in the employment of airline pilots is expected through the 1970's. In addition to those needed to staff new positions, several thousand job openings will result from the need to replace pilots who transfer to other fields of work, retire, or die. Although larger, faster, and more efficient jet planes are likely to be used in the years ahead, increased passenger and cargo miles may exceed substantially the increase in capacity realized from the new equipment. Therefore, employment of pilots is likely to increase to the extent that increased growth of traffic exceeds increased capacity.

Employment of pilots in general aviation activities is expected to continue to grow very rapidly, particularly in business flying, aerial application, air-taxi operations, and patrol and survey flying. Growth in these areas will result from the greater use of aircraft to perform these general aviation activities.

Earnings and Working Conditions

Captains and copilots are among the highest paid wage earners in the Nation. Those employed by the scheduled airlines averaged about $21,000 a year in domestic air transportation and nearly $25,000 in international operations in 1967. Most of the senior captains on large aircraft earned well over $25,000 a year; those assigned to jet aircraft may earn as much as $37,000. Pilots employed by the scheduled airlines generally earn more than those employed elsewhere, although pilots who work for supplemental airlines may earn almost as much. Some experienced copilots were earning as much as $21,000 a year in domestic flying and more than $23,000 in international flying in 1967.

The earnings of captains and copilots depend on factors such as the type, size, and speed of the planes they fly, the number of hours and miles flown, and their length of service. They receive additional pay for night and international flights. Captains and airline copilots who have at least 3 years of service are guaranteed minimum monthly earnings which represent a substantial proportion of their earnings.

Under the Federal Aviation Act, airline pilots cannot fly more than 85 hours a month; some union-management contracts, however, provide for 75-hour a month maximums. Though pilots and copilots, in practice, fly approximately 92 hours a month, their total duty hours, including before- and after-flight activities and layovers before return flights, usually exceed 100 hours each month.

Some pilots prefer shorter distance flying usually associated with local airlines and commercial flying activities, such as air-taxi operations, because they are likely to spend less time away from their home bases and fly mostly during the daytime. These pilots, however, have the added strain of making more takeoffs and landings daily.

Although flying does not involve much physical effort, the pilot often is subject to stress because of his great responsibility. He must be constantly alert and prepared to make decisions quickly. Poor weather conditions also can make his work more difficult.

Most airline pilots are members of the Airline Pilots Association, International. The pilots employed by one major carrier are members of the Allied Pilots Association.

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Sources of Additional Information

Air Line Pilots Association, International, 1329 E St., NW., Washington, D.C. 20004.

(See the introductory section for additional sources of information and for general information on supplementary benefits and working conditions.)

PROGRAMERS

(D.O.T. 020.188)

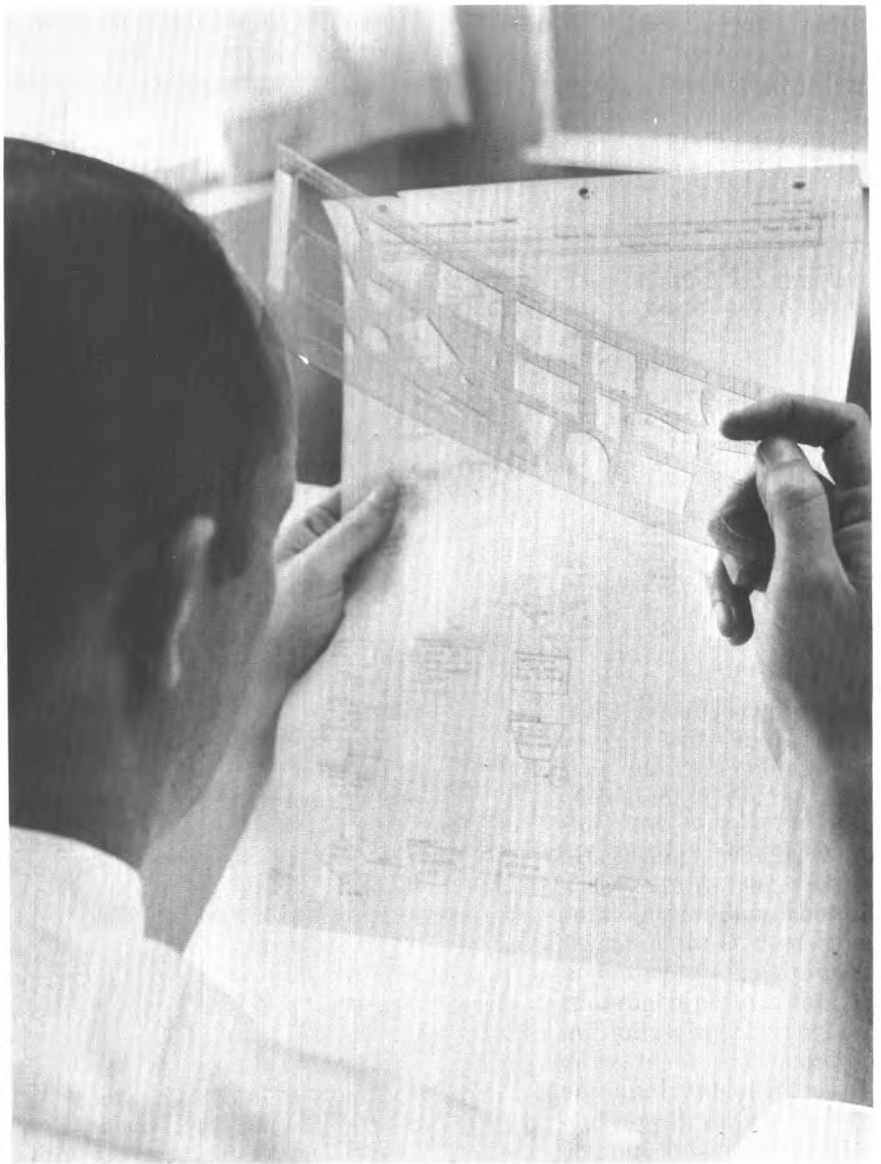
Nature of the Work

An electronic computer, even though sometimes called a "mechanical brain" can only follow step-by-step instructions that tell it exactly what to do. The programer prepares these instructions.

A computer not only makes mathematical calculations at fantastic speeds, but stores large amounts of data in its "memory" and later uses it to perform its tasks, because computers are able to work with masses of information at tremendous speed and with a high degree of accuracy they are used for much "data processing" which would otherwise require the time of many employees. They handle varied assignments such as maintaining inventories, controlling production machinery in factories, making long-range weather forecasts, doing legal and medical research, and analyzing air traffic patterns.

Every "problem" processed in a computer first must be carefully analyzed so that exact and logical steps for its solution can be worked out. In some cases, the preliminary work is done by an experienced programer; in others, it may be done by a specialist known as a systems analyst. (See the statement on systems analysts elsewhere in the *Handbook*.

Once this preliminary work has been completed, the "program," or detailed instructions for processing the data can be prepared by the programer. Exactly how he does this depends not only on the type of equipment to be used but on the nature of the problem. The mathematical calculations involved in billing a firm's customers, for example, are very different from those required in most kinds of scientific and technical work. The programing techniques are also different. Still other techniques are required in writing programing "aids" which



Computer programer consults flow diagram.

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reduce the amount of detail associated with programing. Because of these differences, many programers specialize in certain kinds of work.

In business offices, computers are frequently used to bill customers, make up payrolls, and keep track of inventories. Here the programer often starts his work by determining exactly what information must be used to prepare the necessary documents and by ascertaining the exact form in which this information is entered on company records. He then makes a flow chart, or diagram, showing the order in which the computer must perform each operation, and for each operation he prepares detailed instructions. These instructions, when they are relayed to the computer's control unit, instruct the machine exactly what to do with each piece of information, in order to produce each business document. The programer also is responsible for preparing an instruction sheet for the console operator to follow when the program is run on the computer. (The work of the console operator is described in the statement on Electronic Computer Operating Personnel.)

The final step in programing is "debugging"—that is, checking on whether the instructions have been correctly written and will produce the desired information. A program is usually debugged in two steps. First, the programer takes a sample of the data to be processed and reviews step by step exactly what will happen as the computer follows the series of instructions which make up the program. Then, after he has revised the instructions to take care of any difficulties that have appeared, he completes the test by having a trial run made in the computer. The console operator sometimes helps with this part of the debugging process.

A comparatively simple program can be made for a computer within a very few days. A program which deals with a complex problem or is designed to produce many different kinds of information may require a year or more of preparation—sometimes by a large number of programers. On involved problems, several programers at different levels of responsibility often work as a team, under the supervision of a senior programer.

The programer may perform other related duties, such as designing forms to use in data presentation. In addition, existing programs must be updated to keep pace with administrative changes or to improve efficiency. Also, the introduction of larger or newer model computers often requires that many programs be rewritten.

Places of Employment

About 175,000 programers were employed in 1968. In addition, some professional workers such as engineers, scientists, mathematicians, economists, and accountants spend a portion of their time programing.

Programers are employed chiefly by large business organizations and government agencies. A great many work for insurance companies and banks, public utilities, wholesale and retail establishments, and manufacturing firms of almost every kind. A considerable number are government employees doing work related either to scientific and technical problems, or to the processing of the vast amount of paperwork which is handled in many government offices. In addition, a growing number of programers are employed by computer manufacturers and independent service organizations which furnish computer and programing services to business firms and other organizations on a fee basis.

Training, Other Qualifications, and Advancement

The special abilities most sought after by employers when they hire programers are similar for all types of positions, but requirements regarding education and experience may be very different and may be dependent mainly on the problems with which the programer will be occupied. Some programers are college graduates having degrees in engineering, for example, whereas others have had years of experience in work such as accounting or inventory control.

In selecting programers, employers look for people having an aptitude for logical thinking and the exacting kind of analysis which is part of the job. The work also calls for patience, persistence, and the ability to work with extreme accuracy. Ingenuity and imagination are particularly important in jobs where programers have to solve problems in new ways.

In organizations which use computers for science and engineering, most programers are college graduates, usually having degrees in engineering, the physical sciences, mathematics, or computer science. Graduate degrees may be required for some positions; for almost all positions, an applicant who has no college training is at a severe disadvantage.

Employers who use computers to process business records generally place somewhat less emphasis on technical college training. Many regard previous experience in machine tabulation, payroll work, or accounting equally as

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important and fill many of their programer positions by promoting qualified employees having such experience. When employers find it necessary to hire outsiders, however, they usually give preference to applicants having an education beyond high school. College courses in electronic data processing or in accounting, business administration, engineering, or mathematics provide especially good preparation.

Entrance requirements for jobs in the Federal Government are much the same as for those in private industry. Practically all entry programer positions in the Government require applicants to have a college degree, preferably with training in mathematics, or the equivalent of such preparation in previous work experience.

Young people interested in programing can acquire some of the necessary skills at a steadily increasing number of technical schools, colleges, and universities. The instruction available ranges from introductory home study and extension courses to advanced work in computer technology at the graduate level. High school courses in computer programing are also offered to students in many parts of the country.

However, high school and post-high school instruction do not entirely eliminate the need for on-the-job training. Since technological changes are continually taking place in this field and each type of computer has its own special programing requirements, some additional training is usually necessary.

Most beginners in this occupation attend training classes for a few weeks and then, as they work on minor programing assignments, continue with further specialized training. A year or more of experience is usually necessary before a programer can handle all aspects of his job without close supervision. Once he becomes skilled, his prospects for further advancement are good. Eperienced and capable programers are in strong demand. In organizations employing several programers, promotion may be to a senior programing job having supervisory responsibilities or to systems analyst. An increasing number of programers eventually move up to management positions in their firms.

Employment Outlook

Many thousands of new jobs for programers will become available each year through the 1970's. Employment is expected to increase very rapidly, as an expanding and increasingly complex economy causes computers to become more useful to business and government, and as the number of computer installations also rises rapidly. The increase in employment is expected to be particularly sharp in firms which use computers to process business records or to control manufacturing processes.

The rise in employment could well be accompanied by changes in the nature of the work done by programers. Advances in programing techniques and equipment, such as "automatic programing" and the use of programs and program parts stored in libraries for future reference, will eliminate much of the routine work associated with writing a program. As a consequence, professionally trained personnel qualified to handle both programing and systems analysis are likely to be increasingly in demand, especially for work on scientific and engineering problems. For other positions, many of them in large business offices where the analysis is done by accountants and other subject matter experts, there is some evidence that 2 years of intensive training at the post-high school level may provide a sufficient background for beginning programers.

Most of the openings for programers in the years just ahead will be new jobs that arise as the number of computer installations continues to increase, and computers are put to new uses. Some openings also will occur as programers advance to more responsible positions, or as they leave their jobs to enter other types of employment. Because this occupation includes many comparatively young workers, fewer positions are likely to become vacant because of retirement or death than in other occupations of similar size.

Earnings and Working Conditions

In 1968, beginning salaries for programers averaged $7,850 a year, according to a private survey which covered more than 37,000 data processing workers in all parts of the country. Experienced programers averaged $10,600 a year, with some earning up to $17,000 annually. The average salary for programers having supervisory duties was $12,000 a year; some programing supervisors earned up to $22,000 annually.

The survey indicated substantial differences in the salaries of the lowest and highest paid individuals in the same kinds of positions, however, with some earning up to four times as much as others in the same group. These differences were due partly to the kind of data processed and the kind of computer used, as well as the industry involved and its location.

Federal Government salaries for programers are comparable

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with those in private industry. The great majority earn between $7,000 and $15,800 a year. The minimum entrance salary for beginners was $5,732 a year in late 1968, and the top salaries of experienced programers responsible for complex programing or supervisory and administrative work ranged to $19,800 or more a year.

The standard workweek for programers is about 40 hours. Unlike many computer console and auxiliary equipment operators who work on a 2- or 3-shift basis, programers usually work only during the day. Occasionally, evening or weekend worth may be necessary—for example, when it proves particularly difficult to debug a program.

Work places are usually modern offices, well-lighted and air conditioned. Employers recognize the desirability of providing the best possible work surroundings, because programers working under such conditions can concentrate more readily on the exacting kind of analysis which is an essential part of their job.

Sources of Additional Information

Additional general information about the occupation of programer may be obtained from:

Data Processing Management Association, 505 Busse Highway, Park Ridge, Ill. 60068.

American Federation of Information Processing Societies, 210 Summit Ave., Montvale, N.J. 07645.

A list of reading materials on career opportunities in programing may be obtained from:

Association for Computing Machinery, 1133 Avenue of the Americas, New York, N.Y. 10036.

PSYCHOLOGISTS

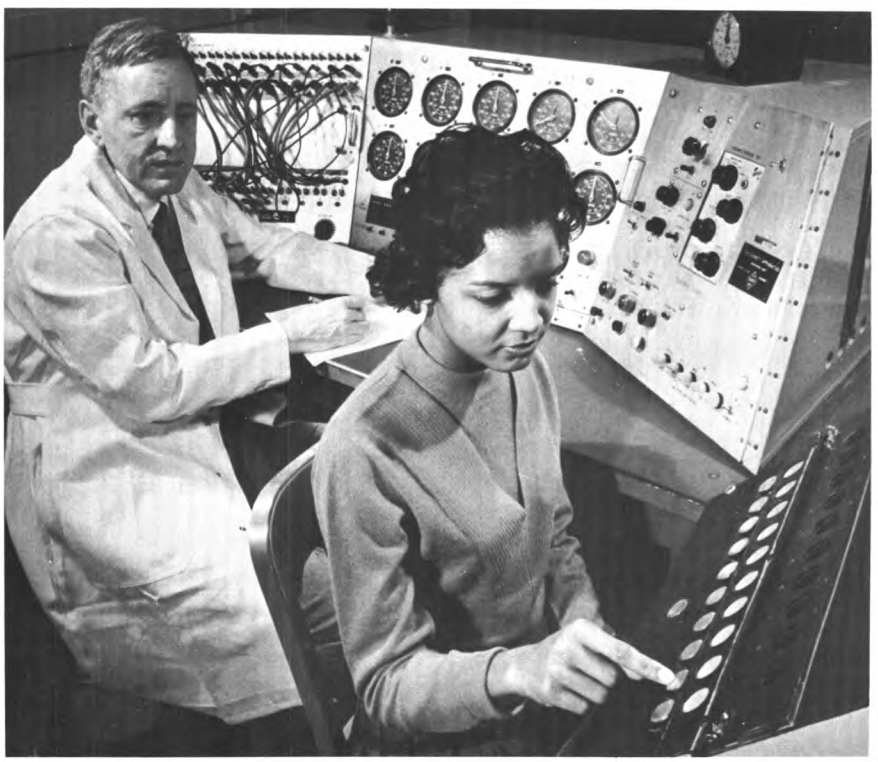
(D.O.T. 045.088 and .108)

Nature of the Work

The problems of severe emotional stress and abnormal behavior, the causes of low morale, or the effective performance of an astronaut, are among the concerns of psychologists seeking to understand people and to explain their actions. Psychologists study the behavior of individuals and groups and often help individuals achieve satisfactory personal adjustments. Their work includes varied activities such as teaching in colleges and universities; counseling individuals; planning and conducting training programs for workers; performing basic and applied research; advising on psychological methods and theories; and administering psychology programs in hospitals, clinics, research laboratories, and other places.

Psychologists obtain information about the capacities, traits, interests, behavior, and actions of people in several ways. They may interview individuals, develop and administer tests and rating scales, study personal histories, and conduct controlled experiments. In addition, psychologists often conduct surveys, either by personal interviews or by written questionnaires.

Psychologists usually specialize in one of the many interrelated branches of the profession. Clinical psychologists are the largest group of specialists. Generally, they work in mental hospitals or clinics and are concerned mainly with problems of mentally or emotionally disturbed people. They interview patients, give diagnostic



Psychologist measures test subject's reaction speed.

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tests, and provide individual and group psychotherapy. Other specialties in psychology include experimental psychology (the study of basic learning and motivation); developmental psychology (the study of special age groups such as young children, teenagers, and the aged); personality and social (the study of the social forces that affect individuals and groups); school psychology (concerned with phychological factors involved in the educational performance and general well being of school age children; comparative psychology (sometimes called animal psychology); physiological psychology (the relationship of behavior to psysiological processes); counseling psychology (helping people achieve satisfactory personal, social, educational, or occupational adjustments); educational psychology (the study of educational processes); industrial psychology (developing techniques for selecting and training workers and improving worker motivation and morale); and engineering psychology (the study of man-machine and other complex system relationships).

Places of Employment

An estimated 32,000 psychologists were employed in 1968. About one-fifth of all psychologists are women.

Colleges and universities employ the largest number of psychologists—nearly two-fifths of the total. Government agencies—Federal, State, and local—employ the second largest group. Within the Federal Government, the agencies having the most psychologists are the Veterans Administration, the Department of Defense, and the Public Health Service of the Department of Health, Education, and Welfare.

Many psychologists also work in elementary and secondary schools, private industry, and nonprofit foundations and clinics. Some are in independent practice, and others serve as commissioned officers in the Armed Forces and the Public Health Service. In addition to positions with the title "psychologist," many personnel and administrative jobs are filled by persons trained in psychology.

Training, Other Qualifications and Advancement

Generally, the master's degree with a major in psychology is the minimum educational requirement for professional employment in the field. Psychologists having this degree can qualify for positions where they administer and interpret psychological tests, collect and analyze statistical data, conduct research experiments, and perform administrative duties. In addition, they may teach in colleges, help counsel students or handicapped persons, or—if they have had previous teaching experience—act as school psychologists or counselors. (See statements on School Counselors and Rehabilitation Counselors.)

The Ph. D. degree is needed for many entrance positions and is becoming increasingly important for advancement. Psychologists having doctorates are eligible for the more responsible research, clinical, and counseling positions, as well as for the higher level positions in colleges and universities, and in Federal and State programs.

At least 1 year of full-time graduate study is needed to earn the master's degree, and most students study longer. An additional 3 to 5 years of graduate work usually is required for the Ph. D. degree. In clinical or counseling psychology, the requirements for the Ph. D. degree generally include 1 year of internship or supervised experience.

Many graduate students receive financial help from universities and other sources in the form of fellowships, scholarships, or part-time employment. Several Federal agencies provide funds to graduate students, generally through the educational institution giving the training. The Veterans Administration offers a large number of predoctoral traineeships, during which time the students receive payments and gain supervised experience in VA hospitals and clinics. The Public Health Service provides funds for

The American Board of Examiners in Professional Psychology awards diplomas in the specialties of clinical, counseling, industrial, and school psychology to those having outstanding educational records and experience and who pass the required examinations.

Some universities require an undergraduate major in psychology for admission to graduate work in that field. Others prefer students with a broader educational preparation, including not only some basic psychology courses but also courses in the biological, physical and social sciences, statistics, and mathematics. predoctoral and post doctoral traineeships and research fellowships. The National Science Foundation, the U.S. Office of Education, the Rehabilitation Services Administration, and the National Institute of Mental Health also provide fellowships, grants, and loans for advanced training in psychology.

Psychologists desiring to enter independent practice must meet certification or licensing requirements in an increasing number of States. In 1968, 43 States had these requirements.

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Employment Outlook

Employment opportunities for psychologists who have doctor's degrees are expected to be excellent through the 1970's. Psychologists holding master's degrees also will be in demand, but their opportunities will be less favorable than for those having the Ph. D. degree.

Continued very rapid expansion of the profession is expected through the 1970's. A large increase is anticipated in the number of psychologists employed by State and local agencies. Currently understaffed mental hospitals, mental hygiene clinics, and community mental health centers will need many clinical, counseling, social, and physiological psychologists. In addition, correctional institutions are expected to use psychologists more extensively in the future.

Increasing awareness of the need for testing and counseling children, combined with growing secondary school enrollments, is expected to increase the need for psychologists in schools. In colleges and universities, more psychologists will be needed for student personnel work, as well as for teaching and research. Increased public concern for the development of human resources as evidenced by the Mental Retardation Facilities and Community Mental Health Centers Construction Act of 1963, as amended, and "Headstart" and other antipoverty programs will further increase the demand for psychologists. The trend toward greater use of psychological techniques by private industry will create new openings for experimental, industrial, personnel, and human engineering specialists.

Many openings for psychologists having Ph. D. degrees who are specialists in clinical, counseling, experimental, human engineering, physiological, social, and personnel psychology are expected in the Veterans Administration, the Department of Defense, and in State and local governments.

Many vacancies also will occur each year owing to retirements and deaths. The transfer of psychologists to do work of a purely administrative nature also may create some job vacancies. Most opportunities, however, will result from the rapid expansion that is anticipated for the profession.

Earnings and Working Conditions

In 1968, starting salaries for male psychologists having a master's degree averaged about $9,100 a year, according to the American Psychological Association. Beginning salaries for males having the doctoral degree averaged $12,800. For women psychologists, starting salaries averaged a few hundred dollars less.

The median annual salary for all psychologists in the National Science Foundation's Register of Scientific and Technical Personnel was $13,200 in 1968. The median salary for those having a Ph. D. was $14,500. According to the Register, self-employed psychologists generally have higher incomes than salaried employees.

Median salaries in graduate departments of psychology ranged from $9,700 for assistant professors to $16,000 for full professors during the academic year 1967-68 (9-10 months), according to a survey conducted for the Conference of Chairman of Graduate Departments of Psychology.

In the Federal Government, psychologists having a Ph. D. degree and limited experience started at $12,243 in late 1968. The annual average salary in the Department of Medicine and Surgery, Veterans Administration, which requires the doctoral degree for all specialties, was about $16,300 in 1968.

Sources of Additional Information

General information on career opportunities, certification or licensing requirements, and educational facilities and financial assistance for graduate students in psychology may be secured from:

American Psychological Association, 1200 17th St. NW., Washington, D.C. 20036.

Information on traineeships and fellowships may be secured from colleges and universities with graduate psychology departments.

RECREATION WORKERS

(D.O.T. 079.128, 187.118, 195.288)

Nature of the Work

Leisure used to be considered the companion of idleness, silently stealing the time needed to produce the necessities of life. In recent years, however, new machines and technology have raised the standard of living of most people and have provided them with leisure hours unheard of a generation ago. How people spend their nonworking hours is now a major concern. Recreation workers help people to enjoy and use their leisure time constructively by or-

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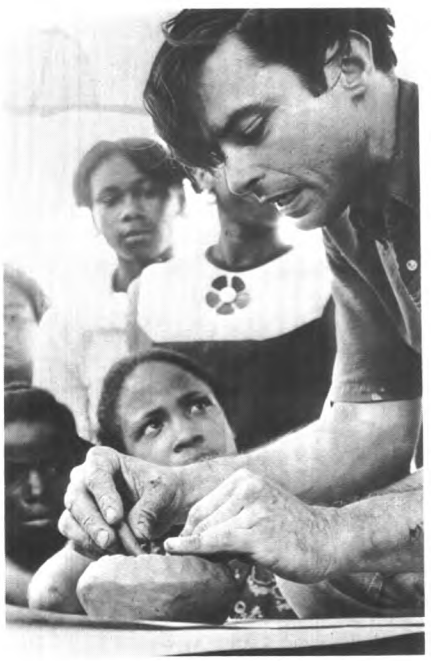
ganizing individual and group activities and by administering physical, social, and cultural programs for all age groups at camps, playgrounds, community centers, and hospitals. They also operate recreational facilities and study the recreation needs of individuals and communities.

Recreation workers employed by local government and voluntary agencies direct activities at neighborhood playgrounds and indoor recreation centers. They provide instruction in the arts and crafts and in sports such as tennis and basketball. They may supervise recreational activities at correctional institutions and work closely with social workers in organizing programs of recreation for the young and the aged at community centers and social welfare agencies.

Many personnel work in industrial, hospital, military, or school recreation. Recreation workers in industry plan the recreation programs of company employees and organize bowling leagues, softball teams, and similar activities. Sometimes, they plan fund drives and company social functions. Hospital recreation workers plan recreation programs for the ill and the handicapped in hospitals, convalescent homes, and other institutions. Working under medical direction, they organize and direct sports, dramatics, and arts and crafts for persons suffering from mental problems and physical disabilities. School recreation workers organize the leisure-time activities of school-age children during schooldays, weekends, and vacation periods.

Some part-time recreation workers and volunteers assist full-time workers throughout the year but mostly during the summer months. Part-time workers are largely college students and teachers. They work primarily as recreation leaders and camp counselors, organizing and leading games and other activities at camps and playgrounds.



Recreation worker gives pottery-making demonstration.

Places of Employment

About 40,000 professional recreation workers were employed full time in 1968; most of them worked full time. The majority worked for local governments and voluntary agencies. Most of the remainder were employed by religious organizations or by the Federal Government in national parks, the Armed Forces, the Veterans Administration, and correctional institutions. Some recreational workers were employed by industry, and a few were teachers in colleges and universities.

Recreation workers are employed in all parts of the country; however, a large proportion are employed in California, Massachusetts, New Jersey, New York, Ohio, Pennsylvania, and Texas. About one-third of all recreation workers are women.

Training, Other Qualifications, and Advancement

Most employers prefer persons who have a bachelor's degree and a major in recreation, social science, or physical education for work in the recreation field. However, fewer than one-half of the recreation workers currently employed have this educational background. Persons interested in becoming recreation workers should take a broad range of courses in college, including philosophy, the humanities, natural sciences, and the arts. Specialized courses stressing the history, philosophy, and scope of recreation; the techniques of community organization; health and safety procedures; and outdoor recreation are particularly helpful. Advanced courses in recreation or public administration leading to the master's degree are desirable for persons interested in higher level administrative positions. Students interested in the field of industrial recreation may find it desirable to take some courses in business administration. It is important for those interested in working as hospital recreation specialists to take course in psychology, health education, and sociology. Training leading to a bachelor's degree with a major in recreation was available in over 130 schools in 1968. About 70 offered a master's degree and about 30 offered a doctorate in recreation.

Good health, emotional maturity, and a warm personality are essential qualities for recreation workers. To increase their leadership skills and their understanding of people, interested students should try to obtain related work

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experience in high school and college. They may do volunteer, part-time, and summer work in recreation departments, camps, youth-serving organizations, institutions, and community centers.

The majority of college graduates entering the recreation field begin as either recreation leaders or specialists, although each year a small number of college graduates enter trainee programs that lead directly to recreation administration. These programs, offered by a few large cities and organizations, generally last 1 year.

Recreation leaders work directly with groups and individuals, organizing or teaching diversified activities such as athletics, dancing, storytelling groups, and social recreation in indoor and outdoor centers. They also may supervise the work of nonprofessional workers and assist in the administration of recreation programs. Recreation specialists are responsible for the organization and development of one activity, such as swimming and archery, or of several closely related activities. Like recreation leaders, they sometimes oversee the work of nonprofessional workers.

After a few years' experience, recreation leaders and specialists may become recreation directors; those having graduate training, however, may start at this level. Directors are responsible for the operation of the facilities, staff supervision, and the development and execution of programs at a particular recreation center, as well as the preparation of budgets and the analysis of recreation programs.

Opportunities for advancement to administrative positions often are limited for persons who have no graduate training. However, it is sometimes possible to advance through a combination of education and experience. Administrative jobs require varying years of experience in full-time recreation work, depending upon the size of the community or organization and the program. For example, the minimum recommended experience to become a community recreation supervisor ranges from 1 to 5 years.

Employment Outlook

Employment of recreation workers is expected to increase very rapidly through the 1970's. Several thousand recreation workers will be needed annually for growth and to replace personnel who leave the field because of retirements, deaths, or transfers to other occupations. In recent years, the number of college graduates having a major in recreation has fallen far short of the demand, and this pattern is expected to continue. Thus, many new recreation workers will continue to be hired from the fields of social science, physical education, and health education. Persons having less than full professional training also will find employment opportunities. As a result of the great demand for recreation workers, part-time and volunteer personnel will be needed, particularly in social welfare agencies and at the local government level.

Factors that will contribute to growth include increased leisure time and rising levels of per capita income. As income levels rise, more persons will participate in a variety of competitive and noncompetitive sports and larger numbers will travel to parks and resorts for camping, hiking, fishing, and other recreational pursuits. In addition, improvements in the national highway system will make many State parks and national forests more accessible to vacationing families. Population growth also will create a demand for more recreation workers to expand existing recreation programs and to aid larger numbers of mentally and physically handicapped persons. Longer life and earlier retirements will increase the number of clubs and organizations for retired persons, and thus increase the need for recreation workers.

Other reasons for the anticipated longrun expansion in the number of recreation workers include a growing interest and participation in recreation activities by the general population; the continued trend toward urban living; the rise in industrial recreation activities as more companies promote recreation programs for their employees; increased attention to physical fitness by government, educators, industry and others; and the initiation of programs to insure the preservation of outdoor recreation areas. A number of recent Federal laws also will contribute to the rising demand for recreation workers. Among these are the Elementary and Secondary Education Act of 1965, which includes provisions for grants to local educational agencies for improving and expanding recreation opportunities for the educationally deprived; and the Older Americans Act of 1965, which provides grants to States for programs, including recreation, for older persons.

Earnings and Working Conditions

Beginning recreation leaders having a bachelor's degree earned between $6,600 and $7,500 annually in 1968, according to the

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National Recreation and Park Association. In the same year, the salaries of recreation supervisors ranged from $7,500 to $10,000, depending upon the size of the community in which they were employed and upon their qualifications. Salaries of recreation directors or superintendents generally ranged from $8,000 in some small communities to over $20,000 in many large cities. There were some regional variations in salary levels—higher salaries generally were paid in the West than in other areas of the country.

In 1968, the annual starting salary for inexperienced recreation workers in the Federal Government was $5,732 or $6,981, depending on their academic records or specialized training. Experienced recreation workers in Federal positions generally earned between $7,700 and $12,200 annually.

The average workweek for recreation workers is 40 hours, although some work upwards of 50 hours. A person entering the recreation field should expect some nightwork and irregular hours, for many recreation personnel work while other persons are enjoying their leisure time. Most public and private recreation agencies provide from 2 to 4 weeks' vacation and other fringe benefits, such as sick leave and hospital insurance.

Sources of Additional Information

Information about recreation as a career and about employment opportunities in the field may be obtained from:

National Industrial Recreation Association, 20 North Wacker Dr., Chicago, Ill. 60606.

National Recreation and Park Association, 1700 Pennsylvania Ave. NW., Washington, D.C. 20006.

Information about employment opportunities in Veterans Administration hospitals may be obtained directly from the hospitals or the Department of Medicine and Surgery, Veterans Administration, Washington, D.C. 20421.

SECURITIES SALESMEN

(D.O.T. 251.258)

Nature of the Work

Almost every time an investor buys or sells stocks, bonds, or shares in mutual funds, it is the securities salesman who puts the "market machinery" into operation. A salesman's services are required not only by the individual having a few hundred dollars to invest, but also by the large institution having millions. Securities salesmen are often called *customers' brokers*, *registered representatives*, or *account executives*.

In executing a buy or sell transaction, a securities salesman usually relays the order through his firm's order room to the floor of a securities exchange. In the over-the-counter market, he sends the security to his firm's trading department. After the transaction has been completed, the salesman notifies the customer to that effect. He also provides many kinds of related services for his customers. To an inexperienced investor, for example, he may explain the meaning of stock market terms and trading practices. For customers having a variety of holdings, the salesman may offer suggestions about the purchase or sale of a particular security. Customers' investment objectives vary. For example, an individual may prefer long-term investments designed to provide a steady income over the years or short-term investments which appear likely to rise in price quickly. Salesmen, therefore, may be called on to furnish information about the advantages and disadvantages of each type of investment. Salesmen often are expected to furnish the latest stock and bond quotations as well as information regarding the activities and financial positions of corporations.

Some salesmen perform these services for all types of customers; others deal solely with individual investors or institutional investors. Many specialize in certain kinds of securities. For example, a salesman may handle only transactions in municipal bonds or only shares in mutual funds. Salesmen employed by investment bankers and other firms which underwrite "new issues," such as the securities issued by corporations needing funds for plant expansion, may take part in the initial sale of these new securities.

Establishing a clientele is very important to the securities salesman's success. Most salesmen new to the occupation spend much of their time contacting potential investors and individuals who once did business with their firm, or seeking new customers in other ways. On the other hand, an experienced salesman may spend most of his time servicing the accounts of his established customers.

Places of Employment

In 1968, more than 135,000 men and women spent all or a part of their time selling securities. The great majority were men. Approximately three-fifths were full-time employees of securities firms, and most of these were salesmen. The rest—partners,

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branch office managers, security analysts, and others — spent only part of their time in sales activities. Other people who sold securities—roughly 55,000 in all—were men and women regularly employed in jobs outside the securities business; most of these persons sold shares in mutual funds in the evenings and on weekends.

Securities salesmen are employed by hundreds of brokerage firms, investment bankers, and mutual fund firms in all parts of the country. Many of these firms are very small. Most salesmen, however, work for a relatively small number of large firms that operate main offices located in big cities (especially in New York City), as well as approximately 6,000 branch offices.

Training, Other Qualifications, and Advancement

Almost all States require securities salesmen to be licensed. State licensing requirements vary: Personal bonds may be required or applicants may have to pass written examinations.

In addition, practically every salesman must be registered as a representative of his firm according to the regulations of the securities exchange or exchanges through which it does business, or the National Association of Securities Dealers, Inc. (NASD), or both. Before beginning salesmen can qualify as registered representatives, they must pass the Commissioner's general securities examination, or those prepared by the exchanges and/or the NASD. These examinations test their knowledge of the securities business. Character investigations also are required.

To assist their salesmen in meeting the requirements for registration, most employers provide training for beginners. In many firms, including all those which are members of the New York Stock Exchange, the training period lasts for at least 6 months. In large firms, training programs are sometimes quite elaborate. Trainees may receive classroom instruction in subjects such as security analysis and effective speaking, take courses offered by schools of business and other institutions and associations, and undergo a period of on-the-job training. Other training programs, particularly in small firms, may be relatively informal and brief. In programs of this type, the trainee may read assigned materials and observe other salesmen as they transact business.

Because a securities salesman must be well informed about economic conditions and trends, a college education is becoming increasingly important for beginners who seek to enter this field. Although employers seldom require specialized training, a degree in business administration or economics, or a background in liberal arts is regarded as good preparation for the work. Courses in finance and other subjects related to the securities business, available at colleges and universities throughout the country, also are helpful.

Many employers consider personality traits as important as academic training in specialized fields.Employers seek people who are well groomed, who possess the ability to deal with people, and who are ambitious and have a sense of responsibility. Because maturity also is important, many employers feel that it is desirable for prospective salesmen to have had experience in other jobs. Before being hired, applicants are sometimes given tests to determine their aptitude for this kind of sales work.

The principal form of advancement for securities salesmen is an increase in the number and the size of the accounts they handle. Beginning salesmen, who usually start by servicing the accounts of individual investors, eventually may handle very large accounts such as those of institutional investors. Some experienced salesmen may advance to branch office managers, who supervise the work of other salesmen while executing buy and sell orders for their own customers. A few salesmen may become partners in their firms or do other administrative work.

Employment Outlook

Employment opportunities for securities salesmen are expected to be good through the 1970's. Some new positions will be created to serve the growing number of individuals and institutions investing money in securities of all kinds. Most positions, however, will be vacancies that occur as salesmen retire or leave the occupation for other reasons.

The number of beginners who leave the occupation tends to be high because of the difficulty new salesmen have in establishing a clientele.

Employment of securities salesmen is expected to increase moderately during the 1970's. The number of individual investors and the funds they have to invest will continue to increase, not only because of economic growth and rising personal incomes, but because of a number of other factors. These include interest stimulated by the activities of investment clubs and associations, plans enabling small investors to make monthly payments toward the purchase of securities, and the increasing need for parents to set aside funds for their children's

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education and their own retirement. Institutional investors also can be expected to have more funds for investment in the future as more people purchase insurance; participate in pension plans; contribute to the endowment funds of colleges, universities and other nonprofit institutions; and deposit their savings in banks. Many more securities salesmen also will be needed to sell new securities issued by expanding corporations and by State and local governments which are financing the construction of new roads and other public improvements.

Earnings and Working Conditions

Trainees are usually paid a salary until such time as they are able to meet licensing and registration requirements. After registration, a few firms continue to pay a salary until the new salesman's commissions increase to a minimum amount. The salaries paid during the training period usually range from $400 to $500 a month; those employed in large firms receive somewhat higher salaries. Factors which help determine salary during the training period include locality of the firm and the individual's educational background, and his experience.

Once the salesman has completed his training, earnings are usually in the form of commissions from the sale and purchase of securities by customers. The size of the commission depends partly on the policies of the firm where the salesman works and partly on the type of security bought or sold, and whether it was traded on a stock exchange or in the over-the-counter market. Commission earnings may fluctuate a great deal because of extremes in market activity. When there is much buying and selling of securities, earnings are likely to be high; when there is a severe slump in market activity, the opposite is likely to be true. To provide their salesmen with a steady income, most firms pay a "draw against commission" —that is, a minimum salary based on the commissions which salesmen can be expected to earn—plus any commissions from additional sales. A few firms pay salesmen only a salary and bonuses which are usually determined by company business.

According to the limited data available, securities salesmen working full time generally earned between $8,000 and $17,000 a year in 1968. Many successful salesmen have incomes over $25,000 a year, however. Salesmen paid on a commission may also receive annual bonuses when business is good.

A securities salesman works in an office in which a great deal of activity occurs. In large offices, there are likely to be rows of salesmen sitting at desks in front of "quote boards" and wall screens, which continually flash information on securities transactions and prices. Most offices provide seats so that customers and others may watch the latest market developments.

Although securities salesmen are not usually required to observe fixed hours of work, many work approximately the same hours as others in the business community. Some salesmen must adjust their time to accommodate those customers who can meet with them only outside business hours—for example, at home in the evenings or on weekends.

Sources of Additional Information

Further information about the work of the securities salesman in firms which are members of the New York Stock Exchange and about the nature of the securities business is available from:

New York Stock Exchange, 11 Wall St., New York, N.Y. 10005.

Information about the investment banking business and sales positions with investment bankers may be obtained from:

Investment Bankers Association of America, 425 13th St. NW., Washington, D.C. 20004.

SOCIAL WORKERS

(D.O.T. 195.108, .118, .168, .208, and .228)

Nature of the Work

Development of a more complex urban society has greatly in-

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creased the need for organized social services. Social workers provide the link between these services, and individuals and families who are not able to provide for themselves or who need assistance in solving their problems.

The problems which concern social workers include poverty; broken homes; physical, mental, and emotional handicaps; antisocial behavior; racial tensions; and unsatisfactory community conditions such as inadequate housing and medical care, and lack of educational, recreational, and cultural opportunities. A variety of public and voluntary agencies have social work programs designed to meet specific needs in specific ways: for example, income maintenance programs; family and child welfare services; social services for the crippled, disabled, ill, and aging; and programs for the prevention of juvenile delinquency. Many social work agencies emphasize service to individuals or families; some place primary emphasis on working with larger groups; and still others are concerned mainly with the community's social welfare. These approaches are reflected in the three basic methods of social work practice: Casework, group work, and community organization. Many social workers use all three methods, but job titles usually reflect the primary method used.

Caseworkers identify the social problems of individuals and families through interviews. They aid them in understanding their problems and in securing necessary services, including financial assistance, foster care, and homemaker service. Group workers help people through group activities to understand themselves and others better, and to work with others to achieve a common goal. They plan and conduct activities for children, adolescents, and older persons in a variety of settings, including settlement houses, hospitals, homes for the aged, and correctional institutions. Community organization workers help plan and develop health, housing, welfare, and recreation services for a neighborhood or larger area. They often coordinate existing social services and organize fund raising for community social welfare activities.

The majority of social workers provide social services directly to individuals, families, or groups. However, a substantial number perform executive, administrative, or supervisory duties. Others are college teachers, research workers, or consultants. The wide range of services provided by social workers is suggested by the descriptions of the principal areas of social work which follow:

Social workers in family service positions in State and local governments and voluntary agencies provide counseling and social services that strengthen family life and help clients to improve their social functioning. They also advise their clients on the constructive use of financial assistance and other social services.

Social workers in child welfare positions in government and voluntary agencies improve the physical and emotional well-being of deprived and troubled children and youth. They advise parents on child care and child rearing, counsel children and youth with social adjustment difficulties, arrange homemaker services during a mother's illness, institute legal action for the protection of neglected or mistreated children, provide services to unmarried parents, and counsel couples who wish to adopt children. They may place children in suitable adoptive or foster homes or in specialized institutions.

Social workers employed by schools aid children whose unsatisfactory behavior or progress in school is related to their social problems. These workers consult and work with parents, teachers, counselors, and other school personnel in identifying and seeking a solution to the problems that hinder satisfactory adjustment.

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Social workers employed by hospitals, clinics, health agencies, rehabilitation centers, and public welfare agencies aid patients and their families with social problems accompanying illness, recovery, and rehabilitation. They usually function as part of a medical team composed of physicians, therapists, and nurses.

Some social workers provide services for patients in mental health centers, hospitals, or clinics. As members of teams composed of psychiatrists, psychologists, and other professional personnel, they develop and report information on the patient's family and social background for use in diagnosis and treatment. They help patients respond to treatment and guide them in their social adjustment to their homes, jobs, and communities. They have particular responsibility for helping the families of patients to understand the nature of the illness. Social workers also participate in community mental health programs concerned with the prevention of mental illness and readjustment of mental patients to normal home and community living. Some conduct research.

Social workers in rehabilitation services assist emotionally or physically disabled persons in adjusting to the demands of everyday living. As part of a rehabilitation team, which usually includes physical or occupational therapists, these social workers serve as a link with the community while patients are in the hospital; later, they help them adjust to home and community life. (Rehabilitation counselors, a related occupational group, are discussed in a separate statement.)

Probation and parole officers and other correctional workers assist persons on probation and parole and juvenile offenders in readjusting to society. They investigate the social history and background of the person under the jurisdiction of the court and make reports to the court to help the judge in his judicial decisions. They also counsel persons on probation or parole, may help them secure necessary education or employment, and direct them to other services in the community. They also seek to resolve problems in marital and parent-child relationships.

Places of Employment

About 160,000 social workers were employed in 1968; about 60 percent worked in State, county and city government agencies and about 5 percent were in Federal Government agencies. Most of the remainder were in voluntary or private agencies. A small number of experienced social workers from the United States were serving in other parts of the world as consultants, teachers, or technicians engaged in setting up agencies, schools, or assistance programs. They were employed by the Federal Government, the United Nations or one of its affiliated agencies, national professional associations, or voluntary agencies.

Training, Other Qualifications, and Advancement

A bachelor's degree, preferably in social welfare, generally is the minimum educational requirement for beginning jobs in social work. In most fields of practice, certain specialized areas require a master's degree in social work. For teaching positions, a master's degree in social work is required, and a doctorate is preferred. In research work, training in social science research methods is required, in addition to a graduate degree and experience in social work. In most States, beginners must pass a written examination in social work for employment in a government agency.

A master's degree in social work is awarded on successful completion of 2 years of specialized study and supervised field instruction in an accredited school of social work. Only graduates of these schools are eligible for membership in the National Association of Social Workers (NASW).

Social workers having 2 years of paid employment in social work under the supervision of a certified social worker and 2 years of membership in the National Association of Social Workers are eligible for certification as members of the Academy of Certified Social Workers (ACSW).

In 1968, 64 graduate schools of social work in the United States were accredited by the Council on Social Work Education. For admission to these schools, a student must have a bachelor's degree representing broad knowledge of the liberal arts, preferably including courses in economics, history, political science, psychology, sociology, and social anthropology. Courses in biology, statistics, writing, and public speaking also are helpful.

Many scholarships and fellowships are available for graduate education. More than three-fourths of the full-time students in graduate schools receive some scholarship aid granted either by the schools or by employing agencies. Some social welfare agencies, both voluntary and public, offer plans whereby workers are granted "educational leave" to obtain graduate education. The agency may pay the expenses or a salary, or both.

Personal qualities essential for social workers include emotional maturity, objectivity, sensitivity,

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a basic concern for people and their social problems, and the ability to form and sustain good working relationships and to encourage social adjustment in others. Students should try to obtain as much related experience as possible during high school and college to determine whether they have the interest and capacity for professional social work. They may do volunteer, part-time, or summer work in places such as camps, settlement houses, community centers, or social-welfare agencies. Some social welfare agencies, both voluntary and public, hire college students and, in some cases, high school students for nonclerical jobs in which the students assist social workers.

Employment Outlook

Employment opportunities for social workers are expected to be excellent through the 1970's. Despite the anticipated increase in the number of graduates of master's degree programs in social work, the demand for these highly trained social workers is expected to continue to exceed the supply. The outlook for persons having a bachelor's degree in social welfare or in related fields will continue to be very good. Qualified and experienced women who wish to work part time should have excellent employment prospects.

Many factors will contribute to the need for more social workers to maintain existing programs and to staff new ones. The occupational structure of the economy is expected to continue to change and create severe problems for many unskilled workers and others whose jobs have been replaced by machines. In addition, family life will continue to be affected by social change. Population growth, especially the increasing numbers of the very young and the very old, the age groups most in need of social work services, is expected to contribute to the demand for social workers. Many openings also will arise because of the need to replace workers who retire, die, or otherwise leave the profession.

Earnings and Working Conditions

In 1968, the median starting salary of new graduates of accredited social work programs was about $8,500, according to a survey conducted by the National Association of Social Workers. The median starting salary of those who entered community organization work was about $9,300; for those in group work it was about $8,500; and for caseworkers, about $8,200. Graduates without prior work experience had a median salary about $300 lower than for all graduates. The salaries offered by agencies to new graduates in the western states were considerably higher than in other regions.

According to a survey of selected occupations by the Public Personnel Association, the average starting salary paid social case workers by various State agencies was about $5,800. This figure, however, reflects very large numbers of persons who do not have a master's degree in social work. Case work supervisors in State agencies had average annual salaries ranging from $7,500 for those having little experience to about $9,800 for those having considerable experience. Salaries of psychiatric social workers averaged from $7,400 to $9,400; those of probation and parole officers averaged from about $6,600 to $8,400.

Salaries of social workers in a cross-section of cities and urban counties were, on the average, above those paid by State agencies. For example, according to the survey cited above, the average starting salary of social case workers in selected urban areas was about $6,300. Salaries of case work supervisors averaged $8,400 for those with little experience to about $10,500 for those with considerable experience. Beginning psychiatric social workers had average salaries of about $8,300; probation and parole officers averaged about $7,100 a year.

In the Federal Government in 1968, graduates of accredited schools of social work received a starting salary of $6,981 a year. Those with 1 year of experience under professional supervision received $8,462. Persons having a bachelor's degree or 3 years' experience in technical or investigative work in a welfare activity began at $5,732 a year.

The predominant scheduled workweek for social workers in 1968 was generally 40 hours; however, as many as one-third regularly worked 37½ hours or less a week. In some social work agencies, the nature of the work requires evening and/or weekend work, for which social workers usually receive compensatory time off. Virtually all social work agencies provide fringe benefits such as paid vacations and sick leave and retirement plans.

Sources of Additional Information

Information on admission requirements and scholarships in accredited graduate schools of social work and colleges offering preprofessional courses in social work, as well as on social work as a career, may be obtained from the National Commission for Social Work Careers of the National Association of Social Workers in cooperation with the Council on Social Work Education. Write to:

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National Commission for Social Work Careers, 2 Park Ave., New York, N.Y. 10016.

SOIL SCIENTISTS

(D.O.T. 040.081)

Nature of the Work

Soil scientists study the physical, chemical, and biological characteristics and behavior of soils. They investigate the soils both in the field and the laboratory and grade them according to a national system of soil classification. From their research, scientists can classify soils in terms or response to management practices and capability for producing crops, grasses, and trees, as well as their utility as enginneering materials. Soil scientists prepare maps, usually based on aerial photographs, on which they plot the individual kinds of soil and other landscape features significant to soil use and management in relation to land lines, field boundaries, roads, and other conspicuous features.

Soil scientists also conduct research to determine the physical and chemical properties of soils and their water relationships, in order to understand their behavior and origin. They predict the yields of cultivated crops, grasses, and trees, under alternative combinations of management practices.

Soil science offers opportunities for those who wish to specialize in soil classification and mapping, soil geography, soil chemistry, soil physics, soil microbiology, and soil management. Training and experience in soil science also will prepare persons for positions as farm managers, land appraisers, and many other professional positions.

Places of Employment

Most soil scientists are employed by agencies of the Federal Government, State experiment stations, and colleges of agriculture. However, many are employed in a wide range of other public and private institutions, including fertilizer companies, private research laboratories, insurance companies, banks and other lending agencies, real estate firms, land appraisal boards, State highway departments, State and city park departments, State conservation departments, and farm management agencies. A few are independent consultants, and others work for consulting firms. An increasing number are employed in foreign countries as research leaders, consultants, and agricultural managers.

Training and Advancement

Training in a college or university of recognized standing is important in obtaining employment, as a soil scientist. For Federal employment, the minimum qualification for entrance is a B.S. degree with a major in Soil Science or in a closely related field of study, and having 30 semester hours of course work in the biological, physical, and earth sciences, including a minimum of 15 semester hours in soils. Those having graduate training—especially those with the doctor's degree—can be expected to advance rapidly into a responsible and high paying position. This is particularly true in soil research, including the more responsible positions in soil classification, and in teaching. Soil scientists who are qualified for work with both field and laboratory data have a special advantage.

Many colleges and universities offer fellowships and assistantships for graduate training or employ graduate students for part-time teaching or research.

Employment Outlook

The demand is increasing for soil scientists to help complete the scientific classification and evaluation of the soil resources in the United States. One of the major program objectives of the Soil Conservation Service of the U.S. Department of Agriculture is to complete the soil survey of all rural lands in the United States. This program includes research, soil classification and correlation, interpretation of results for use by agriculturists and engineers, and training of other workers to use these results. Also, demand is increasing for both basic and applied research to increase the efficiency of soil use.

Earnings

The incomes of soil scientists depend upon their education, professional experience, and individual abilities. The entrance salary in the Federal service for graduates having a B.S. degree was $5,732 since July 1968. They may expect advancement to $6,981 after 1 year of satisfactory performance. Futher promotion depends upon the individual's ability to do high-quality work and to accept responsibility. Earnings of well-qualified Federal soil scientists with several years' experience range from $10,203 to $16,946 per year.

Sources of Additional Information

Additional information may be obtained from the U.S. Civil Service Commission, Washington, D.C. 20415; Office of Personnel, U.S. Department of Agriculture, Washington, D.C. 20250; or any

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office of the Department's Soil Conservation Service.

Also see statements on Chemists and Biologists.

SOIL CONSERVATIONISTS

(D.O.T. 040.081)

Nature of the Work

Soil conservationists supply farmers, ranchers, and others with This program includes research, soil classification and correlation, interpretation of results for use by agriculturists and engineers, and training of other workers to use these results. Also, demand is increasing for both basic and applied research to increase the efficiency of soil use.

technical assistance in planning, applying, and maintaining measures and structural improvements for soil and water conservation on individual holdings, groups of holdings, or on watersheds. Farmers and other land managers use this technical assistance in making adjustments in land use; protecting land against soil deterioration; rebuilding eroded and depleted soils; stabilizing runoff and sediment-producing areas; improving cover on crop, forest, pasture, range, and wildlife lands; conserving water for farm and ranch use and reducing damage from flood water and sediment; and in draining or irrigating farms or ranches.

The types of technical services provided by soil conservationists are as follows: Maps presenting inventories of soil, water, vegetation, and other details essential in conservation planning and application; information on the proper land utilization and the treatment suitable for the planned use of each field or part of the farm or ranch, groups of farms or ranches, or entire watersheds; and estimates of the relative cost of, and expected returns from, various alternatives of land use and treatment.

After the landowner or operator decides upon a conservation program that provides for the land to be used within its capability and treated according to the planned use, the conservationist records the relevant facts as part of a plan which, together with the maps and other supplemental information, constitute a plan of action for conservation farming or ranching. The soil conservationist then gives the land manager technical guidance in applying and maintaining the conservation practices.

Soil conservationist inspects range to determine effect of vegetation in controlling erosion.

Where Employed

Most soil conservationists are employed by the Federal Government, mainly by the U.S. Department of Agriculture's Soil Conservation Service and the Bureau of Indian Affairs in the Department of the Interior. Some are employed by colleges and State and local governments; others work for banks and public utilities.

Training and Advancement

A Bachelor of Science degree and a major in soil conservation or a related agricultural science constitute the minimum requirement for professional soil conservationists. Those who have unusual aptitude in the various phases of the work have good

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chances of advancement to higher salaried technical administrative jobs.

Employment Outlook

Employment opportunities for well-trained soil conservationists were good in 1968. Opportunities in the profession will expand because government agencies, public utility companies, banks, and other organizations are becoming interested in conservation and are adding conservationists to their staffs. Other new openings will occur in college teaching, particularly at the undergraduate level. In addition, some openings will arise because of the normal turnover in personnel.

Earnings

Since July 1968, soil conservationists having a bachelor's degree and employed by the Federal Government received $5,732 a year. Advancement to $6,981 could be expected after 1 year of satisfactory service. Further advancement depends upon the individual's ability to accept greater responsibility. Earnings of well-qualified Federal soil conservationists with several years' experience range from $10,203 to $16,946 a year.

Sources of Additional Information

Additional information on employment as a soil conservationist may be obtained from the U.S. Civil Service Commission, Washington, D.C. 20415; Employment Division, Office of Personnel, U.S. Department of Agriculture, Washington, D.C. 20250; or any office of the Department's Soil Conservation Service.

URBAN PLANNERS

(D.O.T. 199.168)

Nature of the Work

City dwellers today face a growing number of typically urban problems such as deteriorating business and residential areas, traffic congestion, inadequate parks and recreation facilities, shortages of suitable space for industrial development, and air pollution.

In addition, the growth of the suburbs has added increased pressure on the urban center to provide more and better transportation and parking facilities. Professional urban planners try to remedy these problems by developing comprehensive plans and programs for the growth and overall revitalization of urban communities. Urban planners visualize future conditions in the light of trends in population growth and social and economic change; they also estimate the community's long-range needs for land, housing, community facilities, transportation, recreation, business, and industry. The urban planner analyzes alternatives and proposes methods for achieving an efficient and attractive community within a framework determined by the community's elected governing body.

Before they can produce plans for long-range community development, however, urban planners must make detailed studies, including the preparation of maps and charts, which show the cur-

Urban planners check layout of community renewal plans.

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rent use of land for residential, business, and community purposes; the arrangement of streets, highways, and water and sewer lines; and the location of such community facilties as schools, libraries, and playgrounds. These studies also provide information on the types of industry in the community, population densities and characteristics, social features, income levels, employment and economic trends, and other related information.

After they have analyzed and evaluated the facts, urban planners design the layout of recommended facilities and land use and supervise the preparation of illustrative materials. They also prepare plans to show how their proposed programs can best be carried out and what the cost is likely to be. Much of their time is spent conferring with private land developers, civic leaders, and officials of public agencies who do specialized planning. They also may prepare materials for community relations programs, speak at civic meetings, and appear before legislative councils and committees to explain and defend their recommendations or proposals.

In small planning organizations having only one or two professional workers, the planners must be able to handle several kinds of work. In large organizations, which may have several dozen planners, each may specialize in an area such as physical design, survey and research, or community relations work. Some specialize in new town planning, the rehabilitation of city slum areas, or the reconstruction of rundown business districts.

Places of Employment

About 7,000 people were employed as professional urban planners in early 1968. The majority of urban planners are employed by governmental agencies, mainly city, county, and metropolitan regional planning organizations; a growing number are employed by various State governments and by the Federal Government. About one-fifth of the planners do consulting work, either independently in addition to their full-time job, or as an employee or partner in a private consulting firm providing services for private developers or for government agencies. Urban planners also work for large land developers or private research organizations and teach in colleges or universities.

Training, Other Qualifications, and Advancement

Employers consider a master's degree in planning the most desirable educational background for professional work in this field. In Federal agencies and in a growing number of other government agencies, 2 years of graduate work in city planning, or its equivalent, is required for most entrance level positions. However, young people having bachelor's degrees in city planning, architecture, landscape architecture, engineering, public administration, and some other social science fields also may qualify for entrance level positions.

In 1968, more than 50 colleges and universities awarded the master's degree in urban planning. For entrance into the programs, most schools require that students have undergraduate degrees in fields such as architecture, landscape architecture, engineering, economics, statistics, sociology, public administration, or city and regional planning. Nearly all schools require students to spend considerable time in workshop, laboratory, or studio courses, learning to analyze and solve practical problems in urban planning. Most schools require candidates for the master's degree to take 2 years of graduate work and to prepare a thesis or take a final comprehensive examination. A few schools have recently adopted a 3-year master's degree program. Nearly half of the schools require some practical experience or internship. This latter requirement is usually fulfilled by regular paid employment during summer months in a planning office approved by the school's faculty. A very few schools which stress physical design grant a master's degree on completion of 1 year of graduate work to students who hold a bachelor's degree in architecture or engineering.

Planners must have the ability to think in terms of spatial relationships and to visualize the effects of their plans and designs.

Planners also must be able to cooperate with others, since they sometimes encounter differing attitudes and viewpoints which must be evaluated and accepted or rejected with tact to achieve the desired goal. On occasion, they face the discouragement of seeing carefully designed plans fall through because of conflicting political interests or apathy. It is also important that they continue their professional studies in order to broaden their knowledge and keep abreast of new developments.

Beginners in urban planning offices are likely to spend some time doing routine work or making field surveys and compiling statistics required to make projections for future plans. As they become more experienced, workers may be assigned to outline proposed studies, write reports, design the physical layout of a

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large development, make statistical analyses and projections, or perform other duties which require a high degree of independent judgment. When they become senior planners and planning directors, urban planners are likely to spend much time in meeting with officials in other organizations, addressing civic groups, and supervising other professionals. Advancement often occurs through a transfer to a larger city, where the problems are more complex and the responsibilities for planning are greater.

Candidates for the position of urban planner in Federal, State, and local government agencies frequently must pass civil service examinations to become eligible for appointment. These examination are often advertised nationally and usually do not impose residence restrictions.

Employment Outlook

Employment opportunities for graduates having professional training in city and regional planning are expected to continue to be very good through the 1970's. Shortages of qualified planners have been reported in recent years, even though the number of graduates has been rising. In 1968, the American Society of Planning Officials estimated that there were about 2,000 vacancies in planning agencies because of the shortage of well-qualified planners. Although most openings will stem from the need to fill new planning positions, some also will result from the need to replace planners who transfer to other fields of work, retire, die, or leave the field for other reasons. This profession is expected to grow through the 1970's as more communities turn to professional planners for help in determining the most effective way to meet the rising requirements fro physical facilities that result from urbanization and growth in population. As urban communities continue to spill into neighboring areas or merge with other urban areas, open spaces for recreation disappear, smog and traffic problems multiply, and the need for more and better planned facilties becomes acute. Although many of the openings for planners will be with governmental agencies in fields such as health planning, model cities programs, and inter-government planning relations, urban planners also are being employed more and more by private enterprises.

Federal programs of financial assistance to communities for urban planning, for slum clearance and urban renewal, for beautification and open space land improvement, and for improvement of other local facilities will continue to stimulate the demand for planners. The construction of completely new cities and towns also is expected to contribute to a rising need for planners and for people in areas of interest related to urban planning.

Earnings and Working Conditions

Starting salaries of inexperienced planners having only a bachelor's degree in planning were between $6,800 and $7,800 a year in 1968. Starting salaries for persons having a master's degree were generally higher, ranging from $7,100 to $9,800 a year. Planners having a master's degree and 2 to 5 years experience earned annual salaries of between $8,500 and $12,000 or more. Salaries of Directors of Planning depend to a great extent on the size of the city in which they are employed. In 1968, the average annual salary for a Planning Director in a city of under 25,000 people was $11,700; however, some Directors in similar size cities earned annual salaries of over $17,000. In cities of over 500,000 people, the average annual salary of Planning Directors was $19,000 and ranged up to $30,000. Consultants are generally paid on a fee basis. Their earnings are often high and vary greatly according to their reputation and previous work experience.

In late 1968, the usual entrance salary for urban planners employed by the Federal Government was $8,462 a year. In a few cases, individuals having less than 2 years of graduate work or its equivalent were hired as interns at yearly salaries of $5,732 or $6,981, depending upon their academic records.

Since most planners work for government agencies, they usually have sick leave and vacation privileges, and are covered by retirement and health plans. Although most city planners have a scheduled workweek of 40 hours, they sometimes work in the evenings and on weekends because of the need to attend meetings with citizen's groups.

Sources of Additional Information

Additional information on planning and a list of schools offering training may be obtained from:

American Institute of Planners, 917 15th St., NW., Washington, D.C. 20005.

American Society of Planning Officials, 1313 East 60th St., Chicago, Ill. 60637.

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IV. OCCUPATIONAL OUTLOOK SERVICE PUBLICATIONS AND MATERIALS

In addition to the *Occupational Outlook Handbook,* a basic tool in career guidance, the Bureau of Labor Statistics also issues the *Occupational Outlook Quarterly* providing current information on occupational developments between editions of the *Handbook,* and the Occupational Outlook Report Series consisting of over 100 reprints of *Handbook* statements. Both publications assist young people seeking career information. In addition, the Bureau issues at regular intervals occupational outlook bulletins which give more detailed information than can be included either in the *Handbook* or *Quarterly.*

The Bureau of Labor Statistics also has published a *Counselor's Guide to Manpower Information, An Annotated Bibliography of Government Publications.* The bibliography, as the title suggests, lists the major occupational and other manpower publications of Federal and State government agencies that will be useful to counselors and others interested in trends and developments that have implications for career decisions. This bulletin, 1598, is available from the Superintendent of Documents, Government Printing Office, Washington, D.C., 20402, at $1 a copy.

The Bureau also has developed a visual aid for counselors entitled, *Looking Ahead to a Career.* It consists of either a set of 36 color slides or a filmstrip that shows the changing occupational and industrial mix and trends for manpower development, education, and training. The slides and filmstrip which have an accompanying narrative, are available directly from the Bureau of Labor Statistics Regional Offices; the slides cost $10 a set, the filmstrip $5.

Anyone wishing to receive the above materials or have his name added to the Bureau's mailing list for announcements of new publications should send the request, with his address, to the Bureau of Labor Statistics, U.S. Department of Labor, Washington, D.C. 20212.

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V. SOURCES OF ADDITIONAL INFORMATION OR ASSISTANCE

Persons using this publication may want more detail on the occupations discussed in the occupational reports, or information on fields of work which are not covered in this publication.

Suggestions as to sources of additional information on the occupations discussed are given in most of the occupational reports. In addition, several types of publications of the U.S. Department of Labor provide further information on topics such as earnings, hours of work, and working conditions. Other sources likely to be helpful include public libraries; schools; State employment services; business establishments; and trade unions, employer's associations, and professional societies. A brief description of each follows.

Public Libraries

These libraries usually have many books, pamphlets, and magazine articles giving information about different occupations. They also may have several books and current indexes which list the great numbers of publications on occupations, and the librarians may be of assistance in finding the best ones on a particular field of work.

Schools

School and college libraries and placement offices also often have extensive reading materials on occupations. In addition, placement officers and professors usually know of any local occupational information which has been assembled through special surveys made by schools or other community agencies. Also, professors can often give information about occupations related to the subjects they teach.

State Employment Services

Counselors in local public employment offices are in a particularly good position to supply information about job opportunities, hiring standards, and wages in their localities.

Business Establishments

Employers and personnel officers usually can supply information about the nature of the work performed by employees in their industry or business and the qualifications needed for various jobs, as well as other facts about employment conditions and opportunities. The names of local firms in a particular industry can be found in the classified sections of telephone directories or can be obtained from local chambers of commerce.

Trade Unions, Employers' Associations, and Professional Services

Frequently, these organizations have local branches; their officials can supply information relating to the occupations with which they are concerned.

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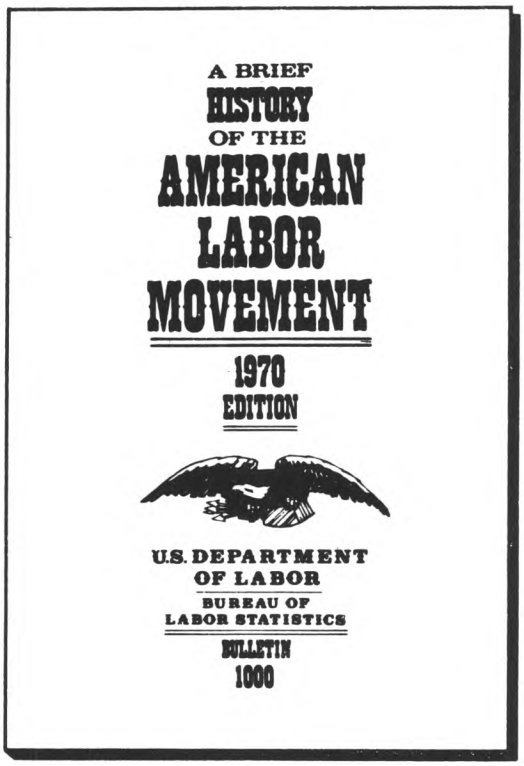

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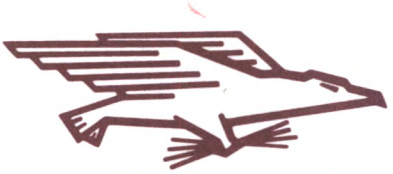

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