

Occupational Outlook Handbook

1963-64 EDITION

Career Information
for Use in Guidance

UNITED STATES DEPARTMENT OF LABOR

W. Willard Wirtz, *Secretary*

BUREAU OF LABOR STATISTICS

Ewan Clague, *Commissioner*



Pointers on Using the Handbook

To find out what is in this book and how it is arranged, see Guide to the Handbook, page 3.

To locate an occupation or industry in this book, see:

Table of Contents, page XI.

Alphabetical Index, page 775.

Edge Index. This index is designed to speed up the process of locating listings in the *Handbook*. Simple instructions on how to use the Edge Index are included on the yellow page in the center of the book.

For a general view of work and jobs in the United States, read the chapter on Choosing a Career—The Economic Framework, page 10.

Forecasts of the future are precarious! In interpreting the statements on the outlook in each occupation, keep in mind the points made on page 4.

The job picture is constantly changing. To find out how you can keep your information up to date, see the chapter on Where To Go for More Information or Assistance, page 6.

You may need local information too. This book gives facts about each occupation for the United States as a whole. For suggestions on where to get information for your own locality, see page 8.

OCCUPATIONAL OUTLOOK HANDBOOK

EMPLOYMENT INFORMATION ON MAJOR OCCUPATIONS FOR USE IN GUIDANCE

1963-64 Edition

A Revised Edition of the
HANDBOOK is published
every 2 years

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UNITED STATES DEPARTMENT OF LABOR
W. Willard Wirtz, Secretary
BUREAU OF LABOR STATISTICS
Ewan Clague, Commissioner



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This volume was prepared by the Bureau of Labor Statistics, U.S. Department of Labor, with the cooperation of the following offices of the Department—

Office of Manpower, Automation, and Training
Seymour L. Wolfbein, Director

Bureau of Employment Security
Robert C. Goodwin, Administrator

Women's Bureau
Esther Peterson, Director

Bureau of Apprenticeship and Training
Edward E. Goshen, Director

Bureau of Labor Standards
Arthur W. Motley, Director

and the—

U.S. Department of Agriculture

U.S. Department of Health, Education, and Welfare

Foreword

This new and revised edition of the Department of Labor's *Occupational Outlook Handbook* provides current information on nearly 700 kinds of jobs. For those planning their careers or seeking their first jobs, this *Handbook* is a reliable guide to the qualifications and conditions governing a vast range of American employment.

This book makes several direct points. The most important is that the young jobseeker today will find—regardless of occupational choice—that opportunities for employment and advancement are directly related to the quality and the kind of skill he or she possesses. The technological change that has reduced the number of production jobs by nearly 700,000 between 1957 and 1962 has also lifted entrance requirements and upgraded qualifications needed across the entire economic range. A high school diploma, once a standard of competence in employment, has become a minimum requirement. The difference in potential earnings over a lifetime between a high school graduate and nongraduate has been estimated at \$50,000. But more important to the individual, the trained and skilled employee is also the person with a rewarding and fulfilling job.

In its sum, this *Handbook* also suggests that the pattern of working life has undergone a fundamental change in recent years. A man's career started tomorrow will probably cover a series of different jobs, each requiring the acquisition of a different or a new skill, before his eventual retirement. Even within the same occupations, there is hardly one that will not demand of those who practice it continued periods of education and training to keep pace with change.

In its scope and range, the list of occupations in this volume reflects the achievement of America's past. Perhaps in no other nation have so many choices been open to so many millions of individuals. But one may find here as well the aspirations of the future in the complex and highly specific occupations for space and scientific development. Whether we fully realize those aspirations will depend upon the decisions that our young people make. We hope that this guide assists them—as it has others in the past—in that most basic decision of all, the selection of a satisfying and rewarding career.

W. WILLARD WIRTZ, *Secretary of Labor*

Prefatory Note

This sixth edition of the *Occupational Outlook Handbook* is designed to provide the occupational information young people need to help them in career planning. It presents a reappraisal of the employment outlook in the occupations and industries discussed in the fifth edition of the *Handbook*, together with the most recent information available in early 1963 on earnings, training requirements, and other related topics. In addition, the occupational coverage of the *Handbook* has been significantly expanded. This edition includes a new chapter on counseling which includes employment outlook statements on three specialized areas: School, vocational, and rehabilitation counseling. Other occupations that have been added are cashiers, floor covering installers, gasoline service station attendants, hospital administrators, industrial designers, landscape architects, oceanographers, shipping and receiving clerks, surveyors, technical writers, and urban planners.

This *Handbook* reflects the results of more than two decades of research by the Occupational Outlook Service, which was established in the Bureau of Labor Statistics by the Congress in 1940. The first edition of the *Handbook* was published in 1949, with subsequent editions in 1951, 1957, 1959, and 1961. Provision has been made by the Congress for the maintenance of the *Occupational Outlook Handbook* on a regular basis. Two related publications are also published regularly by the Occupational Outlook Service—a periodical, the *Occupational Outlook Quarterly*, which provides a continuous flow of current information between editions of the *Handbook*; and the *Occupational Outlook Report Series*, a set of reprints of the *Handbook* statements on different fields of work.

The Bureau of Labor Statistics wishes to acknowledge with gratitude the cooperation received in connection with the preparation of the *Handbook* from hundreds of officials in industry, labor organizations, trade associations, professional societies, government agencies, educational institutions, and other organizations. Without their help the quality of the *Handbook* could not be maintained.

EWAN CLAGUE, *Commissioner of Labor Statistics*

Letter From the American Personnel and Guidance Association

It seems appropriate that during this 50th anniversary year of vocational guidance the new *Occupational Outlook Handbook* should be published with an unprecedented number of employment outlook statements—nearly 700. The great number of occupations and industries covered illustrates the need for vocational guidance. The American economy has become so complex and rapidly changing that neither our youth nor their elders can be expected to be sufficiently well informed on the basis of their own experiences and observations to insure wisdom of vocational selection. The *Handbook* is invaluable in collating a significant amount of vocational information in a single volume and in reflecting new areas of employment as well as those which are expanding or declining.

It pleases me especially to note that this edition of the *Handbook* introduces a new chapter on the field of counseling covering three specialized areas—school, vocational, and rehabilitation. Certainly all these counselors as well as teachers and the many others who work with youth should have their own copy of this book. And I urge all guidance personnel to make sure they have available the most recent edition of the *Handbook*. Indeed, it is possible for some occupations to become obsolete or changed in character between editions of the *Handbook*. I am told, for example, that one of the new occupations, that of programmer, which appeared for the first time in the 1959 edition of the *Handbook* carries with it the seed of change. While growing in employment now, new technological developments suggest that the computer may soon become, in part, its own programmer, and the character of the occupation may change significantly.

On behalf of the American Personnel and Guidance Association, I would like to take this opportunity to congratulate the Bureau of Labor Statistics and its *Occupational Outlook Handbook* staff for maintaining comprehensive coverage and a high quality of research for the *Occupational Outlook Handbook* and its companion periodical, the *Occupational Outlook Quarterly*.

WILLIS E. DUGAN, *President*
American Personnel and Guidance Association

Letter From the Veterans Administration

The Veterans Administration has been actively engaged in the counseling, training, and rehabilitation of veterans since Congress established its vocational rehabilitation and education programs over 20 years ago. The *Occupational Outlook Handbook* was created to satisfy the need for current and reliable occupational information for use in these Veterans Administration counseling and training activities. It has developed over the years into a basic resource of the whole counseling field and is used equally effectively in counseling not only veterans but also schoolchildren and other youth, the nonveteran handicapped, the unemployed, and those who would like to make a vocational change. All of these groups require sound occupational information. They need an accurate picture of each kind of work under consideration, the different entrance requirements, preparation needed, advancement possibilities, information on employment outlook, and authoritative estimates of probable earnings. These needs are expertly satisfied by the *Occupational Outlook Handbook*.

The Veterans Administration commends this *Handbook* to all counselors as a major source of occupational information. It is with real respect for its qualities that this agency has supported its development and encourages its continuation and extensive use.

J. S. GLEASON, JR.
Administrator of Veterans Affairs

Letter From the Department of Defense

The *Occupational Outlook Handbook* is of considerable value in preparing members of the Armed Forces for their return to civil life. Many of those who are serving only limited periods of time in the Armed Forces, as well as those persons who are completing lengthy periods of service and who are planning to enter the civilian labor force upon their retirement, seek advice and assistance in planning their future civilian careers. Such advice and assistance is needed not only near the termination of their military service but also at those times when servicemen are making decisions with respect to their participation in off-duty education programs which are available to them throughout their military careers. The *Occupational Outlook Handbook* is a primary source of information for these purposes. It is on the basis of our experience with this valuable publication that we are most eager to commend it to all who are concerned with career planning.

EDWARD L. KATZENBACH, JR.
*Deputy Assistant Secretary of
Defense for Education*

Letter From the Bureau of Employment Security

The Bureau of Employment Security again welcomes a new edition of the *Occupational Outlook Handbook*—the sixth and the most comprehensive yet issued. This *Handbook* has long been a necessary tool in carrying out the counseling functions of the Employment Service and will be in even greater use as its programs continue to expand. A copy of the *Handbook* is available for reference in each of the 1,900 local employment service offices.

In 1962, nearly 10½ million job seekers came to the local employment service offices and a record 7 million placements in nonagricultural jobs were made, a postwar high. Many who come to the Public Employment Service for help in finding a job need counseling and more than 2 million counseling interviews were conducted last year. One of the difficulties faced by most people in choosing a vocation is insufficient exposure to the variety of opportunities open to them. If left alone, they measure themselves only against the kind of work done by others with whom they come in close contact, and they may choose their job without consideration of other possibilities. An orderly and comprehensive comparison of one field with another is desirable, and the *Occupational Outlook Handbook* makes this possible with a minimum of effort for the counselor.

ROBERT C. GOODWIN, *Administrator*
Bureau of Employment Security

Letter From Vocational Rehabilitation Administration

The *Occupational Outlook Handbook* has proved to be an invaluable reference in the 90 State vocational rehabilitation agencies. In the rehabilitation process, where the ultimate goal is suitable employment for the handicapped, the counselor needs facts on training and other job requirements and on employment opportunities in a wide variety of occupations. With the continuing growth of rehabilitation counseling, there will be an increasing need for up-to-date vocational information of high quality. The Bureau of Labor Statistics is to be congratulated for providing such information through its editions of the *Handbook*.

MARY E. SWITZER, *Commissioner*
Vocational Rehabilitation Administration
Department of Health, Education, and Welfare

Contributors

This *Handbook* was prepared in the Bureau of Labor Statistics, Division of Manpower and Occupational Outlook, Sol Swerdloff, Chief, under the general direction of Harold Goldstein, Assistant Commissioner for Manpower and Employment Statistics. Mary Corre, counseling specialist, served as advisory consultant.

The general planning of the *Handbook* was done under the direction of Cora E. Taylor, Chief of the Branch of Occupational Outlook and Specialized Personnel, who also provided general supervision over the research program on professional, technical, clerical, sales, service, and related occupations. The research and preparation of the chapters on these fields of work were carried on under the direct supervision of Morton Levine, Jane H. Palmer, and Howard V. Stambler.

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Some photographs were supplied by various Federal Government agencies as shown by the credit lines accompanying the pictures.

Note

A great many trade associations, professional societies, unions, and other organizations in industry are in a position to supply valuable information to counselors or young people seeking information about careers. For the convenience of users of this *Handbook*, the reports on separate occupations or industries list some of the organizations or other sources which may be able to provide further information. Although these references were assembled with care, the Bureau of Labor Statistics has no authority or facilities for investigating organizations. Also, since the Bureau has no way of knowing in advance what information or publications each organization may send in answer to a request, the Bureau cannot evaluate the accuracy of such information. *The listing of an organization, therefore, does not in any way constitute an endorsement or recommendation by the Bureau or the U.S. Department of Labor, either of the organization and its activities or of the information it may supply.* Such information as each organization may issue is, of course, sent out on its own responsibility.

The occupational statements in this Handbook are not intended, and should not be used, as standards for the determination of wages, hours, jurisdictional matters, appropriate bargaining units, or formal job evaluation systems. These descriptive statements are presented in a general, composite form and, therefore, cannot be expected to apply exactly to specific jobs in a particular industry, establishment, or locality.

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OCCUPATIONAL OUTLOOK HANDBOOK

Using the Handbook in Guidance Services

The *Occupational Outlook Handbook*, now in its sixth edition, has become an invaluable tool in school guidance and placement programs. Over the years, as both the *Handbook* and guidance services have matured, they have become mutually dependent on each other.

In the guidance field, the *Handbook* is used by several groups. At the college level, the counselor educator explains its contents to counselor trainees to help them understand specific job patterns, characteristics of related occupations, and trends affecting the nature and number of jobs. More important, the counselor educator teaches the future counselors to use this reference in everyday guidance activities.

At the secondary school level, the teacher of occupations finds this volume organized and written in such readable language that his students can use it as a reference book in understanding different kinds and levels of work, and in discovering information about careers of personal interest.

However, at both secondary and collegiate levels, the *Handbook* is most valued by the counselor on the job, and the student who seeks help in choosing a career. The counselor utilizes all available facts about the youth sitting across the desk, and about the jobs that might be suitable for him.

J. A. Stratton, president of the Massachusetts Institute of Technology, said, over 4 years ago, that half of all we knew in science had been learned in the past 10 years, and that our scientific knowledge would double in the next 5 years and continue to multiply at an ever-increasing rate. How true his predictions have been to date! Consequently, most occupations which are affected by scientific knowledge—and what job is not?—

will be subject to change. As work patterns move with the times, worker functions, too, will shift.

Since many occupations which will be important a decade hence have not yet evolved, a student with some years of preparation before him may be encouraged to elect a broad program of courses and perhaps identify a general area of interest such as science, social studies, or art. Specialization may be delayed until a later date. The further he goes in school, the more time he will have to select his major field. The more familiar he is with areas of work as described in the *Handbook*, the better prepared he will be to plan his own future as he goes along.

Most of the career information in the *Handbook* follows a uniform outline: Nature of Work; Where Employed; Training and Other Qualifications; Employment Outlook; Earnings and Working Conditions; and Where To Go for More Information. The comprehensive coverage includes basic information from which the counselor can deduce values that contribute to job satisfaction. Planning for the future requires interpretation of economic facts, anticipation of the effect of science and invention on various vocational fields, and estimates of changing occupational emphasis. Few counselors possess this information and the ability to correlate it for use in the guidance program. The *Handbook* does part of the job and also enables the counselor to assist the student in considering vocational goals or areas which will utilize his strongest potentials—intelligence, special talents, personality, interests, and values.

School counselors all over the country use the *Handbook* as one of their essential tools. It is

among the few volumes they keep on their desks for constant reference. One counselor-trainer reports that she always cautions her counselors-in-training: "Don't rely on your memories for facts about occupations. Consult the *Handbook*." Surely the counselor who fails to avail himself of this and other materials published by the Occupational Outlook Service lacks some of the most authentic and current data about occupations.

The *Occupational Outlook Handbook* is frequently used by counselors in conferring with students who have completed a vocational interest test and find certain occupational areas indicated by test results. The use of the reference makes it easy to refer a pupil to a number of occupations related to his vocational goals. For many counselors, this book is their first reference, and from this as a start they encourage the use of other materials.

The various descriptions of occupations included in the *Handbook* are also available as reprints. Counselors may place these under specific occupational headings in their reference file and make them available to individual students who express interest in particular occupations.

Counselors use the *Handbook* and related materials not only with students but also in helping parents to counsel their children. Here the reprints are especially valuable, as they may be borrowed easily for home reading.

The *Handbook* should broaden each student's background of occupational information and understanding of the important factors influencing occupations, thus helping him to develop desirable and satisfying plans for the future. Careful study of it by counselors, parents, and pupils should help them to realize the many ways in which occupations are changing, growing, and declining. Such realization will emphasize the need for flexible planning for the choice of a major interest area as well as related occupations to which these interests and abilities may lead.

Guidance services are permissive in nature and should always be available in career planning. As a student matures and jobs evolve, making the counselor function, in the present, one of effecting a compatible union of worker and work at some time in the future. Intelligent use of this book can give a counselor the assurance that after he understands what the counselee brings to his potential vocation, he can suggest the various areas of work which will meet these qualifications. A wise counselor and the *Handbook* make a good team.

FRANK L. SIEVERS, *Director*
Guidance and Counseling Programs Branch
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Guide to the Handbook

This book answers many questions young people ask when they are interested in choosing an occupation. It gives information on occupations—on the employment outlook in each field, the nature

of the work, training and other qualifications needed for entry, lines of advancement, where jobs are located, and earnings and working conditions.

How the Handbook Is Organized

Introductory Chapters

The *Handbook* starts with three introductory chapters designed to help counselors and students make effective use of the book and to give them a general view of the world of work.

This chapter, the Guide to the Handbook, describes the contents and organization of the book. It tells how the information was assembled and discusses a number of points which need to be borne in mind in interpreting the statements. The second introductory chapter gives suggestions regarding supplementary sources of occupational information and tells how readers can keep up to date on developments affecting the employment outlook in different occupations. It also contains a brief description of the counseling, placement, and other services available to jobseekers at local offices of State employment services affiliated with the U.S. Employment Service. The final introductory chapter describes some of the most important trends in population and employment, both past and prospective, and provides a background for interpreting the reports on particular occupations.

Occupational Reports

The reports on different fields of work make up the main body of the book. They are arranged in

chapters dealing with groups of related occupations. These chapters are grouped, in turn, into seven major divisions of the book: Professional, administrative, and related occupations; clerical and sales occupations; service occupations; skilled trades and other manual occupations; some major industries and their occupations; occupations in agriculture; and occupations in government.

Indexes and Appendix

To help readers locate information on the occupations in which they are interested, a list of the occupational reports is included in the table of contents at the front of the book. The index at the back of the book lists occupations and industries alphabetically. An edge index has also been introduced to facilitate locating reports. (See yellow page insert.)

The technical appendix contains a discussion of the sources and methods used in analyzing the occupational outlook in different fields of work. It is designed for readers wishing more information on this subject than is included in the present chapter. The appendix also contains an explanation of the D.O.T. numbers given in the occupational reports, to indicate where each occupation fits into the classification system of the *Dictionary of Occupational Titles*.

Some Important Facts About the Occupational Reports

Occupations Covered

The nearly 700 occupations discussed include those of greatest interest to young people. Most of the large ones requiring long periods of education or training are discussed, as are a number of small but rapidly growing fields and other occupations of special interest. Altogether, the occupations covered account for about 90 percent of all workers in professional and related and in sales occupations; nearly as high a proportion in skilled occupations; over half in clerical and in service occupations (outside private households); and smaller proportions in administrative and semi-skilled occupations. The main types of farming are also discussed.

General information on many fields of work not covered in the occupational reports is contained in the introductions to the major divisions of the book. These introductions are also designed to aid the reader in interpreting the reports on individual occupations.

Sources of Information

Information on employment trends and outlook and the many related topics discussed in the occupational reports was drawn from a great variety of sources. It is based in part on extensive field investigation carried out by the Bureau of Labor Statistics professional staff; interviews with hundreds of persons in industry, unions, trade associations, and public agencies provided a wealth of up-to-date information. In addition, the Bureau's other research programs supplied data on employment in different industries, productivity and technological developments, wages and working conditions, trade union agreements, industrial hazards, and a number of other topics. Other agencies of the Federal Government—among them, the Bureau of Apprenticeship and Training and Bureau of Employment Security in the Department of Labor; the Bureau of the Census of the Department of Commerce; the Office of Education of the Department of Health, Education, and Welfare; the Civil Service Commission; the Interstate Commerce Commission; the Civil Aeronautics Administration; and the Federal Commu-

nications Commission—provided additional data regarding the nature of the work in various occupations, training and licensing requirements, wages, and employment trends. Many other public and private organizations—including State licensing boards, educational institutions, business firms, professional societies, trade associations, and trade unions—also made available published and unpublished data and supplied much helpful information through interviews.

After the information from these many sources was brought together and analyzed, conclusions were reached as to prospective employment trends in the occupations. In addition, estimates were made of the numbers of job openings which will be created by retirements and deaths. The supply of new workers likely to be available in particular fields was also analyzed, by studying statistics on high school and college enrollments and graduations and data on the numbers of apprentices in skilled trades.

Preliminary drafts of the occupational reports were reviewed by officials of leading companies, trade associations, trade unions, and professional societies, and by other experts. The information and conclusions presented in each report thus reflect the knowledge and judgment not only of the Bureau of Labor Statistics staff but also of leaders in the field discussed, although the Bureau, of course, takes full responsibility for all statements made.

Points To Bear in Mind in Using the Reports

In using the information which this book contains about employment prospects, it is important to keep in mind that all conclusions about the economic future necessarily rest on certain assumptions. Among the assumptions stated on page 10, which underlie the statements on employment outlook in this *Handbook*, are that high employment levels will be maintained and no cataclysmic events will occur. A catastrophe such as a war or a severe and prolonged economic depression would, of course, create an entirely different employment situation from that likely to develop under the assumed conditions. But young

people would find it impossible to build their lifetime plans in expectation of such unpredictable catastrophes, though, on the basis of historical experience, they must be prepared to weather economic ups and downs during their working lives.

To avoid constant repetition, the assumptions are seldom mentioned in the reports on the many fields of work where the impact of a general decline in business or a change in the scale of mobilization would probably be about the same as in the economy as a whole. On the other hand, in the statements on occupations where employment tends to be either unusually stable or especially subject to ups and downs, these facts are indicated. Even in the latter occupations, however, long-term trends in employment are more important than short-run fluctuations in appraising the outlook in connection with an individual's choice of a lifetime career.

The picture of employment opportunities given in this book applies to the country as a whole unless otherwise indicated. People who want supplementary information on job opportunities in their communities should consult local sources of information, as suggested in the next chapter.

The information presented on earnings and working conditions, as on other subjects, represents the most recent available when the *Handbook* was prepared early in 1963. Much of the information came from Bureau of Labor Statistics surveys, but many other sources were also utilized. For this reason, the earnings data presented in the various occupational reports often refer to different periods of time, cover varying geographic areas, and represent different kinds of statistical measures. Comparisons between the earnings data for different occupations should, therefore, be made with great caution.

Finally, it should be borne in mind that information on occupations and the employment opportunities they offer is only part of that needed in a career decision, which means matching a person and an occupation. The other part relates, of course, to the aptitudes and interests of the potential worker himself. People can obtain help in assessing their own abilities and interests and in selecting the occupation for which they are best suited from vocational counselors in schools and colleges, State employment service offices, Veterans Administration regional offices and guidance centers, and many community agencies.

Where To Go for More Information or Assistance

Persons using this *Handbook* 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, including periodicals described on pages 790-792, provide further information on topics such as earnings, hours of work, and working conditions. Other sources likely to be helpful include the following:

Public Libraries

These libraries usually have many books, pamphlets, and magazine articles giving information about different occupations. They may also 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 libraries and guidance offices often have the same kinds of reading materials on occupations. In addition, school counselors and teachers usually know of any local occupational information which has been assembled through special surveys made by schools or other community agencies. Teachers of special subjects such as

music, printing, and shorthand 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. (The services available through the public employment offices are described in the concluding section of this chapter.)

Business Establishments

Employers and personnel officers can usually 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 Societies

Frequently, these organizations have local branches, with officials who can supply information relating to the occupations with which they are concerned.

Keeping Up To Date on the Occupational Outlook

This edition of the *Handbook*, like all previous editions, incorporates the most recent occupational information available when the book was prepared for publication early in 1963.

The Bureau of Labor Statistics also issues a periodical, the *Occupational Outlook Quarterly*, to keep readers up to date between editions of the *Handbook*, on developments affecting employment

opportunities and on the findings of new occupational outlook research. In addition, the Bureau issues at irregular intervals occupational outlook bulletins which give much more detailed information on various fields of work than can be included either in the *Handbook* or in the *Occupational Outlook Quarterly*. Further information about these publications, and directions for ordering them, will be found on page 790.

The Bureau will be glad to place the name of any user of this *Handbook* on its mailing lists to receive announcements of new publications and releases summarizing the results of new studies. Anyone wishing to receive such materials should send the request, with his address, to the Bureau of Labor Statistics, U.S. Department of Labor, Washington, D.C., 20210.

Services to Jobseekers at Public Employment Offices

Many of the readers of this *Handbook* want assistance in choosing a suitable type of work and in finding the right job. The reader who wants professional assistance from trained employment counselors should know about the services of his local public employment office.

The U.S. Employment Service and affiliated State employment services form a nationwide organization which plays an important part in our economy. Through 1,900 local offices in cities and towns throughout the United States, this employment service finds jobs for workers and workers for jobs.

Although the employment service is a Federal-State system, each employment office is basically a local community organization. It is concerned with facilitating suitable and stable employment for the community's working population and with adequately meeting the manpower needs of employers. The local office tries to do more than merely refer a worker to a job—it tries to match the worker and job so that the requirements of each are satisfied. To do this, the public employment office has developed a number of services that are available to all jobseekers. Many of these are particularly important to young men and women entering the world of work for the first time.

Counseling Services

Employment service counseling assists young people who are starting their careers, as well as experienced workers who wish or need to change their occupation, in choosing and adjusting to a suitable field of work.

The major purposes of employment counseling are to help people gain insight into their actual and potential abilities, their interests, and their personal traits; to understand the nature of occupations; and to make the best use of their capacities and preferences in the light of available job opportunities.

In the employment service, the counselor has a great store of resources, including testing facilities and labor market and occupational information.

Testing. Most local offices provide testing services, including the General Aptitude Test Battery which measures basic abilities for many and varied broad fields of work and for about 850 specific jobs within these fields. These tests help the applicant appraise his abilities. They may reveal aptitudes the jobseeker did not know he had.

Labor Market Information. The State employment office counselor has information about jobs in the community. He knows what kinds of jobs prevail in local industry, which jobs are more plentiful, what the hiring requirements and the opportunities for promotion are, and what the jobs pay. In many labor market areas, the counselor has information about future occupational opportunities, based on area skill surveys which usually cover employers' forecasts of their long-range requirements. He may also have detailed occupational guides covering specific jobs in the community. Since his office is a part of the nationwide employment service, the counselor also has information regarding employment opportunities in other areas throughout the country.

Occupational Information. The employment service office has occupational information which helps the job applicant decide whether he is suited to a particular kind of work. The *Dictionary of Occupational Titles*, *Job Descriptions*, *Estimates of Worker Traits for 4,000 Jobs*, and other compilations describe the work performed in various occupations and the training required, lines of advancement, physical demands, and working conditions for most occupations. Recent publications of the type on file in the employment offices include: Occupations in Electronic Data-Processing Systems, Technical Occupations in Research, Design, and Development Considered as Directly Supporting to Engineers and Physical Scientists, and Selected Occupations Concerned with Atomic Energy.

Cooperative Arrangements With Other Community Groups. Local employment office counselors work closely with other public and private agencies and organizations which provide special services that the jobseeker may need in order to become better prepared for employment. These groups include educational, training, vocational rehabilitation, and health and welfare agencies.

Placement Services

The primary objectives of the placement service in the local employment office are to fill employers' job openings with occupationally qualified workers and to locate for workers employment which is suited to their skills, knowledge, and abilities. The employment office placement service is designed to eliminate the waste of "hit-or-miss" job hunting.

The public employment offices provide jobseekers not only with assistance in finding employment but also with information on the basic elements for getting and holding a job. The employment service personnel explain what to look for in a job; what the sources are for job leads; how to plan for job hunting; how to prepare for an interview with an employer; what information and papers to have ready; and what the proper attitude and dress should be.

Local Openings. State employment office personnel maintain regular contacts with local employers and know their hiring needs and their jobs.

Placement interviewers receive requests from employers for all kinds of workers. Through the local office, therefore, the job applicant has access to a variety of job vacancies with many employers, just as the employer has access to many applicants. When no suitable job exists for an individual worker, the employment service may attempt to solicit an opening for him from likely employers.

Jobs Throughout the Country. The job clearance system of the nationwide network of State employment offices offers the applicant an opportunity to apply for jobs outside his area, elsewhere in the State and the Nation, and even in foreign countries. Each State employment service prepares frequent inventories of hard-to-fill jobs which are distributed to all other State employment services. This makes it possible for them to refer local workers to out-of-area jobs for which they qualify. In addition, a national network of highly specialized professional placement offices has been established with the State employment service to speed the matching of jobs and applicants in professional fields.

Placement Aids. As in counseling, the information on local job opportunities for industries, occupations, and areas, and on occupational requirements which is available in the employment offices contributes greatly to getting the right job for the worker and the right worker for the job. Also available to the jobseeker are aptitude and proficiency tests which help determine whether an applicant is qualified to perform satisfactorily on specific jobs.

Services to Special Worker Groups

The employment service has developed techniques and procedures for particular applicant groups who may encounter special problems in their search for suitable jobs.

For young people, special services include counseling graduating students and school dropouts, and intensive efforts to promote employment opportunities. In many cities, employment service offices have cooperative arrangements with high schools to provide counseling, testing, occupational information, and placement services to sen-

iors prior to their graduation, as well as to those who leave school earlier. More than 10,500 high schools had such arrangements in the school year 1961-62.

The State employment offices have long maintained an active program for helping applicants with vocational handicaps. The emphasis is on what these people can do with their abilities rather than on what they cannot do because of a disability.

Special services for veterans are provided by the employment service. In each local office, there is a veterans' representative who is fully informed regarding veterans' rights and benefits and who carries on job promotion for veterans. In addition, he assists veterans in making use of the usual counseling, placement, and other services provided by local office staff.

The employment service also has developed techniques to deal with job problems of middle-aged and older workers. Special attention is given

to assist them to make realistic job choices and to overcome problems related to getting and holding a job. Employers have been encouraged to remove age restrictions on hiring and to hire only according to the qualifications of the individual.

Similar attention is also given to job problems of members of minority groups and others facing special difficulties in obtaining suitable employment.

How To Locate the Local Employment Office

The addresses and telephone numbers of local offices of State employment services affiliated with the U.S. Employment Service may be found in local telephone directories. Jobseekers, employers, schools, and public and private agencies aiding clients to find employment are invited to utilize the services of the public employment offices in their communities and to avail themselves of the job information maintained in these offices.

Choosing A Career—The Economic Framework

In considering the choice of one's life work, economic developments—past, present, and future—become of vital importance as a background against which to evaluate individual interests and abilities. Counselors, teachers, parents, and others who assist young people in making their vocational choices need to understand the factors which will affect future employment opportunities and careers. Young people themselves may want to gain a greater understanding of the forces at work which are likely to shape their work lives. This chapter of the *Handbook* is, therefore, addressed to them as well as to those who may counsel them. It describes past trends and anticipated changes in those aspects of our economy which strongly influence employment opportunities—changes in population, work force, industries, and occupations. It also discusses the implications of these developments for education and training in relation to occupational choice.

Of course, some aspects of the future are easier to predict than others. For example, the number of people who will be 18 years old in 1975 can be estimated with a very high degree of accuracy, because these are the individuals counted as 3-year-olds in the Census of 1960. Their number in 1975 will be affected only by the number who die before then, and this can be estimated quite accurately from past experience. On the other hand, forecasting employment of automobile assemblers in 1975 is extremely difficult since their employment depends not only upon population growth—which affects both the supply of workers and the demand for automobiles—but also on changes in buyers' preferences (toward European or American makes, for instance, or toward "compact" or "economy" models); changes in production methods which may use fewer workers or different kinds of workers in the future; changes in the level of overall economic activity, employment, and personal income; and other developments outside of the automobile industry that are almost impos-

sible to foresee. Nevertheless, reasonable estimates of employment based on the best information available are much better than sheer speculation. And the longer the training period required to prepare for the occupation, and the greater the expense, the more important is an awareness of the possible future employment picture.

Although no one can accurately forecast all the developments of the future, it is possible to project trends and to estimate, at least in broad terms, future levels of employment in many industries and occupations. To do this, however, requires not only basic factual data, but certain given conditions or assumptions, as well. The picture of future employment as reflected in this *Handbook* is based on four fundamental assumptions:

(1) That a higher rate of economic growth will be achieved and that high general levels of employment will be realized over the long run, even though there may be temporary recessions;

(2) that there will be no major war but that, at the same time, the defense program, including maintenance of the Armed Forces, will continue at about the current level;

(3) that scientific and technological advances will continue; and

(4) that there will be no abrupt change in work patterns and trends of the population, or in the fundamental economic structure of the United States.

Starting with these assumptions and making use of detailed information collected from a great variety of sources, this *Handbook* attempts to provide answers to some questions of major importance to students as they make educational and vocational plans.

Some of these questions are: What kinds of jobs will there be? What industries will provide which kinds of jobs? What fields of work look especially promising? What competition will one face from other workers?

Of particular importance also is an understanding of the dynamic changes going on in our economy. New ways of making things, new products, and new patterns of living are continually causing changes in the kinds of jobs available to workers. This process of change calls for a broad foundation of training and education, so that, if a shift in plans becomes necessary, a transition from one occupation or field of work to another may be made more easily.

To throw light on the changing character of occupational life and to provide background for an understanding of the trends and outlook in particular occupations, the next few sections will review the growth and changing composition of the Nation's population as a whole and of that portion of the population that makes up the work force. The discussion will also tell something about the major trends in employment in broad industry and occupation groups.

The Population and the People Who Work

The Population

Work and jobs exist because there is a population to be served. The larger the population, the more needs there are to be met, hence more jobs. The changing age composition and other characteristics of the population will also affect to some extent the kinds of goods and services that will be needed, which in turn will influence the kinds of jobs that will develop.

The basic fact about our population is its enormous growth since the beginning of our life as an independent Nation. The first census, in 1790, counted 4 million people (only half the population of New York City today) occupying 889,000 square miles of territory. During the first 150 years of our history, from 1790 to 1940, the population grew to 132 million people, occupying 3 million square miles.

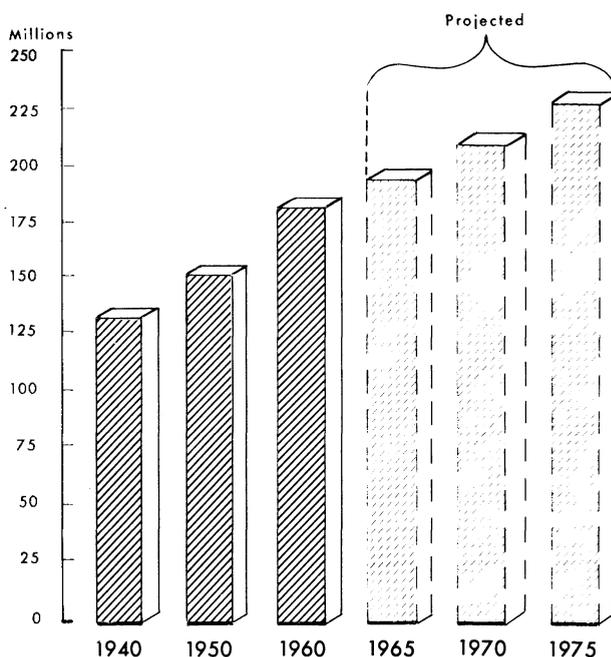
The growth in population was particularly rapid in the several decades preceding World War I, when there was a combination of a high birth rate, large-scale immigration principally from European countries, and a sharp reduction in death rates. After World War I, the rate of population increase slackened for two principal reasons—the birth rate declined and our immigration laws were so changed that the flow of people coming to the United States as immigrants virtually stopped. During the depression years of the 1930's, there was an especially sharp decrease in marriages and therefore in births because of widespread unemployment, low incomes, and limited job opportunities. The low birth rates of the depression years are reflected clearly in the age distribution of the working population today, and will continue to result in a shortage of experi-

enced, middle-aged workers right through this decade.

Since most of the young people using this book were born after 1940, this discussion of population changes will concentrate on what has happened since the beginning of World War II. Chart 1 shows recent and anticipated population changes.

CHART 1

POPULATION WILL REACH 226 MILLION IN 1975—
25 PERCENT MORE THAN IN 1960.....



Source: Data for 1940-60, U.S. Bureau of the Census; projections: U.S. Bureau of Labor Statistics

During the war years, but particularly after 1945, when young veterans began to return home, the birth rate rose spectacularly. In 1947, 3.8 million births were recorded, compared with fewer than 2.5 million a year during the late 1930's. Since that time, the rate has remained high, with the number of births passing the 4 million mark in 1954 and continuing to rise until 1961, then declining slightly in 1962. The 1960 Census counted 180 million people, almost 50 million more than 20 years earlier; by 1975, the population is expected to reach a total of 226 million, or an increase of 45 million in only 15 years.

The presence of so many young people in the population has changed its age distribution considerably since 1940. For example, people under 14 then equaled 23 percent of the total population, but by 1960 this age group had risen to almost 30 percent. It will drop only a little (to 28 percent) between 1960 and 1970 and remain at about that level through 1975 (table 1). The population declines have been in the age groups which are the primary suppliers of experienced workers. In 1940, the broad age group from 25 to 44 was 30 percent of the total population; by 1960, it had dropped to 26 percent and by 1970, it will have dropped still further to 23 percent, almost the exact reverse of the changes that took place in the young group, over the same period of time. After 1970, of course, as today's flood of young people grow older, the proportion of those age 25-44 in the total population will begin to rise again.

TABLE 1. PERCENT DISTRIBUTION OF POPULATION, BY AGE, 1940-75

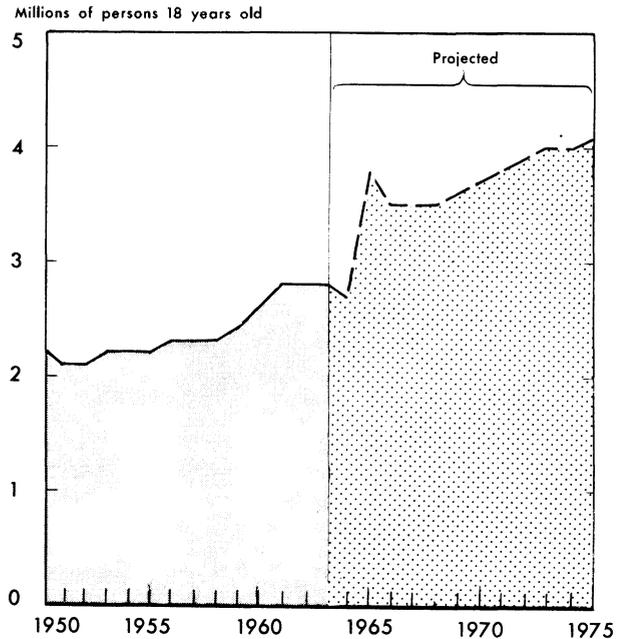
Age	1940	1950	1960	1965	1970	1975
Total population.....	100.0	100.0	100.0	100.0	100.0	100.0
Under 14 years.....	23.1	25.4	29.5	28.8	28.0	27.7
14-19 years.....	11.2	8.5	9.0	10.6	11.0	10.9
20-24 years.....	8.9	7.7	6.1	7.0	8.2	8.4
25-34 years.....	16.2	15.8	12.7	11.5	12.0	13.7
35-44 years.....	13.9	14.2	13.4	12.6	11.1	10.0
45-54 years.....	11.8	11.5	11.4	11.4	11.3	10.6
55-64 years.....	8.1	8.8	8.7	8.8	9.0	9.0
65 years and over.....	6.8	8.1	9.2	9.4	9.6	9.8

SOURCE: U.S. Department of Commerce, Bureau of the Census, *Current Population Reports*, Series P-25, No. 98, and Series P-25, No. 187.

Of most immediate significance to young people now making their occupational plans is the number who will be reaching age 18 during the

CHART 2

NUMBER OF PERSONS REACHING AGE 18 WILL BE MUCH HIGHER EACH YEAR AFTER 1964.....



Source: U.S. Bureau of the Census.

present decade. To look back for a moment, in 1955, young people 18 years old totaled only 2.2 million. In 1960, they totaled 2.6 million, but, by the mid-1960's, a spectacular rise will occur and bring the number to 3.8 million in 1965. These are the post-World War II babies growing up, and their numbers are a measure of the competition for college education or other advanced training and for jobs that every 18-year-old will have to face. After a slight decline, the number of 18-year-olds will again rise to reach 4.1 million in 1975. (See chart 2.)

For the majority of young people, age 18 is a crucial turning point. It is the age at which most of them graduate from high school, if they do not drop out before, and either go on to further education or training or start to work on a full-time basis. Some may decide on full-time work and part-time school or on full-time school and part-time work. Many girls will decide to marry. Whatever the specific decision, it will be, for most young people, as vital a one as they will ever make.

The People Who Work

Statisticians often use terms whose meanings are not obvious and need to be explained. One of these terms, which is used frequently in the *Handbook*, is "labor force." This group of people is only a part of the total population. First, no one under 14 years of age is counted in this group because child labor and school attendance laws generally make it illegal for children under this age to hold regular jobs. Among persons 14 and over, only two groups are counted as being in the labor force: (1) Persons who work, either as full-time or part-time employees (including those in the Armed Forces) or as self-employed; and (2) persons who are unemployed and actively looking for work.

From 1960 to 1975, the labor force will grow even faster than the population as a whole, mainly because of the large number of young people reaching working age. From 73 million in 1960 the labor force is expected to grow, by 1975, to 93 million, an increase of 20 million or 27 percent. At the same time, the population will grow about 25 percent. This 20 million is, of course, only the *net* increase over this period. The total number of new workers entering the labor force will far exceed this figure. Those under 25, alone, will equal 42 million in the 15-year period. The difference between the total entering or reentering and the net growth of the labor force represents persons absorbed into the labor force as replacements for those workers who, during the same 15 years, will have died, retired, or left for other reasons, such as disability or, among women, for marriage or to take care of children.

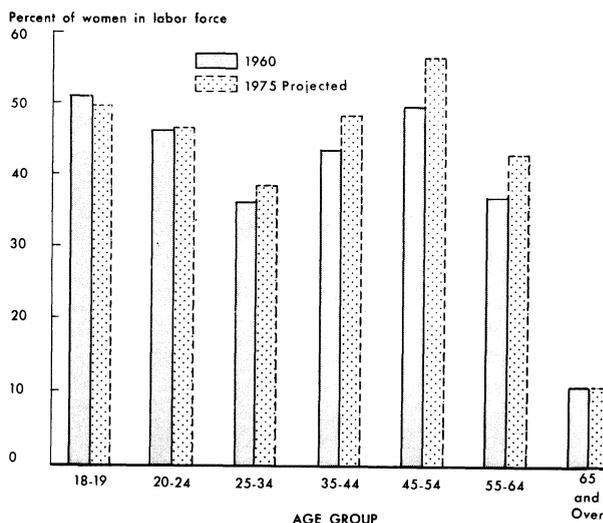
Thus, the first notable characteristic of the work force during the next 10 to 15 years will be the presence of much larger numbers of young people than in the past, despite the fact that higher proportions of youth are remaining in school longer. Second will be the continuing importance of women workers. Young people under 25 will account for almost half of the net increase of 12.5 million in the labor force between 1960 and 1970. Their proportion in the labor force will rise from less than 19 to more than 23 percent. From 1970 to 1975, workers from 25 through 34 years of age will account for the greatest increase. However, over the 15-year period from 1960 to 1975, young people under 25 and adult women over 25

will, together, account for two-thirds of the net increase in the labor force. Young girls just finishing school and planning for their future should therefore realize the implications of the increasing proportion of women over 25 years of age in the United States who will be in the work force. The proportion is declining only in the 18-19 age group and this results primarily from increasing college enrollment. (See chart 3.)

Based on studies by the Bureau of Labor Statistics, most girls can expect the following life pattern as they move from school to middle and old age. Most unmarried girls will go to work at age 17 or 18 (unless they go to college). Within 3 or 4 years, most of these girls will marry. Some of them will then stop working for pay in order to get a new home organized, but a majority will continue to work, either to help put a husband through school, to supplement a husband's income, or to permit purchase of a home, a car, or labor-saving equipment. Then, when the first baby arrives, the vast majority of young mothers give up their jobs and remain out of the labor market until their youngest child is old enough to go to school. It is true that as many as 1 in 5 women with preschool-age children do continue to work, usually because of economic necessity, but the general pattern is that the age group 25-34 supplies the lowest proportion of women workers.

CHART 3

PROPORTION OF WOMEN WHO WORK CONTINUES TO RISE



When the youngest child no longer needs constant care, the trek of mothers back to paid employment begins. This usually happens when the women are approaching their middle thirties, after they have been nonwage earners for about 8 to 10 years. Once back, the tendency is for them to remain in the labor force, perhaps not continuously, but certainly for a substantial proportion of their years to age 65. By 1975, nearly half of all women between 35 and 65 will probably be either working or looking for work. Unless things change radically and unexpectedly in the years ahead, the highest participation rate will be among women age 45 to 54. (See chart 3.)

These comments have concentrated on the life pattern of married women because these women will be in the vast majority. But for the girl who remains single—and 1 in 10 does—the length of her working life will be little different from that of a man. Since most single women must support themselves, and often parents or other relatives, they must continue to hold a job. The “work-life expectancy,” as it is often referred to, looks like this for women: For single women, 40 years at work; for childless married women, about 30 years; and for married women with children, somewhat less. Girls, then, may well give serious thought to the kind of work they want to do and can do best.

The Kinds of Jobs There Will Be

What can young people anticipate about the kinds of jobs that will be available? In what industries will the jobs be found? Just as the size of our work force has changed sharply over the years, so has the size and character of major industries, and these changes greatly affect employment opportunities and occupational choice. Some industries which flourished at the turn of the century are all but gone; others unknown 50 years ago are now among the largest employers. Two dramatic examples of the new industries are aircraft and chemicals. But even these are now old, compared with those in the spacecraft and missile fields and in the production and servicing of electronic equipment. There is little doubt that there are industries and occupations which are so small now as to be hardly noticeable but which will, one day, become major fields of employment.

Changes in Important Industries

Most people, when thinking about what they want to do for a living, think in terms of a specific occupation such as secretary, airplane mechanic, clerk, doctor, machinist, truckdriver, or carpenter, rather than in terms of industrial activities such as manufacturing, retail trade, or construction. This being the case, it might seem more logical to discuss the trends in major groups of occupations first rather than trends in major industries. Although it is true that the occupation *is* of pri-

mary interest, the same occupation often exists in so many different industries that the individual can better visualize the broader opportunities if he first finds out something about industry trends. Knowing these trends, he can then decide not only on the occupation to train for, but what industries offer the best possibilities for using that occupational training.

Farming

The terms “technology” and “mechanization” bring to mind images of great auto assembly plants or oil refineries or an army of robots doing man’s work. Actually, however, the greatest technological revolution in the United States has taken place on the farm. A hundred years ago, more than half of the Nation’s workers were engaged in agriculture. Today, only 1 worker in 12 makes his living from farming, either as a farm owner or as a laborer. The implications of this fact are enormous. In 1870, the average farmer could supply food for only about 6 people; today, 1 farmer can meet the food needs of 27 people.

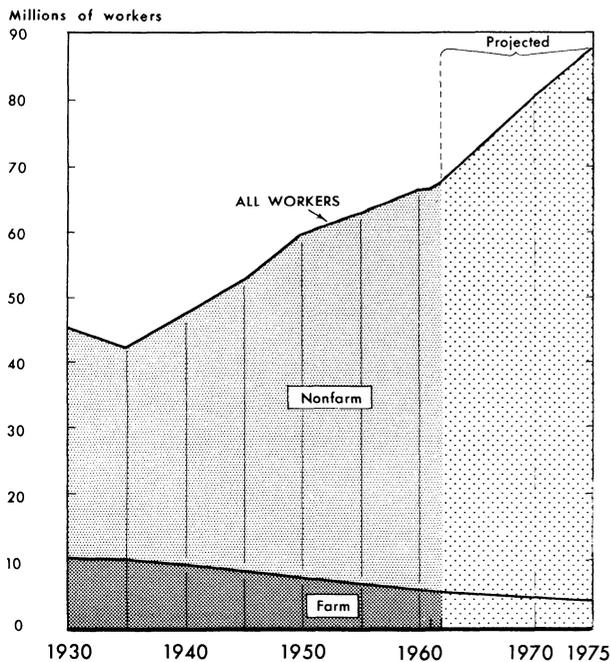
We can readily see why this has been possible. Today’s farmer has machinery which enables him to put into use much greater acreage than a man could handle in 1870. This has contributed to the great growth in size of individual farms. Moreover, the replacement of horses and mules by trac-

tors and trucks in both the city and on the farm has freed millions of acres for the production of food for human beings instead of for livestock. The use of scientific methods, chemicals, fertilizers, better seeds, and improved cattle and hogs has also greatly increased farm productivity.

As a result of these many changes, farm employment has continued to decline to the present. Chart 4 shows this decline since 1930. From 10.3 million farm workers, the number has dropped by about one-half to 5.2 million in 1962. By 1975, the total will have dropped still further, to about 4 million, less than 4.5 percent of the labor force. In view of this continuing decline and the competition from large farms, the young man who has been dreaming of making a living by operating his own small family acreage may want to consider training for something else. Many scientific and professional occupations and specialized services associated with agriculture are developing rapidly and offer greater economic promise than farming on a small scale.

CHART 4

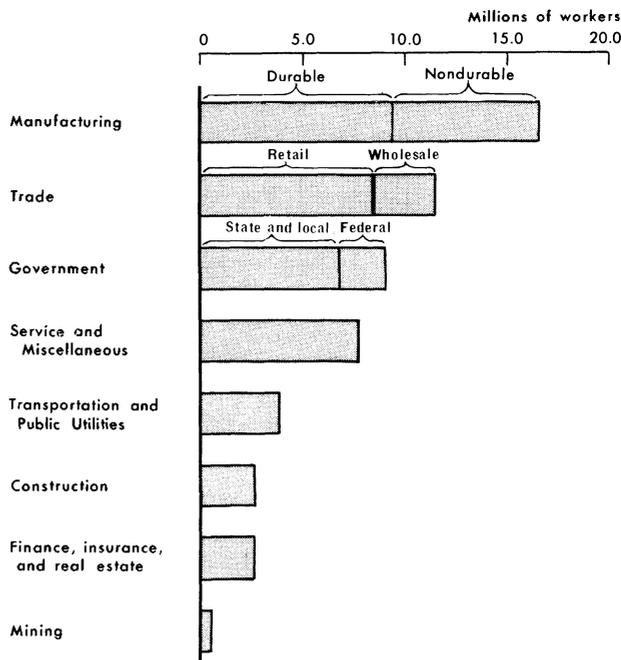
MORE WORKERS IN BUSINESS AND INDUSTRY — FEWER ON FARMS.....



Source: Data for 1930-1962, U.S. Bureau of the Census, projections: U.S. Bureau of Labor Statistics.

CHART 5

EMPLOYMENT IN EIGHT MAJOR INDUSTRY GROUPS, 1962....



Nonfarm Industries

Most workers are employed in industries other than farming; in fact, more than 90 percent now earn their living in one of the following major types of activity: Mining, manufacturing, construction, transportation and public utilities, trade, finance, service, and government. These are broad designations referred to as "industry groups" by the Bureau of Labor Statistics and other Government agencies that collect and publish information on employment. (See chart 5.) Each of these groups includes a variety of individual industries, and in each industry there are many different kinds of jobs. One should not think of "trade," for example, only in terms of clerks selling things over the counter, or of "manufacturing" as offering only jobs on an assembly line, or of "service" as being mainly waiting on tables in a restaurant or pressing a suit in a dry cleaning shop.

The number and kind of jobs in any specific industry will depend on whether the industry is growing or declining, and what kind of processes and machines it uses to carry out its work. Actu-

ally, a young person making his work choice will be most interested in whether employment in an industry is increasing or decreasing, and whether or not workers are available to perform the tasks in that particular industry.

We can get some idea of how the eight major industry groups have been changing in the past 40 years by looking at some figures which the Bureau of Labor Statistics has been collecting directly from employers over that period. First, the total number of employees in all eight groups has practically doubled, and in 1962 averaged more than 55 million. But the same amount of growth did not occur in each of the eight groups. Employment in transportation and public utilities, for example, hardly grew at all, despite the tremendous jump in air and bus travel. There are now only half as many jobs in mining as there were 40 years ago. On the other hand, the service industries, government employment, construction, and wholesale and retail trade grew very rapidly. Employment in government is now more than three times what it was in the early twenties and in the services almost three times what it was 40 years earlier. In both construction and wholesale and retail trade, employment has more than doubled. Employment in manufacturing, while continuing to expand, grew more slowly, increasing little more than $1\frac{1}{2}$ times since 1922. A closer look at some aspects of each broad industry group will help to show what each has to offer in terms of employment prospects.

Although *manufacturing* as a whole has not grown at as fast a rate as some others, it still employs many more people than any of the other seven industry groups. In 1962, about $16\frac{3}{4}$ million people earned their living in the multitude of occupations found in this very diversified segment of the economy. "Operative" jobs, the biggest group in manufacturing, provide work for 2 out of every 5 manufacturing employees and include three or four main types of semiskilled workers:

(1) Those who operate machines or equipment used in manufacturing;

(2) those who assemble various parts to make a single final product such as a radio or television set;

(3) those who inspect and test the product to see that it is made properly and will work satisfactorily;

(4) those who serve as helpers to more skilled workers—such as the stationary fireman who helps the skilled stationary engineer run and repair the steam boilers in a plant.

There are many other kinds of jobs in manufacturing besides operatives—machinists, engineers, stenographers, production managers, tool and die makers, traveling salesmen, and unskilled laborers, to name a few.

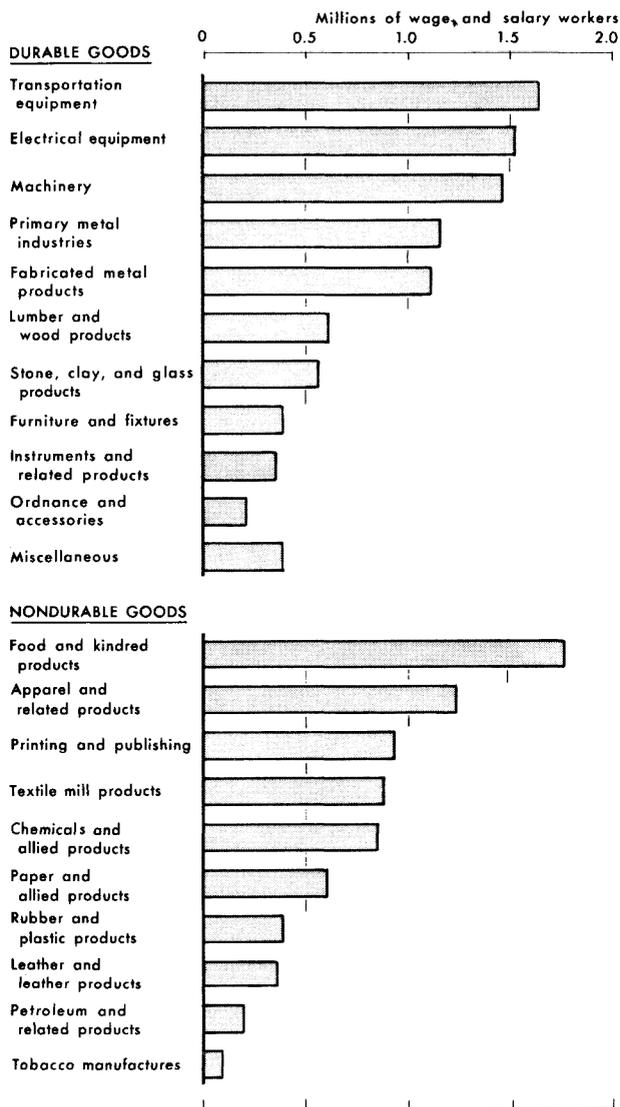
The number of people employed in the different branches of manufacturing is shown in chart 6. The industries making durable goods (things that last a long time), such as machinery, refrigerators, and automobiles, employed a total of almost $9\frac{1}{2}$ million people in 1962. The nondurable-goods manufacturers, who process food, make clothing, print newspapers, and produce many other things that are used up quickly, employed almost $7\frac{1}{3}$ million people. Employment in the durable-goods branch was highest in those industries producing machinery and transportation equipment (autos, aircraft, ships, and railway cars) and electrical equipment and supplies, and was lowest in industries making such specialized items as instruments and ordnance (guns, ammunition, etc.). Employment in the nondurable-goods branch was highest in food and clothing, and the fewest workers were employed in making cigarettes and other tobacco products.

The second largest industry group in 1962 was *retail and wholesale trade*, employing about $11\frac{1}{2}$ million people, almost three-fourths of them in the retail branch. Although various kinds of sales jobs make up the largest group of these employees, the industry also has jobs for large numbers of clerical workers, truckdrivers, delivery men, elevator operators, porters, packagers, and often repair services of various kinds. Wholesale and retail trade has been a "growth" industry—its present employment being more than double its number 40 years earlier. One of its significant features is the fact that it employs high proportions of women in both full-time and part-time jobs, principally in retail sales work, and is one of the principal "absorbers" of middle-aged and older women who are reentering the labor force.

In 1962, *government* was the third largest employer, with more than 9 million workers. Three-fourths of these workers were State and local employees, such as teachers, policemen, firemen,

CHART 6

EMPLOYMENT IN MAJOR BRANCHES OF MANUFACTURING, 1962.....



sanitation workers, and welfare workers. As the population continues to rise, the need for more and more of such workers will increase and will continue the long-range upward trend. The 6.8 million people who were working for State and local governments in 1962 were three times the number so employed 40 years earlier. Federal employment, which rises to higher levels in times of war, has been stabilized at close to 2 million since the end of the Korean conflict. As in other indus-

tries, there is considerable turnover in the Federal service and the government often finds it necessary to put on special recruitment programs for young professional and clerical workers.

In 1962, the *service industries* stood fourth among employers, providing jobs for more than 7¾ million people. These millions were employed in such diverse places as auto and other kinds of repair shops, laundries, dry cleaning establishments, hotels, barber shops, theaters, movie production, advertising firms, and a host of others. The service industry group has also been one of the fastest growing and is now almost three times its size 40 years ago. This reflects a very important fact about our way of life—that as we grow and prosper, higher and higher proportions of people will be engaged, not in manufacturing, but in performing the multitude of services that make life more pleasant and easier for people generally.

The remaining 4 of the 8 major industry groups employed far fewer people in 1962, about 10 million all together. The largest of the four was *transportation* (trains, buses, trucks, airplanes, ships), *communications*, and *public utilities* (telephone, telegraph, gas, and electric light and power) with a total of almost 4 million workers. Despite the many new activities in this general area and all the new inventions involved, this group is one of the slowest growing in overall employment, with the number now employed virtually the same as 40 years ago. This reflects the great decline in railroad employment, owing to mechanization, competition from other forms of public transportation and the increased use of private automobiles, and the increasing mechanization in many other branches of the industry group.

Employment in the *finance, insurance, and real estate* group reached 2.8 million in 1962, more than 2½ times the number 40 years ago. This group of industries, although not one of the largest, is growing rapidly. Some of its growth has a direct relation to the building of new homes, and the phenomenal increase since the depression of the 1930's in installment buying and credit facilities has contributed to its expansion. Most of the jobs are white-collar ones, and almost half of the employees are women.

The *contract construction industry* includes the building of such structures as homes, factories, schools, public buildings, office buildings, apart-

ment houses, roads, bridges, and dams. In the past 40 years, employment in this industry has more than doubled, reflecting again the rapid growth of the Nation's population and industries. In 1962, this industry employed 2.7 million people (almost all of them men), half of them skilled craftsmen. Employment in construction fluctuates greatly, from one season to another and also from year to year, reacting to business activity generally. When business conditions are good, people buy new homes and companies invest in new plants; when business is slack, businessmen and private citizens both tend to put off this kind of spending. Every year, when the weather turns bad, outdoor work declines. Sometimes, as during a war, resources of material and skills go into construction of camps, defense plants, and ships, and private building may almost cease. This happened during World War II, but after 1947, the accumulated, unsatisfied civilian demand boosted construction employment by about 50 percent over the next 10 years. Maximum employment in any single year of the past decade, however, occurred in 1956 when it reached almost 3 million.

Other than agriculture, *mining* is the one industry group where a decline in jobs has persisted over many years. Employment was 647,000 in 1962, only about half of what it was 40 years ago. Mechanization of coal mining and competition from other sources of fuel and power have combined to reduce employment significantly in this industry group. The silent, abandoned coal mines that scar so much of West Virginia, Illinois, Kentucky, and western Pennsylvania are mute evidence of rapid decline in this industry whose deep pits once produced the fuel that fed the furnaces of American industry.

The Industrial Forecast

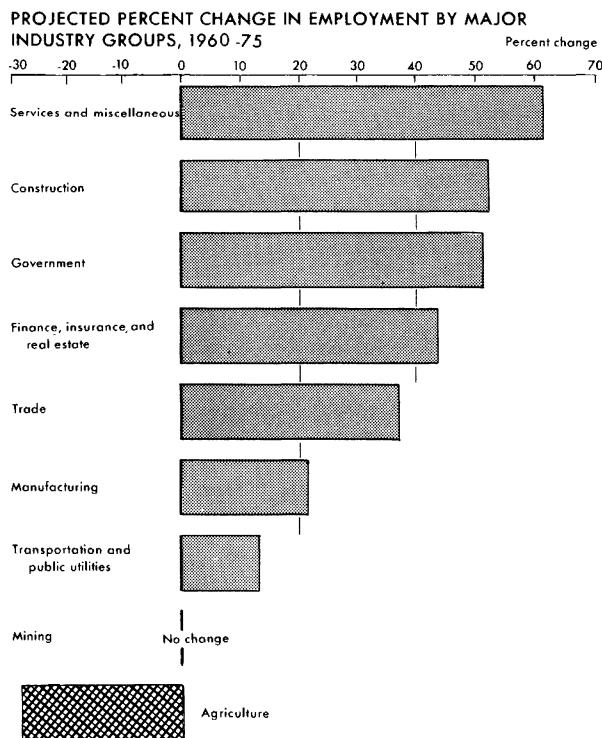
The preceding paragraphs tell where American industry stood in 1962. They describe what has happened over a period of years and illustrate the point that changes occur at varying speeds and often in different directions. What is perhaps more important for those about to choose a career, however, is "What can be expected to happen next?" What industries will employ the expected increase of 20 million workers over the 15-year period from 1960 to 1975? This is where projections come in—

forecasts based on the best available information and on the assumption that the national goal of full employment can be realized. If this is the case, the total number of wage and salary workers in nonagricultural industries is expected to reach 74.2 million by 1975—an increase of 37 percent over 1960.

What then are the prospects for employment growth in the eight broad industry groups over this 15-year period? (See chart 7.) As individual incomes rise and the population spends more and more on all kinds of services, the *service industries* are expected to grow faster than any of the other groups, probably increasing their employment by 61 percent, to 11.9 million workers.

Construction activity is also expected to grow very rapidly as the rising population and new families demand more homes and apartments, and as government funds are used to spur the construction of schools, hospitals, and roads. If national goals for economic growth and overall employment are reached, construction employment may reach 4.4 million by 1975, an increase of 52 percent over 1960.

CHART 7



Government employment is expected to continue its rapid rise, chiefly in State and local units providing services such as education, health, welfare, sanitation, and police and fire protection. By 1975, the total may reach nearly 13 million, an increase of 51 percent in 15 years. Not much change is anticipated in Federal employment, however, which has remained at about the same level for the past decade.

Another small but rapidly growing industry group is *finance, insurance, and real estate*. Its growth reflects mainly the needs of our increasing city population and industrial activity. The number of workers may rise by 44 percent from 1960 to 1975, reaching almost 4 million. Banking, a part of this group, will grow especially fast, partly as a result of an increasing variety of financial activities and services, and by 1975 may account for two-fifths of the workers in this group.

The growth of population and rising incomes are expected to account for a substantial increase in *wholesale and retail trade*. This industry group employs more people than any other except manufacturing. Over the 1960-75 period, the number may increase by more than one-third, reaching beyond 15½ million.

Manufacturing employment is expected to increase more slowly than employment in nonagricultural industries as a whole. As it is the largest group, by 1975 it may number well over 20 million workers, or about one-fifth more than in 1960. Some of its branches, however, will grow much faster than others. Durable goods industries will probably continue to grow much faster than nondurable goods, as they have since World War II. This is partly because of government spending on missiles, spacecraft, and electronic products and partly also because of the growing utilization of automation and other equipment involved in advanced technology. Chemicals, printing, and paper are expected to grow faster than the other nondurable goods industries.

Employment in *transportation, communications, and public utilities* as a group is expected to grow rather slowly to about 4½ million in 1975, only a half-million (13 percent) more than in 1960. But individual industries in the group will grow rapidly, while others are expected to decline. For example, the railroad industry is expected to con-

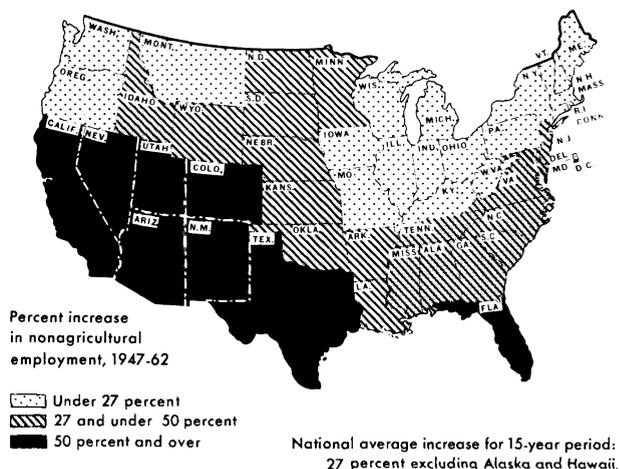
tinue to decline, though at a somewhat slower rate than in the past, while air transportation and trucking are expected to grow at a rapid rate. Continuing technological advances in communications and public utilities as well as railroads will strongly influence employment in this industry group.

No growth is expected in the *mining* industry group as a whole, which has been declining, but employment is expected to remain at about the 1960 level, to 1975. The factors affecting employment in mining have already been mentioned in the discussion of past trends.

Finally, *agricultural employment* is expected to decline substantially, releasing thousands of workers to be absorbed elsewhere. Nevertheless, the professional and technical jobs connected with agriculture, such as those of agricultural research specialist, soil scientist, and soil conservationist, will actually grow.

Before leaving the subject of industry growth and change, one more factor should be mentioned, i.e., that the changes discussed above will not be spread evenly over all areas of the country. Although nonfarm employment, between 1947 and 1962, increased in all States except Rhode Island and West Virginia, the rate of growth has been quite different in various parts of the country. (See chart 8.) Nationally, employment grew 27 percent between 1947 and 1962, but in California, the Rocky Mountain States, the Southwest, and

CHART 8
EMPLOYMENT IS INCREASING MOST RAPIDLY IN WESTERN AND SOUTHERN STATES.....



Florida, employment growth doubled or more than doubled the rise in the national average. Aircraft and spacecraft, missiles, electronics, and tourism account for much of this growth. Nonfarm employment in many primarily agricultural States of the central plains and Southeast has been growing at a rate above the national average, but not as fast as in the West and Southwest. On the other hand, in New England, the Middle Atlantic, and East North Central States, nonfarm employment has increased less than the national average.

In spite of these shifts, the geographic concentration of industry and commerce remains substantially in the areas where it was at the end of World War II. Even though in two of the fastest

growing areas, the Pacific and Mountain States, manufacturing jobs have increased greatly since 1947, more than half of all manufacturing jobs are still found in the New England, Middle Atlantic, and East North Central States. These three regions also still provide half the jobs in trade, finance, service, and transportation, and more than 2 out of 5 of those in construction and government. Only in the extractive industries has the concentration of employment definitely shifted—from the coal-producing areas of the Middle Atlantic to the petroleum- and gas-producing States of Texas, Louisiana, and Oklahoma. This reflects not so much the migration of an industry, however, as a shift in sources of fuel and power.

The Outlook for Occupational Change

Changes in industries, which are the suppliers of jobs, have been accompanied by changes in the nature of occupations and the numbers of people employed in them. These changes have been going on for many decades in every major occupational group. Some groups of occupations have been growing rapidly, others declining, and still others rising or falling from one decade to the next without consistent pattern. The professional and other white-collar occupations have grown fastest over the past 50 years; farm owners and farm laborers have declined most rapidly. Some groups—the skilled, semiskilled, and service workers—have fluctuated, with net gains of about 20 percent or slightly more over the half century. Chart 9 shows the changing proportions of each of these groups in the experienced work force, since 1910.

Probably the most significant overall change in the Nation's occupational structure has been the shift toward white-collar jobs. While this shift has been apparent since the beginning of the century, it has been accelerated in recent years. In 1956, for the first time in the Nation's history, white-collar workers (professional, managerial, office, and sales workers) outnumbered blue-collar or manual workers (craftsmen, operatives, and laborers). (See chart 10.) In the 15 years since 1947, white-collar occupations increased by 9.7 million, totaling almost 30 million in 1962. This

increase represented most of the total growth during the period. In contrast, blue-collar occupations in 1962 numbered less than a million more than they did in 1947. Among the reasons for this shift is the rapid growth of many service-producing industries—including government services, as well as financial and other business and professional services which employ large numbers of white-collar workers—and the relatively slow growth of goods-producing industries, including manufacturing and mining, which employ larger proportions of blue-collar workers.

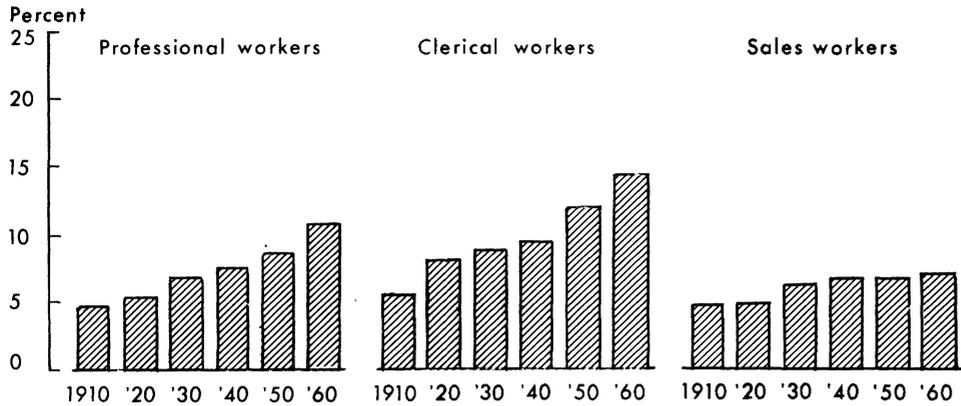
Chart 11 shows the proportions of white-collar, blue-collar, and service workers in each major industry group in 1962. Much of the overall growth in the white-collar group reflects the Nation's technological advancement, the shift from a predominantly agricultural economy to a predominantly industrial economy, the growing needs of a growing population for educational and medical services, the increasing size and complexity of business organizations, and the accelerating tendency in all types of enterprises for more research and more recordkeeping.

Chart 12 projects the changes that are expected to take place between 1960 and 1975 in the major nonfarm occupational groups if the assumed conditions stated previously prevail. In developing these projections, many things were taken into account: the expected increase in the size of the

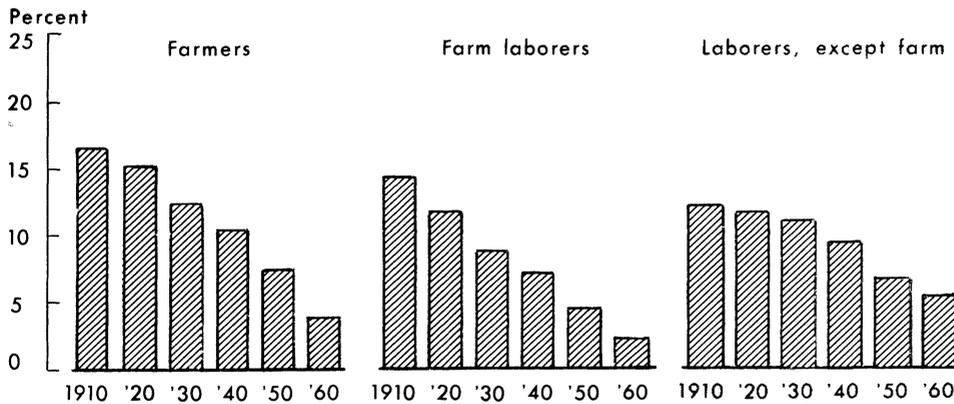
CHART 9

PROPORTION OF EXPERIENCED LABOR FORCE IN EACH OCCUPATIONAL GROUP, 1910-60.....

Professional, clerical, and sales occupations have shown consistent growth



Farm and unskilled occupations have lost ground



Others have shown less consistent trend

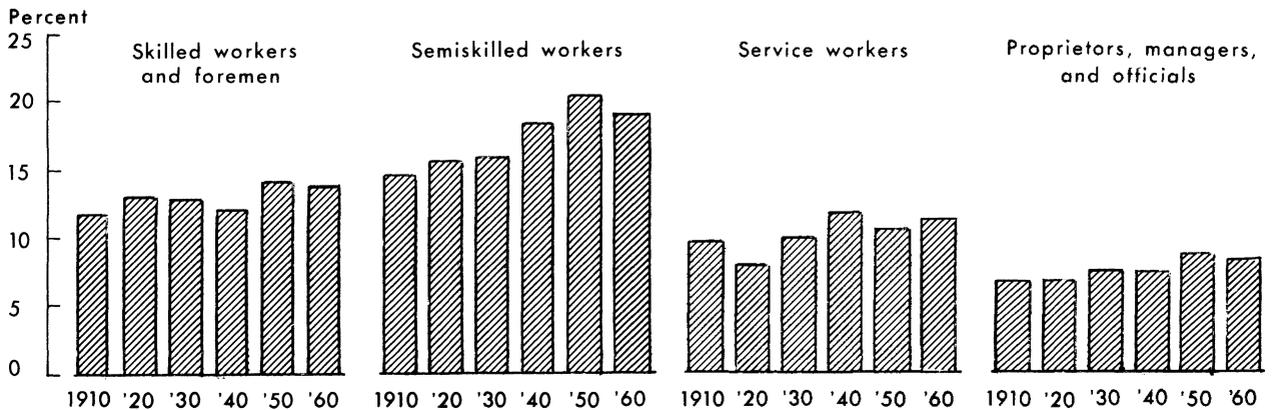
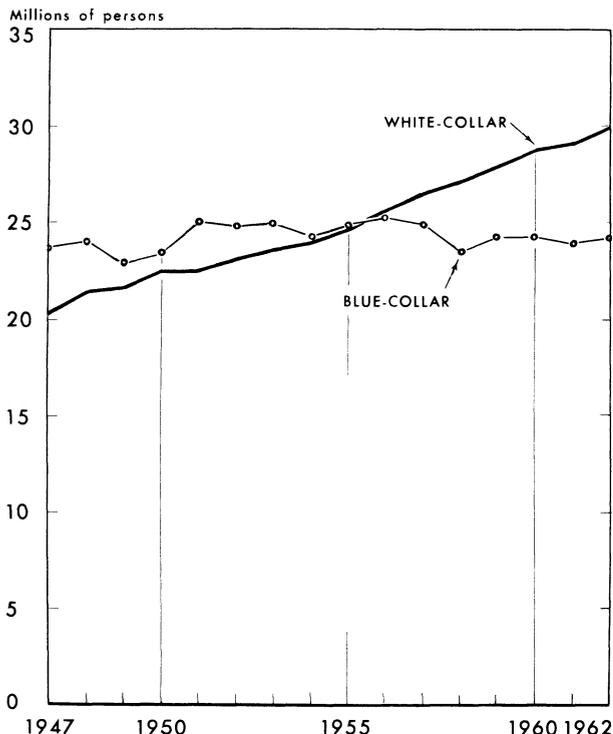


CHART 10

EMPLOYMENT HAS SHIFTED TOWARD WHITE-COLLAR OCCUPATIONS.



labor force, the changing demands of the population for various goods and services, the changing occupational requirements of each industry, and continuing changes in technology, as well as the industrial developments discussed in the preceding section.

Chart 12 also shows which occupations will grow faster than the expected average increase of 31 percent for all employment. The vertical line at the 31-percent point permits a quick grasp of the relationship of one occupational group to another. All the growing occupations except the operators and kindred workers will exceed the average increase. In contrast with this, the number of laborers (excluding farm and mine) is not expected to increase at all, and the numbers of farmers, farm managers, foremen, and farm-workers will continue to decline.

White-Collar Jobs

Rapid growth is expected in the white-collar group, especially among professional and technical

workers. While the group as a whole may increase by about 45 percent from 1960 to 1975, the professional and technical occupations may increase by as much as 65 percent. This would raise the number of workers in this latter group to more than 12 million. Some professions will grow much faster than others. For example, engineers and scientists may roughly double their numbers by 1975, in meeting the needs of a growing economy and rapid advances in electronics, jet aircraft, guided missiles, chemicals, health-related research, and communications. Technicians, who assist these specialists, are increasing in number at least as fast as engineers and scientists. Together, these workers are developing the newest type of economic activity in the country, aptly named "the industry of discovery"—the pursuit of new inventions, new techniques, new materials, and new weapons. These developments, plus an ever increasing demand for school and college teachers, and medical and other health specialists will result in a rate of growth in the professional group more than twice that of the labor force as a whole.

Today's numerically largest white-collar occupation, the clerical workers (close to 10 mil-

CHART 11

PROPORTION OF WHITE-COLLAR, BLUE-COLLAR, AND SERVICE WORKERS IN SEVEN MAJOR INDUSTRY GROUPS, 1962.....

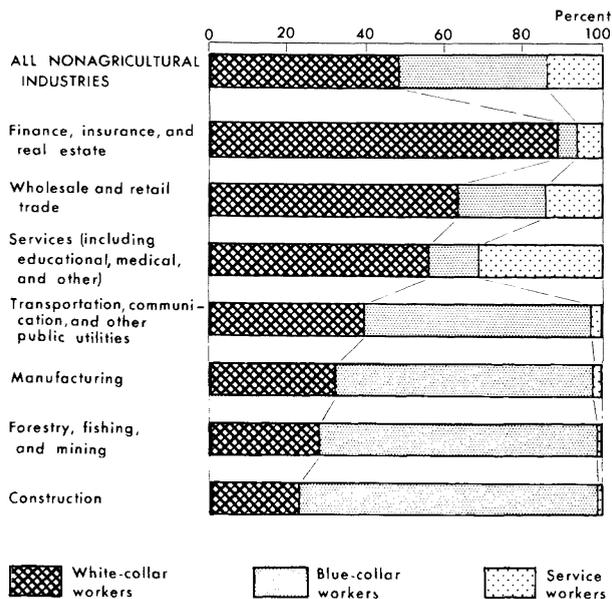
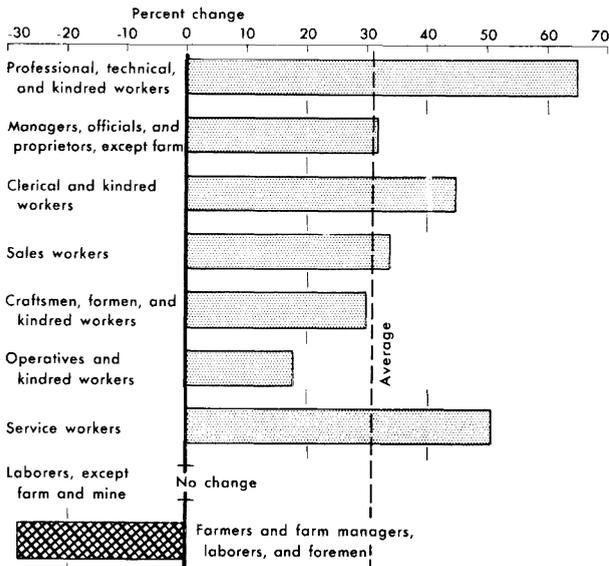


CHART 12

PROJECTED PERCENT CHANGE IN EMPLOYMENT OF WORKERS IN MAJOR OCCUPATIONAL GROUPS, 1960-75....



lion), have grown at a faster rate than any other except the professional group. Relatively rapid growth is expected during the next 10 to 15 years, increasing the number to 14 million by 1975, or 45 percent more than in 1960. Between 1950 and 1960, the number of clerical workers grew over 30 percent; a further increase of about the same magnitude is expected during the decade of the 60's despite the introduction of laborsaving electronic computers and other office machines and more efficient management methods. The supply of typists, stenographers, secretaries, and other office workers never seems to catch up with the demand. Girls graduating from high school with skills in these "commercial arts" almost certainly will find jobs waiting for them. The more complex a society becomes, the greater its need for records and communications, not only to keep modern business operating, but to provide the expanded tax and other reports required by government. Moreover, use of highspeed office and business machines will create some new jobs requiring more skill than many of the clerical tasks with which we are now so familiar.

The third largest group of white-collar workers is the proprietor-managerial group, consisting mainly of owners of small enterprises and salaried

officials in both private businesses and government agencies. This group in 1962 numbered more than 7 million. The proportion of these workers in the total labor force, however, is relatively static, despite their increase in numbers. The noticeable replacement of small groceries, general stores, and hand laundries, often run as a family business, by supermarkets and big chains is cutting into the number of proprietors. On the other hand, salaried managerial positions, with their demand for better education and training, are increasing rapidly. Even though the proprietor-managerial group as a whole is not showing the same growth as some other white-collar occupations, its numbers are expected to increase as fast as the total labor force, and to reach almost 9½ million by 1975.

Among the white-collar occupations, the smallest numerically (about 4½ million) is the sales group, but it is expected to rise to nearly 6 million, or by about 34 percent between 1960 and 1975—slightly faster than the labor force as a whole. Except for some specialized sales personnel, this is the white-collar group that requires less extensive training. One of its great advantages is that it can and does absorb considerable numbers of older women, many of them on a part-time basis. Although such mechanical devices as vending machines, and the increasing availability of self-service in groceries and variety stores will probably act as brakes in the growth of retail sales employment, nevertheless, as the population grows and personal incomes rise, substantial increases are expected.

Blue-Collar Jobs

The most highly trained workers in this group, and the highest earners as well, are craftsmen and foremen sometimes referred to, in more general terms, as "skilled workers." These workers will continue to have a more favorable employment outlook than the less skilled operatives and unskilled laborers. Examples of skilled workers are carpenters, plumbers, electricians, and all the other skilled building trades workers who make possible not only our convenient and efficient homes and offices, but also our roads, bridges, harbors, and airfields. Then there are the skilled metalworkers (such as machinists, tool and die makers, and molders) who read the blueprints,

and prepare models, dies, and tools from which production machines and instruments are made. Before the factory operative can turn out his product on his machine, the machine itself must be manufactured; the construction of this machine from engineering designs is the responsibility of the skilled metalworking craftsman. Another important group are the mechanics and repairmen, who keep automobiles and factory machinery in running order, fix radios and television sets, maintain airplanes in safe flying condition, and do all manner of other repair work that helps our machine-based society to run smoothly. Included also among the skilled workers are the foremen, who direct the work of others, and in many cases also do skilled work themselves. All together, this group totaled about 8½ million workers in 1960 and is expected to grow to more than 11 million by 1975.

Different industries employ quite different proportions of craftsmen. Manufacturing employs a greater number than any other industry (3.2 million). In construction, however, these skilled workers are a much higher proportion of employees than in any other industry group—1 out of every 2, compared with 1 in 5 in manufacturing and in transportation, and fewer than 1 in 10 in other industries. The young man who prepares himself, through apprenticeship or otherwise, for one of the skilled occupations can therefore anticipate pretty well where his greatest job opportunities are apt to be. Another point to remember is that certain occupations within the skilled worker group have grown and will grow faster than others, as is true of so many other aspects of the economy. Mechanics and repairmen, building trades craftsmen, skilled metal workers, and foremen will probably account for most of the growth in this group.

Next to the skilled workers in importance, within the blue-collar group, are the operatives, chiefly semiskilled workers. The most numerous of all major occupational groups (about 12 million in 1962), they hold jobs in almost every major industry. In 1960, they were 18 percent of the employed work force. This was a drop, however, from 20 percent in 1950, and indicates the direction of change for such workers. Prospects for 1970 are that the group will probably increase in numbers to something over 14 mil-

lion, but its relative position in the labor force will drop still further and it will not share the growth rate either of the skilled worker or of some white-collar groups. Changing technology which, in the early part of the century, created so many new jobs through mechanization of manufacturing processes and thereby the development of giant mass-production industries, shows signs, in the future, of braking the growth of semiskilled jobs, at least in manufacturing. Newly found ways of getting machines to do the work of men, popularly known as "automation," permit larger output without a corresponding increase in semiskilled machine operators. The automobile industry is a prime example of this recent kind of change. On the other hand, the increasing use of trucks, buses, and motor vehicles, for both human and freight transport, will continue to create a demand for truck and bus drivers, who are also classified with operatives.

The third main group among blue-collar workers are the laborers, who follow such vocations as deckhand, street cleaner, ditch digger, and carnival roustabout. The least skilled of all workers, they do the hardest physical work, except perhaps farm laborers, and usually are the lowest paid. Over the past half century their place in the labor force has dropped from 12½ percent to less than 6 percent in 1960. In numbers, the need for unskilled workers will remain about the same during the decade, but their proportion in the labor force will continue to drop—to less than 4½ percent by 1975. Even in some of these hard, laborious tasks, growing mechanization will displace much of the physical labor that was once so crucial to industrial production.

The growing occupational group of "service workers" offers a great variety of job opportunities ranging from some quite unskilled jobs to those requiring specialized education and training. For example, janitors are included here, but also waiters, cooks, barbers, laundry workers, beauticians, policemen, firemen, practical nurses, and FBI agents. Over many decades up to the end of World War II, this group rose only slightly as a proportion of the entire labor force, but since then it has sprinted ahead of labor force growth as a whole. The increased demand for services of all kinds reflects not only the needs of

a growing population but of the greater concentration of people in urban areas, an increasing number of women who go out to work and hence need these services, and generally rising income levels. By 1975, we can expect a numerical growth of service workers to about 12½ million, half again as many as in 1960. This increase would place them on a par numerically and proportionately with professional workers.

Growth of this group, nevertheless, will not escape some of the slowing down effects of mechanization and new kinds of equipment. For example, barbers and beauticians are feeling the effects of widespread use of electric razors and home permanent-wave kits, and certain groups of household workers, such as laundresses, are being supplanted by commercial laundry services and housewives who use coin-operated laundry equipment or their own electric washing machines, dryers, and ironers. On the other hand, many occupations in this group will grow substantially

—the policemen and firemen who guard our safety, the hospital attendants and practical nurses who guard our health, and others whose basic function can not be supplanted by machines. These are the occupations which also require more training than many of the service occupations that are declining.

To sum up, the principal occupational changes expected in the 15 years between 1960 and 1975 will be:

(1) A continuing rapid growth in white-collar occupations, especially in the professional and technical occupations;

(2) among blue-collar workers, about average growth in skilled occupations, a slower-than-average growth in semiskilled occupations, and no change in employment in unskilled occupations;

(3) a somewhat faster-than-average growth among service workers; and

(4) a further decline in the number of farmers and farm laborers.

Implications of the Outlook for Education and Training

It is clear that multitudes of opportunities will open up for jobseekers during the years ahead. The ability of young people to embrace these opportunities, however, will depend to an important extent on their education and training. The job world of the future obviously calls for people who have a marketable skill. The day of the "I can do anything," applicant is definitely past. In these days of increasing complexity of jobs and of professional specialization, no one, whether young or old, will be able to offer such versatility in the job market.

Since the fastest growing occupations also call for the most education or specialized training, it becomes obvious that a young worker's chances for a steady, well-paying job in many areas of our economy will be substantially less if he does not have at least a high school education. For many "growth" jobs, especially in the professions, he must have considerably more.

The need for educational upgrading of the work force will not be confined to the professions alone. The burgeoning field of technician jobs also increasingly calls for special preparation beyond the high school. And, as new, automated

equipment is introduced on a wider scale in offices, banks, insurance companies, and government operations, the skill requirements for clerical and other office jobs will rise also. The demand of employers for better trained personnel to operate complicated and expensive machinery is already apparent.

Just how fast industrial processing will yield to an emerging pushbutton era is difficult to predict, but gains in production in many manufacturing industries without equivalent gains in employment suggest that the effects of automation on production jobs may be great.

In some segments of the sales field, too, new developments in machine design, use of new materials, and the complexity of equipment are making it necessary for demonstrators to have greater understanding of technical matters; and repairmen must become familiar with ever more complicated machines.

The rising educational level of the younger population is a partial response to these developing labor market requirements. In 1962, two-thirds of the population 18 years of age had completed high school, compared with only about 1

in 15 in 1900. College enrollments are also rising rapidly. For example, of 1.9 million high school graduates in 1962, half were enrolled in college in the fall immediately following completion of high school. Additional thousands were enrolled in special training courses such as nursing, apprenticeships of various kinds, and others.

Estimates covering the 25-year period, between 1950 and 1975, give an even sharper indication of the continuing rise in the numbers of high school and college graduates. By 1975, high school enrollment will be more than double the 6½ million of 1950 and college enrollment will be almost four times the 2.2 million of 1950.

With so much competition from young people with higher levels of education, the boy or girl who does not get good preparation for work, either by completing high school or college or by some other effective means, will find the going

rougher and rougher in the years ahead. Labor Department studies indicate the possibility of 7½ million school dropouts during the 1960's, of whom 2½ million will not have completed even the 8th grade. These young people will find jobs harder and harder to get because employers prefer the worker who has "stayed the course" through high school. At the same time, the unskilled jobs that once absorbed many untrained people will be a narrowing field of employment.

Young people who have acquired a skill or a good basic education will have a better chance at interesting work, good wages, steady employment, and greater satisfaction with life in general. Getting as much education and training as one's ability and circumstances permit should, therefore, be high on the list of things to be done by today's youth.

Professional, Administrative, and Related Occupations

Professional and administrative occupations have many attractions for young people considering the choice of a career. These occupations offer opportunities for interesting and responsible work and lead to relatively high earnings. As a rule, however, they can be entered only after long periods of specialized education or other preparation, since a broad knowledge of one's field and judgment of a high order are outstanding requirements for success in these types of work.

Approximately one-fourth of all workers in 1962 were in professional, administrative, and related occupations. These occupations—employing about 15½ million people—accounted for about half of all white-collar employment.

Professional occupations are of two main types. The largest group of professions—including those of engineer, architect, physician, lawyer, and teacher—requires formal education in well-organized fields of knowledge. The other group—including occupations such as editor and actor—does not require as much specialized, theoretical knowledge, but demands a great deal of broad background knowledge or creative talent and skill acquired chiefly through experience. Generally, the professions require either college graduation—often with an advanced degree—or experience of such kind and amount as to provide a comparable background. Licenses are required for practice in many professions—medicine, dentistry, and pharmacy, for example—with licensing authorities determining the minimum qualifications which members must have. Professional societies also set up membership standards, which tend to define their respective fields. In many areas of work, however, there is no clear-cut line between professional and other classes of workers.

It is not easy to prepare for and enter professional work. For most professions, one must complete a long period of education and training. Often, applicants are not accepted for pro-

fessional training unless their school grades are high, and employers generally give preference in hiring to graduates whose grades in professional school put them high in their class.

Closely related to the professions—and sometimes overlapping them—is a wide variety of technical occupations. People in these occupations work with engineers, scientists, mathematicians, physicians, and other professional personnel. Their job titles include, for example, those of draftsman, engineering aid, programmer, and electronics, laboratory, or X-ray technician. Employment in these technical occupations usually requires a combination of basic scientific knowledge and specialized education or training in some particular aspect of technology or science. Such training may be obtained in technical institutes, junior colleges, and other schools, or through equivalent on-the-job training. Many of the duties of technicians may be performed also by beginning professional workers. However, because of their more limited educational background, technicians generally find it much more difficult to advance to high-level positions than do professional workers.

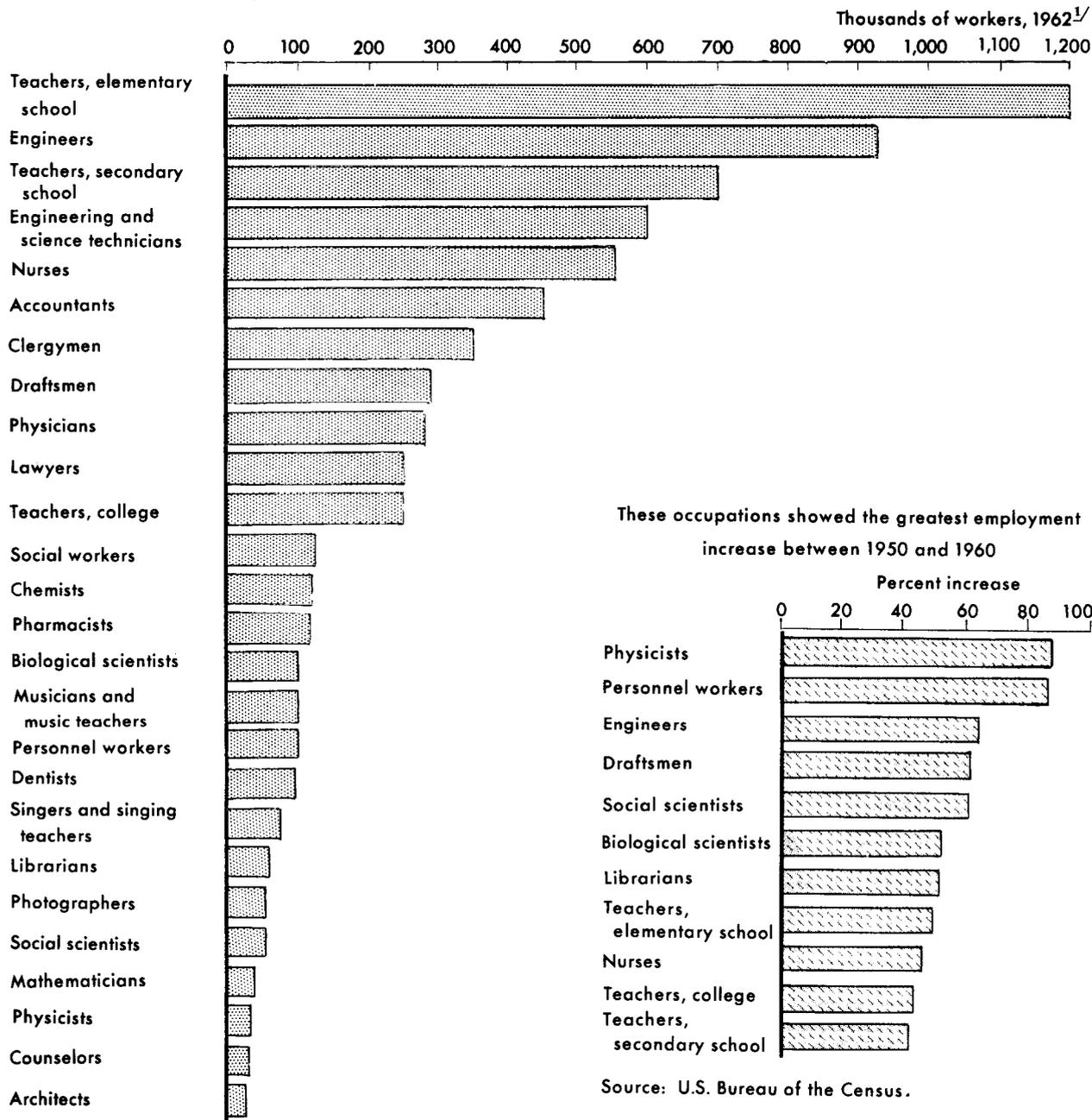
The major professional, technical, and related occupations are shown in chart 13.

People in administrative and related occupations run the Nation's businesses and manage a wide variety of other organizations, both private and governmental. The problems they deal with are as varied as the affairs they manage. They may have to decide, for example, whether and how to manufacture a new model of automobile, furnish a hotel lobby, advertise a store, or build a highway. Whether their organizations are small or large, employing only a few people or many thousands, the decisions administrators reach and their effectiveness in getting these decisions carried out contribute greatly to the success or failure of the enterprise.

CHART 13

**ABOUT 4 OUT OF EVERY 10 PROFESSIONAL WORKERS
ARE TEACHERS OR ENGINEERS**

Employment in selected professional, technical, and kindred occupations



Source: U.S. Bureau of the Census.

^{1/2}Estimated.

About 6.3 million men and 1.1 million women, not counting farm owners or farm managers, were managers, officials, or proprietors in 1962. Of these nearly 7.5 million people, managers and officials in salaried positions accounted for slightly more than half.

The largest group of proprietors—about half of the total number—are owners of stores, restaurants, gasoline service stations, or other kinds of retail establishments. In addition, large numbers manage their own factories or construction businesses.

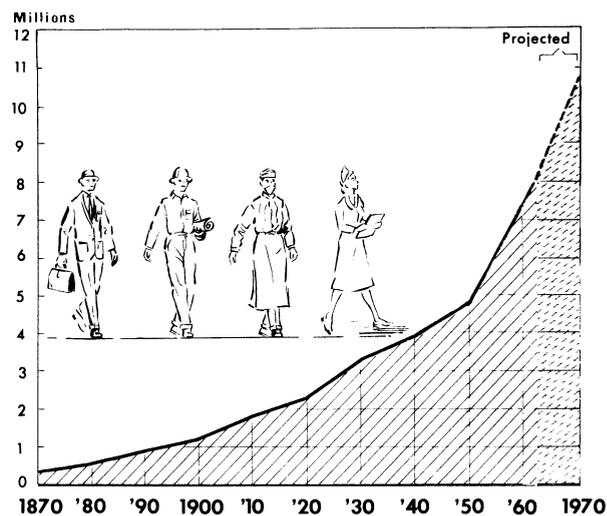
Executives and other managerial personnel in business firms form the largest group of salaried managers and officials. In addition, several hundred thousand people in this category are officials of Federal, State, and local government agencies and nonprofit organizations of many kinds; and there is a very large number of other workers—purchasing agents, credit men, and many others—in specialized jobs closely related to administrative and managerial work. Also grouped with administrative workers in the occupational statistics are persons in a variety of official and managerial positions—for example, members of Congress, ship captains, railroad conductors, trade union officials, and building managers and superintendents—whose functions and background are quite different from those of most administrative personnel and who are, therefore, not covered by the rest of the information presented in this part of the *Handbook*. (Some of these occupations are discussed elsewhere in the *Handbook*, however; see index for page numbers.)

Employment Trends

Employment in professional, technical, and related occupations has risen rapidly over the years. From less than half a million in 1870, the number of these workers has grown to about 8 million in 1962. (See chart 14.) Moreover, while the professions accounted for only about 4 percent of all workers at the turn of the century, by 1962 they represented 12 percent. During the 1950 decade, the rate of growth in the professions was more than twice that for clerical workers, the second fastest growing occupational group. Moreover, thus far in the 1960's the professional, technical, and related worker group continues to exceed in growth all other occupational groups.

CHART 14

GROWTH OF PROFESSIONAL, TECHNICAL, AND KINDRED OCCUPATIONS.....



Data prior to 1950 are decennial census figures and are not strictly comparable to later years.

A major reason for the increase in the total number of workers in professional and related occupations has been the development of new professional fields. The scientific, engineering, mathematics, and closely related professions have had a spectacular growth over the years. Other major professions, which have developed wholly or largely during the present century include social work, accounting, and personnel work. Growth has been especially rapid since 1950 among physicists, personnel workers, engineers, draftsmen, social scientists, librarians, and biological scientists. (See chart 13.) Even more recent has been the growth among mathematicians, programmers, other data-processing specialists, and electronics technicians. Some of this growth has accompanied the expansion in scientific and engineering professions. As scientific and technical work has become more highly organized, particularly in the laboratories and engineering departments of large firms and in government agencies, more technical assistance has been provided for the professional workers. Similarly, large numbers of technicians and assistants work in the health fields, thereby freeing the professional personnel for work requiring more training.

Between 1960 and 1970, employment in the professional and technical group is expected to rise by 43 percent—about twice the rate for total employment. However, there will naturally continue to be differences in the rate of growth among the professions, as is indicated in the statements on most of the major professions in the chapters that follow.

The number of people in administrative and managerial positions in the United States is growing, although by no means as fast as the number of professional workers. In 1910, only 1 out of every 15 workers in the country was in an administrative or related job. By 1962, the proportion had risen to about 1 out of every 10 workers. Employment in this field as a whole is expected to continue increasing moderately. By 1970, the total number of people in administrative and related positions may be about 8½ million, over a fifth more than in 1960.

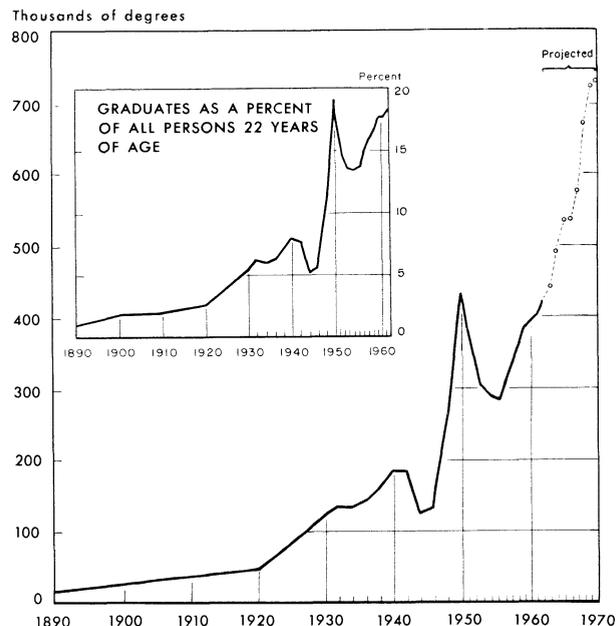
Most of this increase in employment will be in salaried positions. Growth in the number of self-employed proprietors will be relatively slow in the years ahead, because of the trend toward the formation of larger businesses. In the retail field, for example, supermarkets and other types of large stores are replacing the small general store, the separate meat market, and the corner grocery store. On the other hand, the number of managers and salaried officials in larger business organizations and government agencies is mounting rapidly.

Educational Trends

In addition to the many professional occupations for which college graduation has long been an entry requirement, demand for college graduates is increasing at the entry level in many other professional, administrative, and related occupations. Graduates are sought for many positions which either did not exist a few decades ago or which were formerly filled by employees selected primarily on the basis of their experience and personal characteristics. This emphasis on a college education will probably be reinforced in the years ahead—in view of the growing complexity of modern industry and technology, which is constantly increasing the amount of technical knowl-

CHART 15

NUMBER OF BACHELOR'S DEGREES GRANTED.....



Source: U.S. Department of Health, Education, and Welfare, Office of Education.

edge required for effective performance in many professional and administrative jobs.

The growth in the professional, administrative, and related occupations has been accompanied by a great increase in the numbers of young men and women graduating from college—who are, of course, the chief source of professionally trained workers. The proportion of young people completing college (represented as a percent of all persons 22 years of age) rose from 2½ percent in 1920 to 8 percent in 1940, and to nearly 18½ percent in 1962, as shown in the inset in chart 15. (The high level reached in 1950 is artificial, reflecting the large number of veterans who went to college under the veterans' education program and who, in many cases, would have completed college earlier if it had not been for the war.)

The recent rapid increase in the proportion of young people graduating from college (chart 15) reflects a number of basic social trends. Family incomes are higher, and more people can afford to put off going to work and to pay the costs of education. More families want a

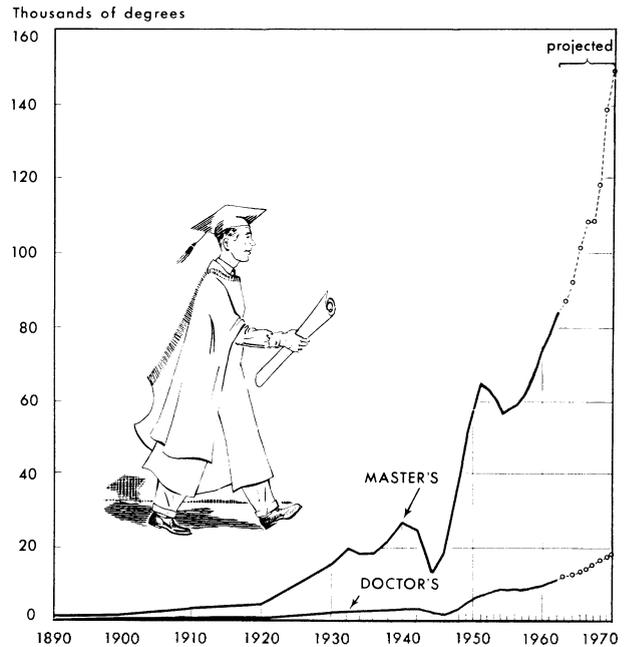
college education for their children. Scholarships and loans are available for more students; part-time work opportunities are also available, particularly in times of labor shortages. Finally, a college education is becoming necessary for an increasing proportion of jobs, and in many professions the amount of education needed is increasing. Since these factors will probably continue to be influential in the future, the proportion of young people who are graduated from college is expected to go on increasing for many years. The college-age population is also growing. The number of people age 18 to 21 will rise by 5 million during the 1960's. These factors, considered together, point to a great increase in college graduations, assuming that the Nation's colleges and universities can build the classrooms, laboratories, dormitories, and other facilities and hire the faculty members needed to provide for the greatly increased numbers of students. It is likely that the number of bachelor's degrees awarded annually will be about 80 percent greater by 1970 than in 1961. Projections prepared by the U.S. Office of Education indicate an increase from the 401,656 bachelor's degrees granted in 1961 to 537,000 in 1965, and 731,000 in 1970.

The number of students taking graduate training has also risen very rapidly during past decades, and will probably continue to mount in the years ahead. A master's degree is usually earned through 1 or 2 years of study beyond the bachelor's degree. To earn the Ph. D. degree usually requires 3 years or more beyond the bachelor's degree. As a rule, graduate study is concentrated in the major subject field of the student's interest, whereas undergraduate study is broader in content.

Chart 16 shows the vast increase in graduate degrees awarded since 1920 in all fields taken together. The numbers of master's and doctor's degrees granted reached unprecedented heights in the early 1950's, following the record number of bachelor's degrees granted a few years before. After a slight decline in the mid-1950's, master's degrees rose to about 79,000 in 1961 and are expected to exceed 100,000 in 1965, if past trends

CHART 16

NUMBER OF MASTER'S AND DOCTOR'S DEGREES GRANTED.....



Source: U.S. Department of Health, Education, and Welfare, Office of Education.

continue. The number of doctorates awarded (10,575 in 1961) may reach 13,200 by 1965. According to projections made by the U.S. Office of Education, the number of master's degrees conferred may come close to 150,000 and doctorates may exceed 18,000 in 1970.

These projections obviously imply a great increase in the supply of personnel which will be available for professional employment. Since the demand for personnel is also expected to show continued growth, there is promise of expanding employment opportunities for the increasing numbers of college graduates. The anticipated increases in college-trained personnel raise the possibility, however, of increasing competition during the late 1960's for the better professional positions in at least some fields of work, as indicated in the statements on the various fields in following chapters.

TEACHING

Of all the professions, teaching is the largest. About 2 million men and women in the United States are full-time teachers, and thousands of others teach part time. Many scientists, physicians, accountants, and members of other professions teach one or more classes in colleges and universities. Similarly, large numbers of craftsmen teach part time in vocational schools. Also, many other people instruct in adult education and recreation programs.

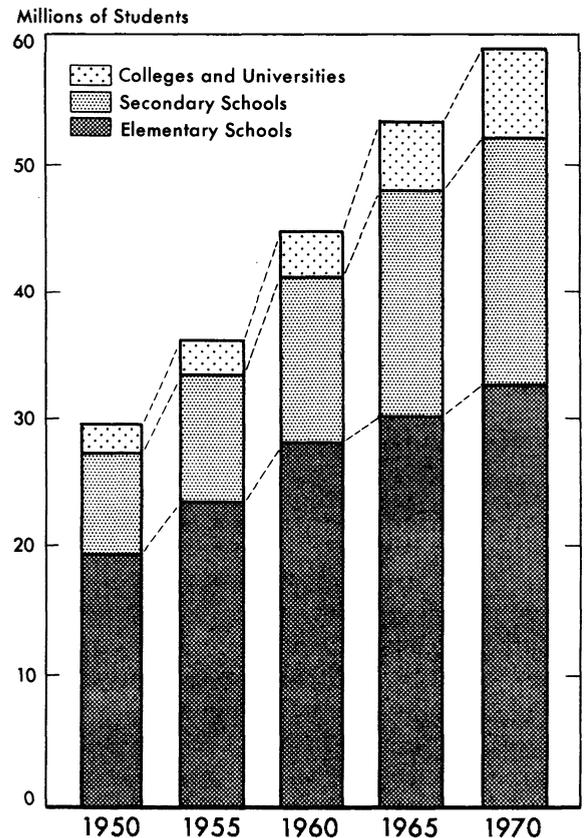
No other profession offers so many employment opportunities for women; slightly more than 1 million women are teachers, more than twice the number employed in nursing—the second largest field of professional employment for women. Women teachers far outnumber men in kindergarten and elementary schools. Men, however, hold slightly more than half the teaching positions in secondary (junior and senior high) schools, and men hold about four-fifths of all college and university teaching positions.

The number of teachers needed by the Nation's schools depends chiefly, of course, on the number of students enrolled. In the fall of 1962, about 51 million people—more than one-fourth of the country's total population—were enrolled in the Nation's schools and colleges. The extremely high birth rates of the past two decades largely account for this record enrollment. For example, the high birth rates of the 1940's brought unprecedented increases in elementary school enrollments in the early 1950's. By the mid-1950's, these children were beginning to enter the high schools, and toward the end of the decade the colleges were beginning to feel their impact. Furthermore, the proportion of young people of high school and college age who are attending school is higher than ever before. A continuation of both population growth and increased high school and college attendance is expected to produce an impressive rate of increase in high school enrollments by 1970 and an even more rapid increase in college

enrollments. (See chart 17.) The proportion of young children of elementary school age enrolled in these schools is not expected to change appreciably during the coming decade; nevertheless, a sizable increase in the number of children so enrolled is expected. Total enrollments in all schools and colleges combined, according to U.S. Office of

CHART 17

ENROLLMENTS WILL TOTAL NEARLY
60 MILLION BY 1970



Source: U.S. Department of Health, Education, and Welfare, Office of Education.

Education estimates, may increase to more than 60 million by 1970.

To staff the new classrooms that must be provided for the rising numbers of students, the Nation's teaching staff will need to be about one-fifth larger by 1970. In addition, a still greater number will be required to replace teachers who leave the profession. (See chart 18.) Many new teachers will also be needed in both elementary and secondary schools, to reduce the ratio between pupils and teachers. Moreover, additional teachers must be trained so as to replace teachers who do not meet the minimum standards for certification. This school staffing problem has been one factor that has brought about an increasing interest in technological developments and other changes in educational methods. Educational television, for example, is already in use on an experimental basis, and its extension may enable many teachers to

handle larger classes efficiently in some subject areas. Teaching machines designed to present information mechanically and to test student responses to the material covered are being considered, where appropriate, for use as a teaching aid. Language laboratories where tape recordings are used in foreign language instruction are being set up in many secondary schools and colleges. Other adjustments, including lengthening the school year and providing teachers with clerical assistance, may also affect the demand for teachers. Although opinions differ concerning the effect of these innovations, it seems likely that, for the next few years at least, their chief effect may be to improve the quality of education.

The outlook for teachers at each educational level—in elementary and secondary schools, and also in colleges and universities—is discussed in the following statements.

Kindergarten and Elementary School Teachers

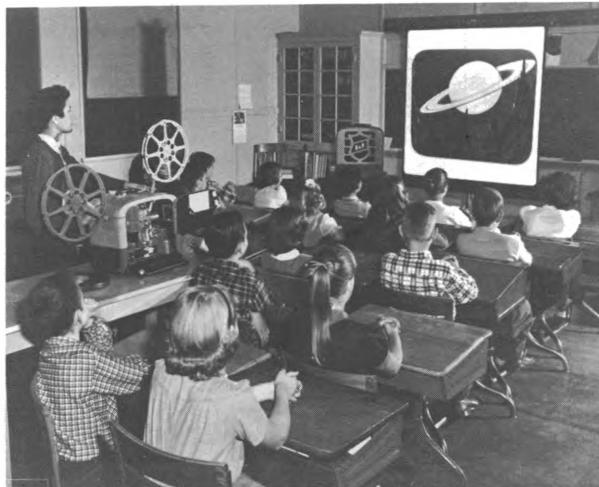
(D.O.T. 0-30.02 and .11)

Nature of Work

Elementary school teaching is the largest field of professional employment for women and is also a growing field for men. In 1962, 1.2 million kindergarten and elementary teachers were employed in elementary schools. This total included about 900,000 classroom teachers and several thousand principals and supervisors in public schools, and more than 200,000 teachers in parochial and other private schools.

Kindergarten teachers provide a program of education for young children. Most frequently they divide the schoolday between two groups, teaching two classes a day. Some, however, may work with one group all day. The kindergarten program provides children with experiences in play, music, artwork, stories, and poetry; it also introduces them to science, numbers, language, and social studies. After school hours, kindergarten teachers may plan the next day's work, study and 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 several groups of children in one or two subjects. Many school sys-

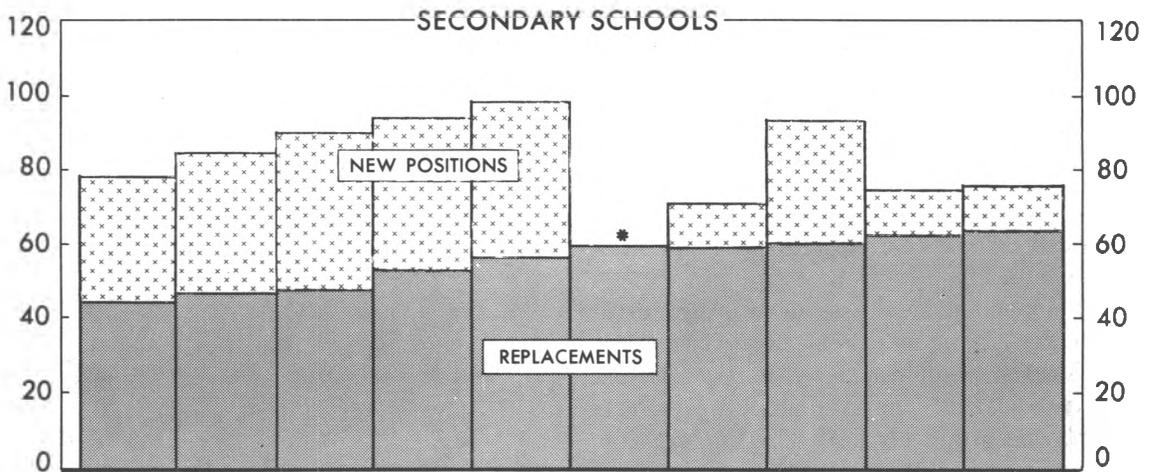
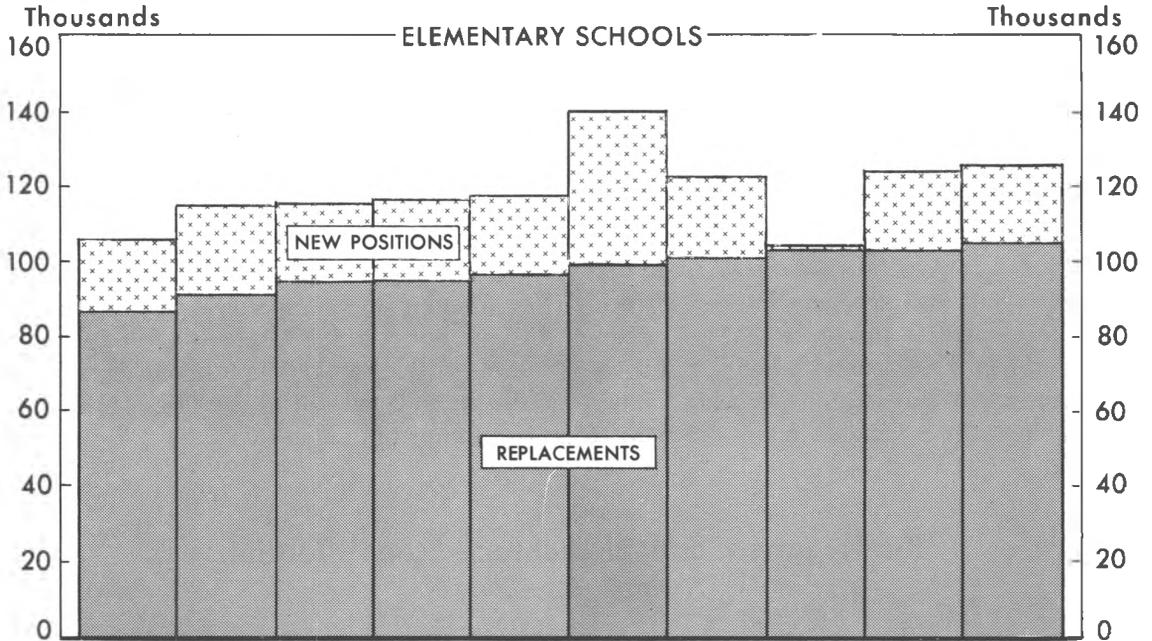


Elementary school teaching is the largest field of professional employment for women

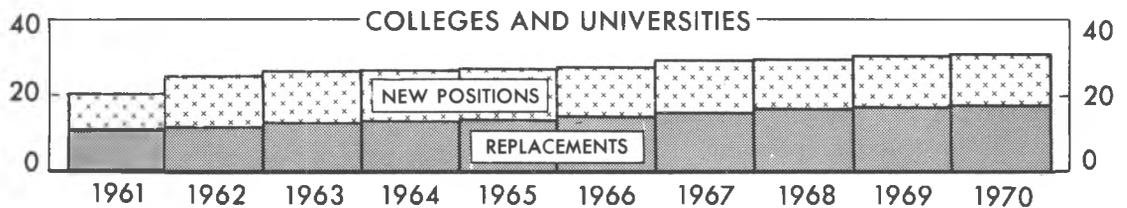
CHART 18

GREATEST DEMAND FOR TEACHERS WILL CONTINUE TO BE IN ELEMENTARY SCHOOLS

(Annual Recruitment Need For Teachers)



* No net increase in teaching positions expected in country as a whole.



Source: U.S. Department of Health, Education, and Welfare, Office of Education; and U.S. Department of Labor, Bureau of Labor Statistics.

tems also employ special teachers to give instruction and to assist classroom teachers in subjects such as art, music, physical education, industrial arts, foreign languages, and homemaking. Teachers in schools with only a few students, largely in rural areas, may be required to teach all subjects in several grades.

Although the time spent in the classroom is usually less than the average working day in many other occupations, the elementary school teacher must spend additional time each day 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. According to a recent survey, the average workweek of elementary school teachers is about 48 hours including time spent in out-of-class instructional and other duties.

Where Employed

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 20,000 teach in 1-room schools. Kindergarten teachers, however, are employed primarily in the large city school systems.

Training, Other Qualifications, and Advancement

All States require every teacher in the public schools to hold a certificate. Several States have this same requirement for teachers in parochial and other private elementary schools.

In 1963, 44 States and the District of Columbia issued regular teaching certificates only to persons with at least 4 years of approved college preparation, and the other 6 States required at least 2 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 personal 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 teachers must have their certificates renewed every year until all requirements for regular certificates have been met.

All States and many individual school systems have certain additional requirements for public school teaching. They may, for example, require a health certificate, evidence of citizenship, or an oath of allegiance. The prospective teacher should find out 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, the prospective elementary school teachers spend roughly 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 studying liberal arts subjects. Some study of the process of learning and human behavior is usually included.

Beginning 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; or by obtaining additional preparation.

Among the most important personal qualifications for elementary school teaching are a love and enjoyment 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 are also valuable. Civic, social, and recreational activities of teachers may be influenced, and are sometimes restricted, by the customs and attitudes of their community.

Employment Outlook

Many thousands of openings for elementary school teachers will occur each year in the middle and late 1960's. Enrollments in kindergarten and grades 1 through 8 will continue to rise during this period, but at a slower rate than in the preceding decade. As a result, the demand for teachers to staff new kindergarten and elementary school classrooms is expected to level off towards the end of this decade. Nevertheless, it is estimated that an average of about 20,000 new teachers will be needed annually to take care of the increase in enrollments and, in addition, an average of about 100,000 annually will be required as replacements. Each year, many teachers will reach retirement age and a much larger number of young women will withdraw from the teaching profession because of marriage or for other reasons.

Altogether, the number of additional elementary and kindergarten teachers needed will be, on the average, about 120,000 each year during the remainder of the 1960 decade, unless replacement rates are reduced considerably. This figure does not provide for the additional teachers needed to lower the pupil-teacher ratios, to replace persons not meeting regular requirements, to extend kindergarten facilities to all areas, or to provide for other improvements. On the other hand, classroom innovations and technological developments may affect the number of teachers needed.

The number of students preparing for elementary school positions each year is likely to continue to fall short of the demand for new teachers. For example, in 1962, only 54,000 prepared for such teaching positions, whereas more than twice that number were needed. At the same time about 56,000 public elementary school teachers who did not meet the minimum requirements for certification were employed. Some expansion in the supply of qualified teachers is expected to result from the increasing college population and the offering of special incentives such as those provided by the National Defense Education Act of 1958 under which financial aid is available to selected students with superior academic backgrounds who are planning to become elementary or secondary school teachers. As in the past decade, the deficiency in the supply of elementary

school teachers will probably continue to be met by issuing short-term emergency certificates to teachers not meeting regular requirements, by increasing the size of classes, by the reentry of former teachers into the profession, and by attracting qualified personnel from other fields of work. Shortages will tend to be greatest where teachers' salaries are lowest or where better paying employment opportunities are available in other fields.

Earnings and Working Conditions

The average salary for classroom teachers in public elementary schools, according to National Education Association estimates, was \$5,560 in 1962-63. In three States (Alaska, California, and New York), teachers' salaries averaged \$6,700 or more; in five States (Alabama, Arkansas, Mississippi, North Dakota, and South Dakota), less than \$4,000.

Teachers' salaries are usually lowest in rural schools and highest in large city systems, where educational and experience requirements are likely to be highest.

Teachers generally enjoy a dignified and respected position in their communities. Their employment is steady, and usually 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.

Since most schools are in session only 9 months a year, teachers often work at other jobs or take courses for professional growth during the summer. Some school systems, however, are extending the teachers' working year to 12 months with a 1-month vacation in the summer. These systems require the teacher to teach in summer sessions or attend workshops during the time beyond the regular school year.

Where To Go for More Information

Information on schools and certification requirements in a particular State is available from the State department of education at the State capital.

General information on teaching may be obtained from:

U.S. Department of Health, Education, and Welfare,
Office of Education, Washington, D.C., 20202.

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. 0-31.01 and .10)

Nature of Work

Secondary school teachers—those employed in junior and 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 science subjects; mathematics and general science; and chemistry and biology or general science. Teachers in fields such as home economics, agriculture, commercial subjects, driver education, music, art, and industrial arts less frequently conduct classes in other subjects.

survey the average workweek of secondary school teachers is about 46 hours including time spent in out-of-class instructional and other duties. Maintaining good relations with parents, the community, and fellow teachers is an important aspect of their jobs.

About 700,000 teachers, principals, and supervisors were employed in the Nation's public and private secondary schools in 1962-63. 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.

Where Employed

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); another large group of teachers 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).

Despite increasing urbanization, about half of all secondary school teachers are still employed in rural areas or in cities of less than 30,000 population.

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 a bachelor's degree. Nearly all States also require at least the equivalent of one-half year of education courses, including practice teaching, plus specialized courses in one or more subjects commonly taught in secondary schools.



Courtesy of U.S. Department of Health, Education, and Welfare

Recording equipment is used by high school teacher of foreign languages

Besides giving classroom instruction from 20 to 30 hours each week, secondary school teachers develop and plan teaching materials, develop and correct tests, keep records, make out reports, consult with parents, supervise study halls, and perform other duties. Many supervise student activities, such as clubs and social affairs—sometimes after regular schools hours. According to a recent

Ten States require a fifth year of study or 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 experience, 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 education. Satisfactory 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 can ordinarily obtain temporary certification in a State while he prepares to meet any additional requirements.

Qualified secondary school teachers may advance to positions as supervisors, assistant principals, principals, superintendents, or other administrative officers as openings occur. At least 1 year of professional education beyond the bachelor's degree, plus several years of successful classroom teaching are required for most supervisory and administrative positions. Often a Ph. D. degree is required for appointment as superintendent. A few experienced teachers are assigned to the positions of part- or full-time guidance counselors, teachers who instruct in the pupils' homes, or instructors of handicapped or other special groups. 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 also are high standards of personal conduct. In addition to a special enthusiasm for the subjects they teach, a broad knowledge and appreciation of the arts, sciences, history, and literature are also desirable. Civic, social, and recreational activities of teachers may be influenced, and sometimes restricted, by the customs and attitudes of their community.

Employment Outlook

A growing number of secondary school teachers will be needed during the middle and late 1960's, when enrollments will expand rapidly as a result of the high birth rates following World War II. The great increase in population reaching high school age, combined with the trend for a growing proportion of young people to enter and graduate from high school, will result in an estimated average annual demand for about 25,000 additional teachers. Furthermore, throughout this same period, vacancies created by turnover will be more than double the number of new positions. Altogether, the projections indicate that more than 80,000 new secondary school teachers must be recruited each year during the remainder of the 1960's. (See chart 17.) Classroom innovations and technological developments, however, may affect the number of teachers needed.

The supply of persons available to fill teaching positions each year is difficult to estimate. Although most of the new teachers are drawn directly from college graduating classes, some positions are filled by former teachers (many of whom dropped out to care for their young children), by persons not meeting certification requirements, and by fully qualified persons who have been in other types of employment. Not all qualified new graduates seek teaching positions. For example, in June 1961, about 77,000 college graduates met certification requirements for secondary school teaching; of these, however, only about two-thirds were teaching in the following academic year. The rest were employed in positions other than teaching, engaged in graduate study, were in the military service, had become homemakers, or were otherwise lost to the teaching field. Similarly, a large proportion of the 88,000 potential teachers graduated in 1962 was not available for teaching positions. Should this situation persist, well-quali-

fied candidates seeking to enter secondary school teaching will find employment opportunities in most geographic areas and in most subject fields. About 27,000 public school secondary level teachers who did not meet the minimum certification requirements were employed in 1962.

Employment opportunities for secondary school teachers are expected to continue to be best in science, mathematics, foreign languages, industrial arts, and other subject fields for which the demand in private industry and government is also great. When economic conditions are unfavorable, competition for teaching positions increases. At such a time, certification requirements are often raised.

Earnings and Working Conditions

The average annual salary for all classroom teachers in public secondary schools was about \$5,995 in 1962-63, according to estimates by the National Education Association. In Alaska, California, and New York, average salaries exceeded \$7,000; the average was less than \$4,000 in two States, Arkansas and Mississippi.

Junior high school teachers frequently receive somewhat lower salaries than high school teachers in the same school system; however, the trend is toward equalizing salaries of teachers with the same educational preparation, regardless of grade taught or sex. Teachers of vocational education, physical education, and other special subjects often receive higher salaries for their work than do other teachers in the same school. 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 are usually lower in towns and small cities than in larger cities, 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 \$25,000 or more in many large cities.

Teachers often add to their incomes by teaching in summer school, working as camp and recreational counselors, or doing other work. Many teachers, however, use their vacations to work toward advanced degrees or to take specialized courses. Some teachers supplement their incomes during the regular school year. They may teach in adult or other evening classes, work part time in business or industry, or write for publication.

Some form of retirement, often under Government programs, is provided most teachers. Nearly all school systems have some provision for sick leave and an increasing number grant other types of leave with pay.

Where To Go for More Information

Information on schools and certification requirements in a particular State is available from the State department of education at the State capital.

General information on teaching may be obtained from:

U.S. Department of Health, Education, and Welfare,
Office of Education, Washington, D.C., 20202.

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. N.W., Washington, D.C., 20036.

College and University Teachers

(D.O.T. 0-11.50)

Nature of Work

About 350,000 faculty members are employed in the Nation's 2,000 colleges and universities. However, it is estimated that in 1963 only about 200,000 were engaged in full-time teaching. Close to 100,000 were teaching part-time in medicine, law, business administration, and other profes-

sional fields. Other faculty members were employed in administration, full-time research, or other educational activities. Men predominated in most college teaching fields and held about 95 percent or more of the positions in engineering, the physical sciences, agriculture, law, and philosophy. Only about one-fifth of all college and uni-

versity teachers were women; however, the majority of teachers in the fields of nursing, home economics, and library science were women.

College and university teachers instruct students in specific subjects. More than half of all faculty members teach courses in social science, fine arts, English, physical science, education, or engineering. In many 4-year institutions, the usual teaching load is from 12 to 15 hours a week. Associate professors and full professors—who also serve as advisors to graduate students—may spend only 6 or 8 hours a week in actual classroom work. Besides teaching classes, college teachers spend considerable time preparing tests and other materials for classroom use, checking and grading students' work, and keeping up to date with developments in their specialties. Many faculty members carry on research projects, write for publication, aid in college administration, or lecture to civic and professional groups. Some professors act as consultants to business, industrial, scientific, or government organizations.

Where Employed

About half of all faculty members are employed by universities. About 25 percent are in liberal arts colleges. Between 5 and 10 percent are employed by teachers' colleges, and roughly the same proportion are on the faculties of community (junior) colleges. The rest (5 percent or less) are in technological, theological, and other professional schools.

Some States have many more colleges and universities than others, partly as a result of differences in population size. About half of all college and university teachers are employed in these eight States, in each of which college enrollments exceed 100,000: New York, California, Pennsylvania, Illinois, Massachusetts, Texas, Ohio, and Michigan.

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. The doctor's degree is often, but not always, required for promotion or appointment to positions above the rank of instructor. The doctorate

is particularly important for teaching positions in the biological sciences, physical sciences, psychology, social sciences, philosophy, and religion; it is least likely to be a requirement in the fields of business and commerce, engineering, fine arts, health and physical education, and home economics. A number of States that maintain public junior colleges require State certification for teaching in these 2-year schools. To obtain such a certificate, a teacher must have completed the master's degree and certain courses in education.

To enter college teaching, specialization in some subject field is necessary. In addition, undergraduate courses in the humanities, social sciences, and natural sciences, and the mastery of at least one foreign language are also an important part of the college teacher's educational background. Intensive instruction in the selected field of specialization is given in graduate school. During graduate work, outstanding students may be employed as part-time assistants to aid in teaching undergraduates. Such work affords valuable experience for the prospective teacher. Some colleges offer other means, such as informal seminars or meetings, by which the graduate students can develop teaching competence. A good many beginning college teachers—especially those in education departments—have had some experience in high school or other types of teaching.

Most 4-year colleges and universities recognize four academic ranks: instructor, assistant professor, associate professor, and full professor. Few institutions grant tenure (full status as a member of the staff on a continuing basis) or give advancement to instructors with less than 3 years of service. Advancement to assistant and associate professorship is generally restricted to candidates with extensive graduate training or teaching experience. A doctor's degree and many years of teaching experience—from 10 to 20 years—is usually required to become a full professor. A recent private survey indicates that among the teaching faculty about one-quarter each are professors and associate professors, about 30 percent are assistant professors and close to 20 percent are instructors. Outstanding achievement, generally through research or publications, often hastens advancement. Teachers of some subjects, such as engineering, law, mathematics, medicine, and natural sciences,

are sometimes appointed at higher ranks than other teachers with comparable experience and education.

Employment Outlook

Openings for new entrants to college teaching will be numerous throughout the 1960's and will increase greatly during the latter part of the decade. Opportunities will be best for those with doctoral degrees and for those who have completed all requirements for the doctorate except the dissertation. Nevertheless, there will be many employment opportunities for new entrants with the master's degree, particularly in junior colleges.

A great increase in college enrollment is in prospect. The number of young people in the 18- to 21-year age group will rise by more than 2 million between 1965 and 1970. At the same time, it is likely that the extension of college education to a higher proportion of young people will continue—owing to rising family income, greater demand for college-trained personnel, and the increasing number and proportion of the population who finish high school and are, therefore, eligible to enroll in college. The anticipated increase in the number of community colleges and schools offering evening classes will also tend to make it possible for more young people to attend college. If the proportion of young people attending college continues to increase moderately and facilities are available, college enrollments are expected to increase from about 4½ million at present to nearly 7 million by 1970.

To handle this increase in enrollments, thousands of additional full-time teachers will be needed annually for the rest of the 1960's. Besides the new teachers needed to take care of expanding enrollments, even larger numbers are likely to be required annually to replace persons who will retire, die, or otherwise leave the profession. The number leaving teaching each year to enter other types of employment will depend primarily on the level of business activity and on conditions in the academic profession itself. Between 1963 and 1970, an estimated 200,000 new teachers will be needed to take care of enrollment increases and replacement needs. Teaching innovations and technological developments also may affect the number of college teachers needed. Some educational leaders today advocate larger classes, and more independ-

ent work on the part of students, to help solve the teaching shortage.

The supply of new college teachers is comprised largely of students receiving graduate degrees. The U.S. Office of Education estimates that the number of doctorates conferred during the rest of the 1960 decade will average about 15,000 a year, the number of master's degrees, close to 115,000 annually. It is difficult, however, to predict the proportion of graduates who will enter teaching. In 1961, when the demand was for at least 25,000 new teachers, about 90,000 persons received graduate degrees; nevertheless, shortages of qualified teaching personnel were reported in several fields, particularly in the physical sciences, engineering, mathematics, and in some social science fields. Some increase in the supply of college teachers is anticipated because of Federal legislation enacted in 1958, which will make more fellowships available to graduate students interested in college teaching as a career. Nevertheless, it is likely that the number of well-qualified persons available for teaching positions will continue to be insufficient to meet the demand in many subject fields throughout the 1960's. (See index for page numbers of separate statements on each profession.)

Earnings and Working Conditions

According to the U.S. Office of Education, teachers in 4-year colleges and universities had an average salary of \$7,680 for 9 months' work in 1961-62; instructors averaged \$5,580; assistant professors, \$6,750; associate professors, \$7,980; and professors, \$10,320. Average salaries of teachers tend to be lowest in junior colleges and teachers' colleges. The Office of Education also reported average salaries (9-10 months' basis) for teaching faculty of all ranks and for full professors in public and private institutions in 1961-62 as follows:

Type of institution	All ranks		Full professors	
	Private	Public	Private	Public
Universities.....	\$8,620	\$8,300	\$11,990	\$11,240
Liberal arts colleges.....	6,640	7,710	8,410	10,360
Teachers colleges.....	5,420	7,220	-----	9,010
Junior colleges.....	5,180	7,210	-----	-----

Faculty members who teach the year round 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 have professional income in addition to their regular salaries. The chief source of supplementary income is additional teaching (often in summer sessions) which is not a part of the teachers' regular duties. Consulting work may be a major source of extra income, particularly for teachers of engineering and physical sciences; research grants providing additional income to faculty members are now common, especially in many large, well-known universities; and fees for lecturing and royalties on publications are other possible sources of income. Opportunities for such additional income usually increase as the faculty member gains recognition. For the majority of colleges teachers, however, the additional income may be 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 retirement age, though nearly as many stipulate 70.

Many colleges and universities provide benefits such as: Sabbatical leaves of absence—typically, 1 year's leave with half salary or a half year's leave at full salary after 6 or 7 years of employ-

ment in the same college; 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.

Where To Go for More 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.

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. (See index for page number.)

COUNSELING

Counseling is a large, rather loosely defined, field of work and one that overlaps some other professional fields. The objective of all counseling, in its broadest sense, is to help others understand themselves and to improve their capacity to live and work more effectively. But it is difficult to distinguish clearly among counselors either by the setting in which the counseling is conducted or the kind of counseling offered—personal, educational, or vocational. Nonetheless, despite differing emphases, counselors are concerned with the well-being of the whole person in their evaluation of an individual's particular problem, and similarities among counselors are more numerous than the dissimilarities. For example, people who counsel professionally need to have understanding, tolerance, the ability to accept others as they are, and a concern for people combined with a capacity for remaining objective. The training and other qualifications required are also similar among counselors.

This chapter deals in detail only with three areas of counseling that are generally recognized as separate specialties in the field: School counseling, vocational counseling, and rehabilitation counseling.

School counselors are the largest group engaged in counseling. They are concerned with educational and vocational goals as well as with the day-to-day adjustment of pupils to their school environment. *Rehabilitation counselors* work with the physically or mentally disabled. Although this counseling is, in large part, vocationally oriented, it also involves personal counseling particularly

as it relates to the handicapping nature of the person's disability. *Vocational counselors* are concerned primarily with vocational goals, job placement, and work adjustment. They may work with the young, the old, the able-bodied, and the disabled. Employment outlook statements on these counseling specialties are contained in this chapter.

As already mentioned, some people who are identified with other professional occupations also provide counseling services. The most closely related occupation in this category is that of counseling psychologist. Since it is part of the field of applied psychology, this specialty is described in the statement on psychologists in this *Handbook*. Similarly, a great many social workers provide counseling services to families and individuals, but their work is discussed in the statement on social workers. Several other groups of professional workers who also do some counseling but whose primary training is in another field (such as teaching, health service, law, or religion) are covered elsewhere in this *Handbook*. (See index for page numbers.)

Student personnel workers and other staff members of colleges and universities make up another large group concerned with providing counseling services. This chapter does not deal with these workers, nor does it include personnel workers in government and industry who may perform some counseling but whose primary concern is with the efficient use of manpower in their organizations. (See index for page number of statement on personnel workers.)

School Counselors

(D.O.T. 0-36.40)

Nature of Work

School counselors help pupils make and carry out plans for their education and work. They also

assist students in understanding and adjusting to their school and social environment. Besides working directly with pupils, counselors consult with

classroom teachers, school administrators, and parents to further the development of individual children and the objectives of the general educational program. In addition, counselors may lead discussion groups on topics related to improving students' performance in school. Many counsel only part time, and may also teach classes in occupations, social studies, or other subjects.

Counselors interview students to obtain relevant information that will help these young people understand their own interests and abilities. Additional information about each student may be obtained from tests, administered by a specialist in testing or by the counselor, and from school and medical records. These data are analyzed and interpreted by the counselor who then works with the student to plan an appropriate course of action.



Courtesy of U.S. Department of Health, Education, and Welfare
High school counselor discusses college requirements

Counselors in junior and senior high schools assist students in selecting courses which fit in with their career or college plans. They make information available on colleges and college admission requirements. They may also aid students in selecting other types of post-high school training and in finding part-time work while in school or full-time employment after leaving school. To aid students and their parents in developing the

student's plans, counselors maintain files or libraries of occupational, college, and other information, arrange for showing of educational and vocational films, schedule appointments with college admissions officers, conduct "career day" programs, or arrange trips to factories, business firms, and colleges. A sizable number of counselors make followup studies of recent graduates and dropouts and cooperate in surveys of local job opportunities. They may also conduct or cooperate in research concerning the effectiveness of the educational program.

The methods used in counseling elementary school children necessarily differ in many respects from those used with older students. Special tests and play activity are among the additional techniques used with children in the lower grades. Elementary school counselors often serve more than one school.

As with classroom teachers, many full-time counselors perform a variety of other duties, such as supervising school clubs or other extra-class activities (often after regular school hours). In some schools, counselors do their own recordkeeping and other paperwork; however, most large schools provide clerical assistance.

Where Employed

Approximately 36,000 persons performed some counseling functions in the public secondary schools during the 1961-62 school year, according to the U.S. Office of Education. Nearly 16,000 persons were full-time counselors; another 10,000 spent at least half (but not full) time in counseling activities; and the remainder worked less than half time as counselors. In addition, several thousand secondary school teachers had 1 hour each week free for counseling. Although no precise information is available, it is estimated that about 500 counselors work in elementary 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 several schools to a counselor.

About one-third of all high school counselors and two-thirds of the elementary school counselors are women.

Training, Other Qualifications, and Advancement

As a rule, school counselors must meet the requirements for a State teaching certificate. (See statements for Kindergarten and Elementary School Teachers and for Secondary School Teachers.) In addition, all but five States (as of mid-1962) issue certificates for school counseling only to applicants who meet certain minimum qualifications concerning training and experience in the counseling and guidance field. For certification, all of these States require some graduate level work in the guidance field, and over half stipulate a master's degree or its equivalent in counselor education. Experience requirements for such certification range from 1 to 5 years in teaching; in many States at least 1 year of work experience outside the teaching field is also required. A private survey of high school counselors conducted in early 1960 indicated that of the counselors spending at least half their time in counseling activities, 43 percent were certified at that time.

Undergraduate college students interested in becoming school counselors usually take the regular program of teacher education, preferably with additional courses in psychology and sociology. After graduating from college, they may acquire the needed teaching or other experience, either before or while studying for their advanced degrees. In some school systems, teachers who have completed half of the courses required for the master's degree may counsel under supervision while taking additional courses. The subjects of the required graduate level courses usually include lectures on the counseling process, understanding the individual, educational and occupational opportunities, and testing and measurement. Some knowledge of statistics is also necessary for interpreting tests. Counselor education programs at the graduate level are available in more than 200 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. Supervised practice in guidance is provided in an increasing number of training programs.

Advancement for school counselors is most frequently related to supervisory or other administrative positions within the school system. For those with a Ph. D. degree, advancement may

be to college teaching positions in the guidance field.

Employment Outlook

Employment opportunities for well-trained school counselors are expected to be excellent throughout the 1960's. A persistent shortage of qualified counseling personnel has existed in all States for many years, according to the U.S. Office of Education, and this situation is likely to continue for at least several years. The recent tendency among the States to increase minimum entrance requirements for counselors, particularly as they relate to graduate level training, has tended to intensify, at least temporarily, the existing shortage of qualified workers.

Many hundreds of new counselors will be required each year to replace those leaving the profession. According to recent 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. In addition, counseling services will have to be expanded considerably each year during the decade just to keep pace with the growth in school enrollments. Thus, a substantial need for new counselors will exist without allowing for any further strengthening of counseling services. The average ratio of counselors to students in the country 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.

Over the long run, the demand for counseling services will remain strong. Vocational counseling will be needed by the great number of young students who will be preparing to enter the labor force for the first time, on a permanent basis, during the late 1960's. These students will need information such as that on rising educational requirements for entry jobs, the job changes effected by automation and other technology, and on where employment is to be found. Public concern over the employment problems of school dropouts is placing increasing pressure on the school counselors to help prepare these students for employment before they leave school. 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. In addition, there is increasing recognition of the need to identify and counsel talented children at an early age, so they may develop with maximum benefit both to themselves and to the Nation.

In addition to limitations in the supply of qualified counselors, the extent of guidance services in different localities will continue to be related to the wealth of the community and to the priority which school administrators and the community assign to guidance services in school planning. Although communities may favor the expansion of counseling services, the necessary money may not be made available because of competing needs for funds. In recent years, however, budget allocations for counseling activities have been increasing, and this trend is expected to continue, leading to a growing demand for counselors in most parts of the country.

Earnings and Working Conditions

A private survey of counselors found that the average annual salaries of most counselors in 1962 were within the range of \$6,000 to \$7,000. Many school counselors have 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.) Some of these counselors have extra earnings because they work 1 or 2 months longer each year than the classroom teachers. However, some school systems pay counselors an additional amount unrelated to months worked.

In most school systems, counselors receive regular salary increases as their counseling experience increases and as they obtain additional education. Some counselors supplement their income by part-time employment in consulting or other work with private or public counseling centers, government agencies, or private industry. Those with superior qualifications may have opportunities for summer employment, especially as teachers in counselor-training institutes.

Where To Go for More 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 and from the U.S. Department of Health, Education, and Welfare, Office of Education, Guidance and Counseling Programs Branch, Washington, D.C., 20202.

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

American Personnel and Guidance Association,
1605 New Hampshire Ave. NW., Washington, D.C.,
20009.

Rehabilitation Counselors

(D.O.T. 0-36.40)

Nature of Work

The rehabilitation counselor interviews each physically or mentally disabled person to obtain as much information as possible about him, his emotional problems, and the nature of his disability. During the early interviews, the counselor attempts to establish free and easy communication to ensure a relationship of mutual trust and confidence. Information developed in the interviews is used with other medical, psychological, and social data to help the handicapped person in evaluating himself in relation to the kind of work

that is suitable to his physical and mental capacity, interests, and talents. A plan of rehabilitation may then be worked out jointly by the counselor, the handicapped person, and those providing medical treatment 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 employment becomes appropriate the counselor assists in finding a suitable job and often makes followup visits to be sure that the placement is satisfactory.

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 specialities are expected to develop as services for other types of difficult cases are included in rehabilitation programs.



Courtesy of National Institutes of Health

Rehabilitation counselor checks a handicapped worker's job adjustment

The time spent in the direct counseling of each individual depends upon the person and the nature of his disability as well as the counselor's workload. Some rehabilitation counselors may have the responsibility for as many as 200 persons in various stages of rehabilitation; on the other hand, those with less experience, or specialized counselors working with the severely handicapped, may handle relatively few cases. In addition to working directly with the handicapped person, the counselor must also maintain close contact with other professional people working with handicapped persons, members of their families, other agencies and civic groups, and private employers and business groups who hire the handicapped. The counselor is often responsible for related activities, such as employer education and community publicity for the rehabilitation program.

Where Employed

Every State provides a public rehabilitation program that is financed cooperatively with Federal and State funds. In 1962, about three-fourths of the estimated 3,000 full-time rehabilitation counselors worked in these State and local rehabilitation agencies. In addition, more than 350, most of whom were counseling psychologists, worked for the Federal Government in the Veterans Administration. The remainder were employed by hospitals, labor unions, insurance companies, special schools, rehabilitation centers, sheltered workshops, and by other public and private agencies that conduct rehabilitation programs and job placement for the disabled.

An estimated 10 to 15 percent of all rehabilitation counselors are women.

Training, Other Qualifications, and Advancement

A general 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, there are no uniform requirements as to the specific kind and amount of education needed to qualify for work in this field. Some employers prefer to hire people with a master's degree who have majored in vocational or rehabilitation counseling; others find the master's degree with a major in a related discipline—social science, psychology, education, or social work—satisfies their needs; a few require the Ph. D. degree, with a major in counseling psychology. Work experience in related fields, such as vocational counseling and placement, social work, psychology, education, and other types of counseling, is also given considerable weight by some employers, especially when considering applicants with only the bachelor's degree.

It usually takes from 1½ to 2 years to complete the master's degree in the fields of study preferred for rehabilitation counseling. The curriculum for the master's degree in rehabilitation counseling may include a basic foundation in psychology and such courses as Medical Aspects of Rehabilitation, Cultural and Psycho-Social Aspects of Disability, Survey of Therapeutic Care and Rehabilitation, Legislative Aspects of Rehabilitation, Counseling Techniques, Occupational and Educational In-

formation, Community Resources, and Placement and Follow-Up.

To earn the Ph. D. degree in rehabilitation counseling or in counseling psychology may require 4 to 6 years of graduate study. For the doctorate, intensive training in psychology, other social sciences, and the biological sciences as well as research methodology is required.

In 1962, 32 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, Vocational Rehabilitation Administration. In these graduate programs an internship (supervised work in a rehabilitation setting) is required.

About three-fourths of State rehabilitation agencies require applicants to comply with State civil service and merit system rules, and this proportion is steadily increasing. In most cases these regulations require the applicants to take a written competitive examination, which is sometimes 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 with little experience are usually assigned the least difficult cases; experienced and highly trained counselors are assigned persons with the 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

Employment opportunities for well-qualified rehabilitation counselors are expected to remain excellent throughout the 1960 decade. The shortage of counselors that has been evident since World War II seems likely to persist for a number of years. Persons with graduate work in rehabilitation counseling or in a related field will have the best opportunities for employment. Opportunities will also be available to applicants with a bache-

lor's degree and some related work experience, but employers are placing increasing emphasis on the master's degree as the minimum education standard for the profession.

The present supply of rehabilitation counselors is inadequate to meet the counseling needs of the mentally and physically handicapped. Most of the disabled war veterans have been rehabilitated, but the number of other people needing rehabilitation counseling is nevertheless increasing. It is estimated by the Vocational Rehabilitation Administration that at least 2 million persons in the Nation need rehabilitation counseling now; and that an average of about 600 new counselors will be needed annually during the rest of the 1960 decade to staff new and expanding programs and to replace counselors who leave the profession. This annual demand exceeds considerably the number presently being trained and entering the field. Over the next few years, the supply of rehabilitation counselors will probably be augmented to some extent by people from related fields, but the most closely related disciplines (psychology, social work, and education) are those in which the demand for graduates also generally exceeds the supply.

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 the more difficult and chronic disabilities; and the anticipated increases in public and private funds allocated to these services, because of the increasing support for social welfare in general, and because of the growing awareness that expenditures for rehabilitation are often returned as savings on appropriations for programs involving health and custodial care, public assistance, and other types of welfare.

Earnings and Working Conditions

In mid-1962, the beginning average (median) salary paid rehabilitation counselors employed in State agencies was \$5,400 according to the U.S. Department of Health, Education, and Welfare, and the average salary of experienced counselors was \$6,660. Counselors with a doctorate in psy-

chology working with the disabled in the Veterans Administration were hired in early 1963 at annual salaries ranging generally from \$8,045 to \$11,150, 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. For the field work it is often necessary to be able to drive a car.

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

Where To Go for More Information

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

American Personnel and Guidance Association,
1605 New Hampshire Ave. NW., Washington, D.C.,
20009.

American Psychological Association, Inc.,
Division of Counseling Psychology,
304 East 45th St., New York, N.Y., 10017.

National Rehabilitation Association,
1025 Vermont Ave. 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,
Vocational Rehabilitation Administration, Wash-
ington, D.C., 20201.

Vocational Counselors

(D.O.T. 0-36.40)

Nature of Work

Vocational counselors (including employment counselors) help people develop and accept an adequate career goal that will bring personal satisfaction. They assist clients by planning with them on how to prepare for, enter, and progress in their work. The extent of the counseling assistance available, however, differs among agencies providing such service. In State employment service offices, for example, counseling most commonly relates to short-run employment goals and involves a limited amount of counseling. In private agencies, on the other hand, the focus, typically, is on longrun vocational goals with more extensive analysis and counseling.

Counselors interview the person seeking their counsel to obtain vocationally significant information about his personal traits, interests, training, work experience, and work attitudes. During or after such sessions, counselors record the applicant's responses to their questions as well as their own general observations about the interview. They may assist the individual in filling out questionnaires concerning his personal history and background, which are then reviewed together. Additional data on the person's general intelligence, aptitudes and abilities, physical capacities,

knowledge, skills, interests, and values are also 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.

In subsequent interviews, and to the extent that time permits, counselors assist the applicant in evaluating and understanding his own work potential and provide him the information he needs



Vocational counselor seeks information from client about his interests, training, and work experience

in making plans appropriate to his talents and interests. Job requirements and employment opportunities or training facilities are discussed. An employment plan is jointly developed 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 labor market or occupational analyst.

In many cases, counselors help find a suitable job by suggesting possible employment sources and appropriate ways of applying for work. They may also contact prospective employers on behalf of applicants. After job placement has been completed, counselors may follow up to see if help with work adjustment is needed.

Counselors may also devote some time to developing job contacts in the community through conferences with employers. Often they conduct group meetings on employment opportunities.

Where Employed

The great majority of counselors—1,000 full time and 2,000 part time—are employed in State employment service offices where the main focus is on employment counseling. The next largest number—probably about 500—work for various private or community agencies offering vocational counseling, primarily in the larger cities. In addition, some work in institutions such as prisons, mental hospitals, and training schools for delinquent youths. The Federal Government employs a limited number of vocational counselors, chiefly in the Bureau of Indian Affairs and the Veterans Administration. Some people trained in vocational counseling are engaged in research or graduate teaching in the vocational guidance field. About half of all vocational 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, with some course work in counseling and psychology. Private and community agencies have not agreed upon minimum entrance requirements, 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 with a Ph. D. in counseling 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 are often given some additional out-service training in counseling at nearby colleges and universities or, in some cases, at summer institutes. 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 such as Techniques of Appraisal and Counseling for Vocational Adjustment, Group Guidance Methods, Counseling Followup Techniques, Psychological Tests in Vocational Counseling, Educational Psychology, Psychology of Occupations, Industrial Psychology, Job Analysis and Theories of Occupational Choice, and some course work in research methods and statistics.

Counselor education programs at the graduate level are available in more than 200 colleges and universities, most frequently in the department of education or psychology. To obtain a master's degree, students must complete 1 to 2 years of graduate study which often includes supervised practice in counseling.

An increasing number of 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 may also require a written or oral examination, or both.

Counselors who demonstrate that they are well qualified may, after considerable experience, advance 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; some be-

came consultants; and others, with the doctorate, may obtain teaching appointments as professors in the guidance field.

Employment Outlook

Vocational counselors with a master's degree and those with recognized related experience in the field will have excellent employment opportunities in both public and private agencies for the rest of the 1960 decade. In addition, college graduates with only a bachelor's degree who are interested in trainee positions as employment counselors will find many opportunities in State and local employment service offices.

The demand for well-qualified vocational counselors is expected to be strong for some time to come, owing in part to new Federal legislation (the Manpower Development and Training Act and the Trade Expansion Act, both passed in 1962) that provides for counseling in connection with the occupational training or retraining of large numbers of unemployed workers. In addition to the expanding counseling activities resulting from these programs, a sharp increase is expected in the number of young workers entering the labor force for the first time during the late 1960's. These young people will need guidance to prepare them adequately for employment in a fast-changing job world. Furthermore, vocational counseling is being recognized increasingly as a valuable tool in combating many social problems; for example, it aids in restoring persons receiving public assistance to independence, in keeping young people in school, and in identifying desirable employment goals for school dropouts. In addition to counselors needed for expanding programs, many are needed each year to replace workers who retire, die, or leave the profession for other reasons.

In the future, as in the past, the chief limitation on the expansion of both public and community vocational counseling services will be the availability of funds. Counseling in public employment agencies is dependent on the allocation of Federal and State moneys for these services; counseling in the community agencies is dependent

upon community or private funds which may be limited because of competing demands.

Earnings and Working Conditions

The annual average (median) salary for beginning employment counselors in the State employment service offices was \$4,760 in mid-1962; for experienced employment counselors, the average salary was \$5,915. Scattered reports from a few voluntary agencies in large cities indicate that trainees for vocational counseling positions were being hired at about \$5,500 a year; annual salaries reported for experienced counselors ranged up to \$8,500. In early 1963, trainees in Federal agencies generally started at \$5,540 a year; experienced counselors were hired at salaries ranging between \$6,675 and \$8,045 depending on their qualifications and experience.

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

Where To Go for More Information

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

American Personnel and Guidance Association, Inc.,
1605 New Hampshire Ave. NW., Washington, D.C.,
20009.

U.S. Department of Health, Education, and Welfare,
Office of Education, Guidance and Counseling Programs
Branch, Washington, D.C., 20202.

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 about 160 private agencies offering vocational counseling services that meet certain professional criteria set forth by the American Board on Counseling Services, Inc., is provided in the "Directory of Approved Counseling Agencies, 1963-64," available from the American Personnel and Guidance Association, Inc., at \$2 a copy.

HEALTH SERVICE OCCUPATIONS

Nearly everyone knows something about the professional services provided by doctors, dentists, and pharmacists. Many people also have some first-hand knowledge of the duties of nurses, attendants, and other workers who take care of patients in hospitals. Less well known, but likewise of great importance to the public health, are the large number of people employed behind the scenes in other health service occupations such as laboratory or X-ray technician. Altogether, more than 2 million people were employed in the health field in 1962. Employment in this field has increased by more than 40 percent since 1950—nearly three times the increase for all employed persons.

Nurses, physicians, pharmacists, and dentists make up the largest of the professional health occupations; in 1962, the numbers in these occupations ranged from about 100,000 dentists to 550,000 registered professional nurses. Other professional health occupations with sizable employment are dietitian, veterinarian, optometrist, chiropractor, osteopathic physician, and hospital administrator. Other health service workers include technicians of various types, such as medical technologists, medical X-ray technicians, dental hygienists, and dental laboratory technicians. Large numbers—nearly three-quarters of a million—work as practical nurses and auxiliary nursing workers, including orderlies, nursing aids, hospital attendants, and psychiatric assistants.

Workers in the health field are employed in many kinds of places including hospitals, clinics, laboratories, pharmacies, nursing homes, industrial plants, private offices, and patients' homes. Those employed in health-related occupations are concentrated in the more heavily populated and prosperous sections of the Nation and in big cities, but some are in every village and town.

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, medical X-ray technician, medical technologist, dietitian, physical therapist, occupational therapist, dental hygienist, and medical record librarian. On the other hand, the majority of dentists, optometrists, physicians, veterinarians, and pharmacists 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 during the middle and late 1960's, although the rate of growth will differ considerably among the various health service occupations. In general, the factors which have contributed to an increase in the demand for health care in the recent past will probably continue to operate. Among these factors are the country's expanding and aging population, the rising health consciousness of the general public, the extension of hospitalization and medical insurance plans, the rapid expansion of expenditures for medical research, and the continued provision of health care for veterans and members of the Armed Forces and their families. In addition, many new workers will be needed each year to replace those who retire, die, or—particularly in the case of women—leave the field for other reasons. Thus, there will be many opportunities for employment in the health field over the rest of the decade and in the longer run.

Registered Professional Nurses

(D.O.T. 0-33.)

Nature of Work

Registered professional nurses provide nursing services to patients, either by giving direct care or through supervising allied nursing personnel. They administer medications and treatments prescribed by physicians; observe, evaluate, and record symptoms, reactions, and progress of patients; assist in patient education and rehabilitation; improve the physical and emotional environment of patients; 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.



Student nurse gets practical experience in caring for a patient

The largest group of professional nurses are *hospital nurses* who care for patients in hospitals or related institutions. Most of these are general duty 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 often supervise auxiliary nursing workers. Some hospital nurses serve primarily in the operating room, assisting surgeons with operations. Others limit

their work to certain types of patients such as children or the mentally ill; still others are engaged primarily in administrative work in hospitals.

Private duty nurses are employed directly by patients or their families to give individual nursing care, usually to one patient, when constant attention is needed. Sometimes, in a hospital, one private duty nurse may take care of a few patients who require special nursing care but not full-time attention.

Office nurses are employed mainly by physicians in private practice or in clinics, and occasionally by dentists, to assist in the care of patients. Sometimes, they perform routine laboratory and office work.

Public health nurses work for health agencies and visiting nurse associations, caring for patients in clinics or visiting them in their homes. Their duties may include giving first aid treatment or periodic nursing care as prescribed by a physician, demonstrating diet plans to groups of patients, and arranging for immunizations. These nurses may work with community leaders, teachers, parents, and physicians in planning or conducting community health education programs. Some public health nurses work in schools, although not all school nurses are public health nurses.

Occupational health or industrial nurses provide nursing care to employees in industry and government, and are responsible for promoting employee health. They may work alone (with a doctor on call), or they may be part of a health service staff in a large organization. According to a doctor's instructions, they treat minor injuries and illnesses occurring at the place of employment, provide continued nursing care when needed, arrange for further medical care if necessary, and offer health counseling. They may also assist with health examinations and inoculations, keep and analyze health records of employees, and help develop programs to prevent or control diseases and accidents.

Nurse educators teach students the principles and skills of nursing, both in the classroom and at

the bedside. They may also conduct refresher and in-service courses for nurses.

Nurses also engage in numerous other activities such as research, editing nursing journals or textbooks, and serving on the staffs of nursing organizations.

Where Employed

Two-thirds of the estimated 550,000 professional nurses employed in 1962 were hospital nurses. Approximately 22,000 were employed by the Federal Government, mainly by the Veterans Administration and the Public Health Service, and about 8,500 were serving as commissioned officers in the Armed Forces. Nearly 70,000 were private duty nurses who cared for patients in hospitals and private homes; about 40,000 were office nurses; public health nurses in government agencies, visiting nurse associations, and clinics numbered 35,000; nurse educators accounted for 20,000; and occupational health nurses, 17,000. Most of the remainder were staff members of professional nurse organizations or were employed by research organizations.

Approximately one-fifth of all nurses employed in 1962 worked on a part-time basis. Less than 3 percent of all employed professional nurses are men.

Training, Other Qualifications, and Advancement

A license is required to practice professional nursing in all States and the District of Columbia. To obtain a license, a nurse must have graduated from a school approved by the State board of nursing and pass a State board examination. A nurse may be registered 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. Many schools accept only graduates in the upper third or half of their class. Demonstrated competence in science and mathematics may also be required. Young people considering a nursing career should have an interest in people and a desire to care for the sick and injured. Other personal qualifications needed are dependability, good judgment, patience, and good physical and mental health.

Three types of educational programs—diploma, baccalaureate degree, and associate degree—offer the basic preparation required for professional nursing. Diploma programs are conducted by hospital 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 programs in junior and community colleges last approximately 2 years. In late 1962, there were 1,126 programs of these 3 types in the United States. Nearly 80 percent were diploma; 15 percent, baccalaureate degree; and the rest, associate degree programs.

All professional nursing programs include classroom instruction and supervised nursing practice. Students generally begin their program by studying such subjects as anatomy, physiology, microbiology, nutrition, psychology, and basic nursing care. Subsequently, they are given instruction and supervised experience in the care of patients with different types of illnesses, in hospitals and health facilities. Students in colleges and some other schools are also assigned to public health agencies and 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.

Hospital nursing usually begins with general duty work, from which nurses with experience may be advanced to progressively more responsible supervisory positions, such as head nurse, supervisor, assistant director, and director of nursing service. A bachelor's or master's degree, however, is customarily required for supervisory and administrative positions, as well as for positions in nursing education and public health nursing. Although some public health agencies hire nurses who do not have degrees in public health nursing, their advancement in these agencies is usually limited.

Employment Outlook

Registered professional nurses are expected to have excellent employment opportunities throughout the remainder of the 1960's. The outlook is especially favorable for nurses with graduate training to fill positions as administrators, teachers, clinical specialists, and public health nurses.

Shortages have been reported in the nursing profession for many years and are likely to persist even though the number of professional nurses in relation to population is rising. Although the number of active professional nurses per 100,000 people rose from 249 in 1950 to 297 in 1962, the demand in 1962 exceeded the supply in many parts of the country. The supply is primarily determined by the number of girls graduating from high school who enter and complete nurses' training. At present, not enough students are entering the field to meet growth and replacement needs; however, this situation is likely to improve somewhat as a result of the substantial increase in the number of high school graduates, beginning with the school year 1964-65. The supply of nurses will also continue to come partly from reentry—at least on a part-time basis—of inactive nurses, who represent a very high proportion of all registered professional nurses.

Among the principal factors which will continue to contribute to the rising demand for nurses, over the long run, are population growth and the increased proportions of very young and old people in the population. Other factors include: Improved economic status of the population; widespread membership in hospital and medical insurance plans; expansion of medical services as a result of new medical techniques and drugs; and increased interest in preventive medicine and rehabilitation of the handicapped. Replacement needs are high—many professional nurses leave active nursing each year, primarily because of marriage and family responsibilities. Thus, in addition to the many nurses required to fill new positions, at least 25,000 will be needed annually throughout the remainder of the 1960's as replacements.

Earnings and Working Conditions

Information on the earnings of professional nurses is scattered and refers to different time periods. The most recent information available is summarized below.

The average annual salary of general duty nurses in non-Federal general hospitals was \$3,900 in early 1963, according to the National League for Nursing. Head nurses and supervisors usually earned more.

Fees for private duty nurses generally were between \$15 and \$20 for a basic 8-hour day in 1961, according to the American Nurses' Association (ANA). Office nurses were earning \$4,320 a year, on the average, when surveyed by the ANA in 1962. Average salaries of public health nurses employed by local government agencies in 1962 were \$4,902, as indicated by a National League for Nursing study. Industrial nurses earned average weekly salaries ranging from \$75 in Greenville, S.C., and \$100 in Toledo, Ohio, to \$118.50 in the Beaumont—Port Arthur, Tex., area, according to a survey by the Bureau of Labor Statistics in late 1961 and early 1962. Average salaries of industrial nurses in about half the 61 areas for which earnings data on nurses were reported ranged between \$95 and \$105 a week.

Nurse educators and administrators had an average (median) salary of \$5,150 in schools of professional nursing when surveyed by the ANA in 1960.

The Veterans Administration offered inexperienced nurses with diploma and associate degrees an annual salary of \$5,035, and baccalaureate graduates, \$5,820 in early 1963. In other Federal Government agencies, the entrance rate for nurses was \$4,565 for graduates of 3-year training programs or for graduates of 2-year schools who had 1 year of experience or additional nursing education. The beginning salary in early 1963 for nurse officers (second lieutenants and ensigns) in military services was \$4,265, including allowances. Those with bachelor's degrees who were commissioned in the U.S. Public Health Service received salary and allowances totaling \$4,828 a year.

Virtually all nurses receive extra pay for work on evening or night shifts and 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.

Where To Go for More Information

Information on approved schools of nursing, nursing careers, Future Nurses Clubs, and scholarships may be obtained from:

National League for Nursing, Committee on Careers,
10 Columbus Circle, New York, N.Y., 10019.

Information on salaries, working conditions, and employment opportunities may be obtained from:

American Nurses' Association,
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.

Physicians

(D.O.T. 0-26.10)

Nature of Work

Physicians diagnose diseases and treat people who are ill or in poor health. In addition, they are concerned with the prevention of disease 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—often referred to as “family doctors”; the others are specialists in 1 of the 32 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 (childbirth and women's diseases), psychiatry (mental disorders), pediatrics (medical care of children), radiology (use of X-ray and other radioactive sources), ophthalmology (the eye and its diseases), and pathology (diagnosing changes in body tissues).

Where Employed

About 250,000 physicians were professionally active in the United States in mid-1962. The great majority—over 175,000—were engaged in private practice. About 34,000 were interns or residents in hospitals, and another 10,000 held regular positions on hospital staffs. More than 20,000 physicians were serving as commissioned officers in the Armed Forces or were employed in Federal Government agencies, chiefly in the hospitals and clinics of the Veterans Administration and the Public Health Service. The remainder were employed in private industry, State and local health departments, medical schools, research foundations, and professional organizations.

In 1962, nearly 40 percent of all physicians were in the five most populous 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 the larger 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



Courtesy of National Institutes of Health

Surgery is one of the largest medical specialties

approved medical school, pass a licensing examination, and—in 32 States and the District of Columbia—serve a 1-year hospital internship. As of 1962, 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 acceptance by the profession. Twenty-two 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 43 States and the District of Columbia as a substitute for State examinations. Although physicians licensed in one State can usually obtain a license to practice in another without further examination, some States limit this reciprocity.

In early 1963, there were 86 schools in the United States in which students could begin the study of medicine. Eighty-two awarded the degree of doctor of medicine (M.D.) to those completing the 4-year course; 3 offered 2-year courses in the basic sciences to students who could then transfer to regular medical schools for the last 2 years of study. The remaining school (set up as a 4-year institution) had not yet graduated its first class and was, therefore, only provisionally approved. 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 least 3 years of college education for admission, and a few require 4 years. The great majority of students entering medical schools have completed 4 years of college. A few medical schools allow selected students with exceptional qualifications to begin their professional study after completion of 2 or 3 years of college. These students are usually awarded a bachelor's degree while in medical school.

Premedical study must include courses in English, physics, biology, and inorganic and organic chemistry in an accredited college. Students are also encouraged to 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 is also 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, 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 and learn to take case histories, perform examinations, and recognize diseases.

New physicians are increasingly taking training beyond the 1-year hospital internship. Those who plan to be general practitioners often spend an additional year 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 or more years of practice in the specialty. Doctors interested in teaching and research may take graduate work leading to the master's or Ph. D. degree in a field such as biochemistry or microbiology.

A growing number (in 1962, about 1,500 U.S. citizens and 8,500 of foreign citizenship) who received their medical training abroad were serving as interns and residents in this country. To be appointed to approved internships or residencies in U.S. hospitals, however, graduates of foreign medical schools (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.

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 have emotional stability. Although some aspects of physicians' practice may appear to be glamorous or dramatic, much of their work involves dealing with human tragedy.

The majority of newly qualified physicians open their own offices. New graduates entering the Armed Forces are usually commissioned as first lieutenants or lieutenants (j.g.). Physicians who have completed their internships and enter on active duty serve as captains in the Army and Air Force and as lieutenants in the Navy. Graduates of accredited medical schools are eligible for Federal Civil Service positions and for commissions in the U.S. Public Health Service.

Employment Outlook

Excellent opportunities are anticipated for physicians throughout the remainder of the 1960's. The number of medical school graduates is expected to increase moderately. Many medical schools have recently expanded their facilities and a few new schools are being planned. The number of graduates will, therefore, rise from about 7,200 in 1962 to an estimated 7,700 by 1970, according to projections of the U.S. Public Health Service. Moreover, graduates of foreign medical schools—both U.S. citizens and others—may continue to add to the supply. (In 1962, about 2,000 foreign-trained physicians were licensed in the United States.) On the other hand, about 5,000 new doctors will be needed each year for the remainder of the 1960's to replace those who retire or die. The remaining number will not be sufficient to maintain the current ratio of physicians to population in spite of expected increases in medical school facilities and the establishment of new schools.

A steady increase is expected in the demand for physicians' services, in both the near future and the long run. The need for medical services will be increased by the anticipated population growth and change in the age composition of the population, the rising health consciousness of the public, and the trend toward higher standards of medical care. Extension of prepayment plans for medical care and hospitalization, continued Federal Government provision of medical care for members of the Armed Forces, their families, and

veterans, and the continuing growth in the fields of public health, rehabilitation, industrial medicine, and mental health will also tend to bring about a need for more doctors. In addition, expanded medical research activities will require more trained investigators; medical schools will have openings for additional faculty members; and the growing number of hospital training programs will require more interns and resident physicians.

The rise in demand for physicians' services will be limited, to some extent, by advances in medical science and more efficient use of medical personnel. The introduction of new drugs and medical techniques, the more extensive use of assistants trained in other health occupations, and the increasing proportion of patients treated in hospitals and physicians' offices rather than at home will probably enable individual physicians to care for more patients. In addition, the growing tendency of doctors to work in groups is expected to result in a more effective use of the physician's time. Nevertheless, population expansion and the general rise in use of medical services are expected to outweigh any lessening in demand for physicians caused by other developments. For all these reasons, the longrun outlook is very bright for young people who have proper qualifications and are able to gain admittance to medical school.

Women physicians, who represent about 6 percent of the profession, will continue to find good opportunities as general practitioners and as specialists. In 1962, about 6 percent of all medical school students were women. They were enrolled in all schools, and one school accepted only women.

Earnings and Working Conditions

New graduates serving as interns in 1962 had an average (median) stipend, during this training period, of \$191 a month in hospitals affiliated with medical schools and \$249 a month in other hospitals. In many cases, interns also received room, board, and other maintenance allowances. The average stipend of residents during 1962 was \$248 a month in hospitals affiliated with medical schools and \$302 a month in nonaffiliated hospitals. Many hospitals also provided full or partial room, board, and maintenance allowances. During the first year or two of independent practice,

physicians may earn little more than the minimum needed to pay expenses but, as a rule, their earnings rise rapidly as their practice develops.

Earnings of individual physicians depend on factors such as the region of the country in which they practice, income level of the patients, and the physician's skill and personality 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.

According to a survey by the U.S. Public Health Service, the average (median) annual net income of physicians in group practice was \$22,607 in 1959; the net incomes among these physicians ranged from \$6,800 to \$91,268. Those in the West had the highest average net incomes and those in the Northeast had the lowest.

Many physicians work long and irregular hours. Most specialists work fewer hours each

week than general practitioners. As doctors grow older, they tend to work shorter hours. Many, however, continue in practice well beyond 70 years of age.

Where To Go for More 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 pre-medical education and medicine as a career, may be obtained from:

Council on Medical Education and Hospitals,
American Medical Association,
535 North Dearborn St., Chicago, Ill., 60610.
Association of American Medical Colleges,
2530 Ridge Ave., Evanston, Ill., 60201.

Pharmacists

(D.O.T. 0-25.10)

Nature of Work

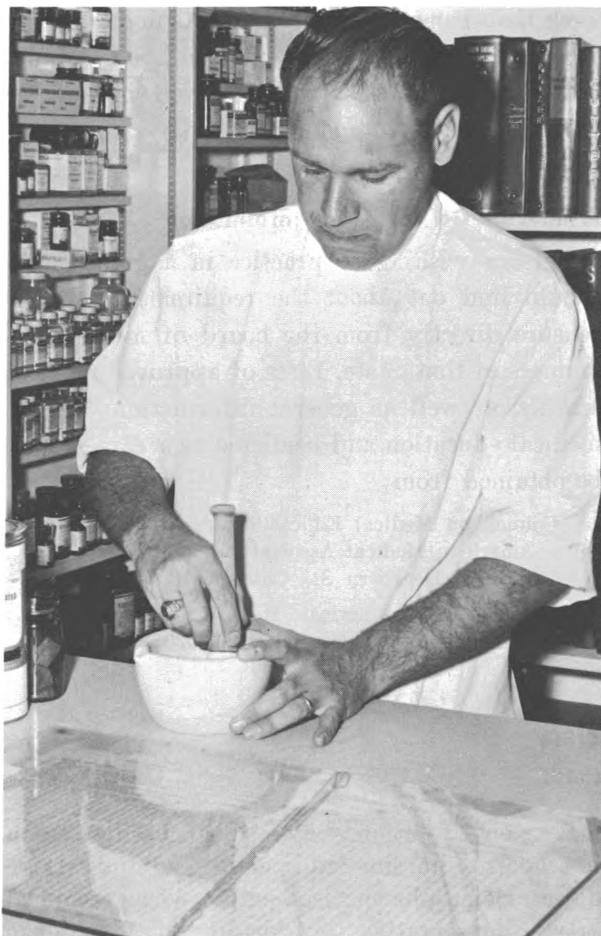
Pharmacists help to protect people's health by making drugs and medicines available and providing information on their use. They dispense prescriptions ordered by physicians and other medical practitioners and may also sell many medicines which can be bought without prescriptions. Pharmacists must understand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

Many pharmacists in retail drugstores or community pharmacies have sales and managerial as well as professional duties. Besides dispensing drugs, these pharmacists may hire and supervise salesclerks and buy and sell other kinds of merchandise. Some pharmacists, however, operate prescription pharmacies which sell only drugs and medical supplies. Pharmacists in hospitals fill prescriptions and advise the medical staff on the selection and effects of drugs; they may also

make sterile solutions, buy medical supplies, teach in schools of nursing, and perform administrative duties. Some pharmacists, employed as technical sales representatives or "detail men," by drug manufacturers and wholesalers, inform doctors and dentists about new drugs and sell medicines to other pharmacists. Others teach in colleges, perform research, supervise the manufacture of pharmaceuticals, develop new drugs, write for pharmaceutical journals, or do administrative work.

Where Employed

About 103,000 of the 117,000 licensed pharmacists in early 1962 worked in retail pharmacies. About half of these retail pharmacists owned their drugstores, alone or as members of a partnership, and the others were salaried employees. The remaining pharmacists were employed by pharmaceutical manufacturers and wholesalers or worked for hospitals. Approximately 850 were civilian employees of the Federal Government, working chiefly in hospitals and clinics of the Veterans Administration and the U.S. Public



In compounding prescriptions, pharmacists must know about new drugs

Health Service. In addition, some served as pharmacists in the Armed Forces, taught in colleges of pharmacy, or worked for other employers such as State and local government agencies.

Nearly every town has at least one drugstore with one or more pharmacists in attendance. Most members of the profession, however, are employed in or near cities and in those States which have the greatest population.

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 under the supervision of a regis-

tered pharmacist. In 12 States, part or all of this experience must be acquired after graduation. All States except California, Florida, Hawaii, and New York grant a license without an examination to properly qualified pharmacists already licensed by another State.

In 1963, there were 76 pharmacy colleges in the United States. Some of these were not filled to capacity and qualified applicants could usually expect to be accepted.

To graduate from a pharmacy college, one must have at least 5 years of study beyond high school; two schools require a longer period of education. Some pharmacy colleges with a 5- or 6-year course admit students directly from high school and provide all the education necessary for graduation. Others provide 3 or 4 years of professional instruction and require all entrants to have completed their prepharmacy education in an accredited college or university. Prepharmacy education usually emphasizes mathematics and basic sciences, such as chemistry and biology, but also includes courses in the humanities and social sciences.

The bachelor's degree awarded upon graduation from a pharmacy college is sufficient 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 (the study of the effects of drugs on the body), pharmacognosy (the study of the drugs derived from plant or animal sources), or pharmacy administration—is usually required for research work or college teaching. Graduate study is also considered 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 study and practical experience in a hospital pharmacy.

Prospective pharmacy students should have a good high school background in mathematics and science. In addition, orderliness and a liking for detail are desirable qualities for young people entering the profession. For those planning to become retail pharmacists, the ability to deal with people and manage a business is of special importance.

Pharmacists often begin as employees in retail pharmacies. After obtaining some experience and

the necessary funds, they may open their own pharmacies or buy established drugstores. A pharmacist who gains experience in a chain drugstore may advance to store manager and, later, to a higher executive position within the company. Hospital pharmacists with the necessary training and experience may be advanced to chief pharmacist or other administrative positions.

Employment Outlook

Most new pharmacy graduates are expected to be able to find employment readily through the middle and late 1960's. From 3,000 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 position for pharmacists, are expected to provide enough employment opportunities to absorb each year's graduates. In 1963, employers in some localities were having difficulty in meeting their needs for pharmacists, and not enough people with graduate degrees in pharmacy and related fields were available for college teaching and laboratory research positions.

In the long run, a moderate increase in employment of pharmacists is expected. New drugstores will be added, particularly in residential areas or suburban shopping centers; the country's expanding population—especially the growing number of old people and children—and the rising standard of medical care point to an ever-increasing demand for pharmacists' services. The trend toward larger drugstores, however, will enable pharmacists to spend more of their time in professional activities, thus lessening the overall demand for retail pharmacists. Nevertheless, because of the trend toward shorter working hours, many drugstores will hire additional pharmacists. Continued expansion in pharmaceutical manufacturing and research is expected to provide more opportunities for pharmacists not only in production and research but also in distribution and sales positions. Employment in hospitals will probably rise with the construction of additional facilities and the more extensive use of pharmacists for hospital work. In both the pharmaceutical industry and hospitals, the demand will be greatest for pharmacists with graduate education.

Thus, many factors point toward continuous

growth in this profession. It should be borne in mind, however, that employment of pharmacists is closely related to the prosperity of the retail drug industry which, in turn, depends to a large degree on the general level of economic activity.

Women, who represent about 7 percent of all pharmacists, will continue to find their best opportunities in hospital pharmacies, prescription pharmacies, and in laboratory work, although some are employed in all branches of the profession. Women students are accepted by all colleges of pharmacy and in 1962 constituted about 13 percent of undergraduate enrollments.

Earnings and Working Conditions

Beginning pharmacists employed in drugstores earned between \$125 and \$175 a week in 1962, according to reports from cities in various parts of the country. Pharmacists who owned and operated drugstores generally made more than this; however, their earnings, and also to a lesser extent those of salaried pharmacists, are greatly affected by the length of their workweek, the size and geographic location of the store, and many other factors. Beginning pharmacists employed in hospitals generally earned from \$4,500 to \$6,500 a year, and those in drug manufacturing firms between \$5,700 and \$6,900 annually. The entrance salary for newly graduated pharmacists in the Federal Civil Service was \$5,540 in early 1963; however, pharmacists with a year of experience could start at \$6,675.

According to a survey made by the U.S. Public Health Service, the average (median) annual earnings of all full-time pharmacists were \$8,310 in 1961; for self-employed pharmacists, average net earnings were \$9,930, and for salaried pharmacists, \$7,800. Among salaried pharmacists, those who worked in retail chain stores had the highest average annual earnings—about \$8,600; for those employed in independent drugstores, the average was about \$7,600, and for those in hospital or clinic pharmacies, it was about \$7,100.

Retail pharmacists generally work more than the standard 40-hour week. Drugstores are often 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 week for many salaried retail pharmacists, and some work 50 hours a week or more. Self-employed pharmacists often work more hours than those in salaried positions. In 1961, according to the U.S. Public Health Service, almost half of all self-employed pharmacists worked 60 hours a week or more. Those who teach or work for industry, government agencies, or hospitals have shorter workweeks. Salaried pharmacists frequently receive paid vacations, health insurance, and other fringe benefits.

Where To Go for More Information

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

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

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

Dentists

(D.O.T. 0-13.10)

Nature of 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 that may affect a patient's general health. They spend most of their time with patients, but devote some time to laboratory work—making dentures, inlays, and other dental appliances. 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. They also employ other assistants who perform office work and assist the dentist in his "chairside" duties.

Most dentists are general practitioners who provide many types of dental care; only about 4 percent are recognized as specialists. Approximately 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 dentures), pedodontics (dentistry for children), oral pathol-

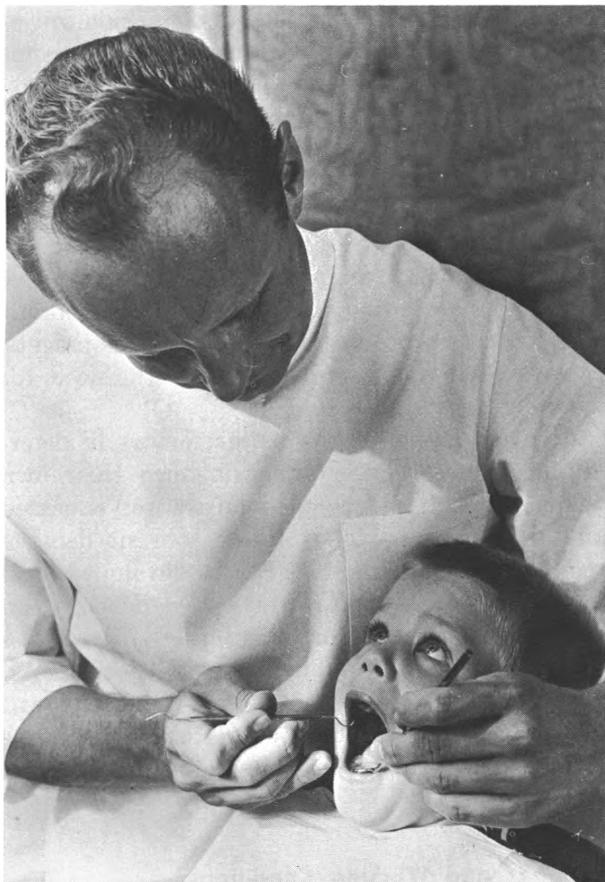
ogy (diseases of the mouth), and public health dentistry.

A few dentists—about 3 percent of the total number—are primarily employed 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.

Where Employed

About 95,000 dentists were at work in the United States in mid-1962. Nine out of every 10 were in private practice. Of the remainder, nearly 6,000 served as commissioned officers in the Armed Forces; about 1,200 had other types of Federal Government positions—chiefly in the hospitals and clinics of the Veterans Administration and the Public Health Service; and about 1,500 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 certain States. In 1961, about a third of the dentists were in the 4 most populous States (New York, California, Pennsylvania, and Illinois), whereas 20 States had less than 10 percent. The region including Delaware, the District of



Dentist checks a young patient's teeth

Columbia, Maryland, New Jersey, New York, Pennsylvania, and West Virginia had the highest ratio of dentists to population, with 1 dentist for every 1,442 persons in 1961. The Far West had the second highest ratio and New England, the third. At the other extreme was the Southeast with an average of only 1 dentist for every 2,796 residents in 1961.

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 early 1963, 38 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, Dela-

ware, 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 call himself a "specialist" unless he has been licensed as such after passing a special State examination. Few States permit dentists licensed in other States to practice in their jurisdictions without further examination.

Two years of pre dental college work followed by 4 years of professional training in a dental school are the minimum educational requirements for the profession; 7 of the 47 dental schools in operation in the United States in early 1963 required 3 years of pre dental study. Pre dental 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; the degree of Doctor of Dental Medicine (D.M.D. or D.D.M.) is conferred by a few schools.

Keen competition exists for admittance to dental schools. In selecting students, these schools give considerable weight to college grades and amount of college education; about 80 percent of the students enrolled in 1961 had at least 3 years of college education and nearly half had bachelor's degrees. In addition, all dental schools participate in a nationwide dental 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 often take graduate work in one of the basic sciences. To become recognized as a certified specialist, a dentist must pass specialty board examinations. To qualify for these examinations, he needs 2 or 3 years of graduate education and several years of specialized experience. Graduate training may be obtained at most schools of dentistry or by serving an internship or residency at 1 of

the 233 approved hospitals that offer these programs.

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 dentists who are already established, 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 schools are eligible for Federal Civil Service positions and for commissions in the U.S. Public Health Service.

Employment Outlook

The demand for dental services is likely to increase faster than the supply of new dentists during the remainder of the 1960's. The number of dentists graduated each year is expected to increase only slightly—from about 3,300 in 1961 to an average of 3,500 per year in the second half of the 1960 decade—and about three-fourths of each year's graduating class will be needed to replace dentists who retire or die. Thus, unless the increase in dental school facilities is greater than was contemplated in early 1963, it appears that it will be impossible to retain the present ratio of dentists to population.

The demand for dental services is expected to increase steadily over the long run, because of the growth in population, the growing awareness of the importance of regular dental care, and the development of new payment 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. A number of dentists will continue to serve in the Armed Forces. Al-

though better dental hygiene and fluoridation of community water supplies may prevent some tooth and gum disorders, such measures—by preserving teeth that might otherwise be extracted—may tend to increase rather than decrease the demand for dental care over the long run.

Individual dentists will be able to care for more patients, as a result of the use of new techniques, equipment, and drugs, and more extensive and effective use of dental hygienists, assistants, and laboratory technicians. These developments, however, will not completely offset the need for more dentists.

Location is one of the major factors in determining success of dentists who open their own offices. For example, people who are well educated and well paid are most likely to visit dentists regularly. Also, a practice can be developed most quickly in small towns where new dentists can 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 may be lower than that in larger communities.

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. In 1961, average (median) income above expenses for all self-employed dentists was about \$14,750 a year, and \$10,250 for all salaried dentists, according to an American Dental Association survey. About 50 percent of all dentists had net earnings between \$9,950 and \$19,949 annually; approximately 25 percent earned less than \$9,950; and 25 percent earned more than \$19,949. Nearly 7 percent of all dentists reported net incomes of \$30,000 or more.

In 1961, the median net income of dentists under the age of 30 was \$8,890. The highest average earnings were for dentists between the ages of 40 and 44, who reported a median net income of \$17,400. Practitioners in cities of 50,000 to 100,000 population earned more, on the average, than those in either larger or smaller cities. Specialists generally earned considerably more than general

practitioners, with orthodontists reporting the highest incomes, on the average.

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.

Where To Go for More Information

People wishing to practice in a given State should find out about the requirements for licensure directly 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,
222 East Superior St., Chicago, Ill., 60611.

Medical X-Ray Technicians

(D.O.T. 0-50.04)

Nature of Work

Medical X-ray technicians—also called medical X-ray technologists—operate X-ray equipment under the general direction of physicians, who are usually radiologists (specialists in the use of X-rays).

Most technicians perform diagnostic work, using X-ray equipment to take pictures of internal parts of the body which the doctor wishes to examine. They may prepare a prescribed X-ray "opaque," such as barium salts, which the patient swallows in order to shade various organs to provide proper visibility in the X-ray picture. To prepare patients for X-ray, technicians position them between the X-ray tube and the film and cover body areas not to be exposed to the rays with a protective lead plate. When necessary, they set up or adjust devices to prevent the patient from moving. After determining the proper voltage, current, and desired exposure time, the technician operates the controls to obtain the pictures for interpretation by the physician.

Other technicians perform therapeutic X-ray work. They regulate special X-ray equipment used for treatment of diseases, such as certain types of cancer. After placing the patient in the proper position, these technicians operate the equipment from an adjoining room. They may also assist radiologists by preparing radium and other radioactive materials. Some technicians perform duties involved in both diagnostic and therapeutic X-ray work.

Medical X-ray technicians keep equipment in good working order by cleaning it and making

minor repairs. Other duties may include processing film and keeping records of services performed for patients. Some X-ray technicians operate other kinds of equipment such as that used in diagnosing heart disease or brain damage.

Chief technicians in some hospitals, in addition to their usual duties, instruct nurses, interns, and students in X-ray techniques.

Where Employed

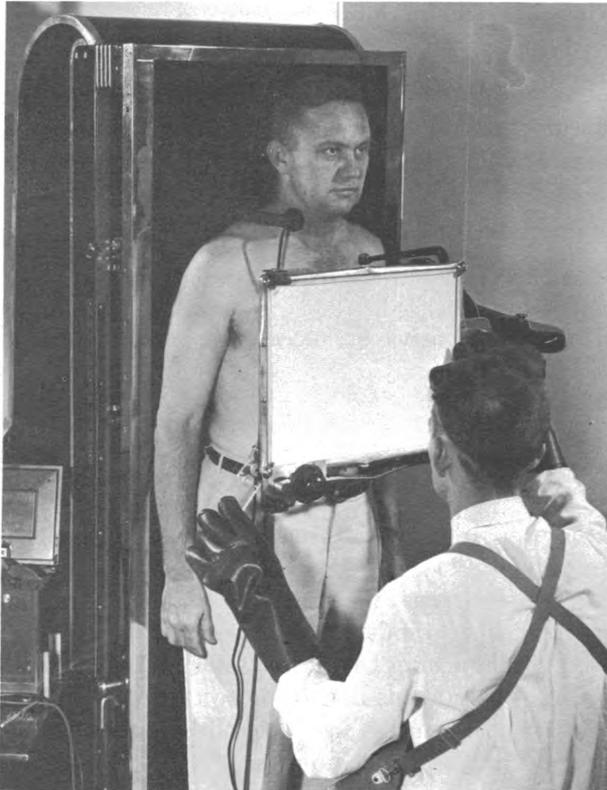
About one-fourth of the approximately 60,000 X-ray technicians employed in 1962 worked in hospitals. Most of the remainder worked in medical laboratories, physicians' and dentists' offices or clinics, Federal and State agencies, and for school systems.

Most technicians work in or near large cities where medical facilities and services are concentrated; however, some are employed in hospitals and clinics in small towns or rural areas. A few work as members of small mobile X-ray teams, engaged mainly in tuberculosis detection.

Most X-ray technicians are women, although the number of men in the field has increased during recent years.

Training, Other Qualifications, and Advancement

Training programs in X-ray technology are conducted by hospitals or by medical schools affiliated with hospitals. In 1962, 715 schools of X-ray technology were approved by the American Medical Association (AMA). The program in X-ray technology usually takes 24 months to



Courtesy of National Institutes of Health

X-ray technology is being used increasingly in diagnosis and treatment of disease

complete. A few schools, however, offer longer courses and, to students who also complete the academic requirements, some award the bachelor's degree.

In addition to training programs in approved hospital schools, some courses in X-ray technology are offered by vocational or technical schools. Training also may be obtained in the military service, or through on-the-job experience under the supervision of a radiologist.

All of the approved schools require that applicants be high school graduates, and a few require 1 or 2 years of college or graduation from a nursing school. High school courses in mathematics, physics, chemistry, biology, and typing are considered desirable. Preference is generally given to applicants between the ages of 18 and 30.

The program in X-ray technology usually includes courses in anatomy and physiology, nursing procedures, physics, radiation protection, darkroom chemistry, medical ethics, principles of

radiographic exposure, X-ray therapy, radiographic positioning, department administration, and equipment operation and maintenance.

Technicians who have had at least 2 years' experience under the direction of a radiologist (which may include training time) may apply for registration with the American Registry of Radiologic Technologists. If they pass the examination, they may use the title, "Registered Technologist," R.T. (ARRT). Registration is important for obtaining highly skilled and specialized positions.

Technicians employed in large X-ray departments may advance to the job of chief X-ray technician and may also qualify as teachers of X-ray techniques.

Good health and stamina are important qualifications in this field. Because of the possible exposure to radiation, people with a tendency toward anemia should avoid working with X-ray equipment.

Employment Outlook

Shortages of trained medical X-ray technicians are likely to persist throughout the remainder of the 1960's unless the supply of these workers is increased substantially. In early 1963, for example, the American Society of X-Ray Technicians reported that the demand for technicians was much greater than the number of persons expected to graduate from approved courses in X-ray technology. Many employers prefer to hire only graduates of approved courses. Although enrollments have risen in recent years, approved schools were not filled to capacity in early 1963.

The increased use of X-ray equipment in the diagnosis and treatment of disease and the continuing expansion of such programs are the leading factors pointing toward growth in this field. In addition, more workers will be needed to help administer radiotherapy, as new knowledge of the medical benefits of radioactive material becomes more widespread. Routine X-raying of large groups will continue to be performed as part of programs for disease prevention and control. For example, many employers now demand chest X-rays of all employees, and most insurance companies include a chest X-ray as part of the physical examination required for an insurance policy.

Replacement needs will probably remain high in this occupation, since many of the large number of women in it will leave their jobs because of marriage or family responsibilities. The shortage of trained technicians who are available for full-time work will make it necessary for employers to continue to hire part-time workers.

Earnings and Working Conditions

According to a private survey, about three-fourths of the X-ray technicians employed by State and local government hospitals in 1962 earned between \$3,600 and \$5,400 annually.

New graduates of AMA-approved schools of X-ray technology, or X-ray technicians with 1 year of general and 1 year of specialized experience, were employed by the Federal Government at an annual salary of \$4,110 in early 1963; those with no experience or specialized training, but

who have passed an aptitude test, received \$3,560 per year.

Full-time technicians generally work 8 hours a day, 40 hours a week, and may be "on call" for some night or emergency duty. Most are covered by the same vacation and sick leave provisions as other workers in the organizations which employ them.

Care must be taken to protect medical X-ray technicians from the potential hazards of radiation exposure. Precautionary measures include the use of safety devices such as individual instruments that measure radiation, lead aprons, rubber gloves, and other shieldings.

Where To Go for More Information

The American Society of X-Ray Technicians,
537 South Main St., Fond du Lac, Wis., 54935.

The American Registry of Radiologic Technologists,
2600 Wayzata Blvd., Minneapolis, Minn., 55405.

Medical Technologists

(D.O.T. 0-50.01)

Nature of Work

Medical technologists perform laboratory tests to aid physicians in detecting, diagnosing, and treating diseases. They usually work under the direction of a pathologist (a physician who specializes in diagnosing the causes and nature of disease) or a scientist specializing in a clinical science.

Among the tests which medical technologists may make are blood counts, urinalyses, and skin tests. Other body fluid and tissue samples are also examined microscopically, cultured to determine the presence of bacteria, fungus, or other organisms, and analyzed for chemical content or reaction. Technologists may also type and cross-match blood samples, determine blood coagulation time and sedimentation rates, measure basal metabolism, and analyze water, food products, or other materials for bacteria. Medical technologists sometimes prepare slides from sample tissues and body cells, as in cases of suspected cancer. Both speed and accuracy are required in this preparation.

Technologists who work in small laboratories often perform many types of tests. Those em-

ployed in large laboratories usually specialize in making several kinds of related tests in areas such as bacteriology, parasitology, biochemistry,



Courtesy of Veterans Administration

Medical technologist uses automatic analyzers to make laboratory tests

blood banking, hematology (blood analysis), histology (tissue preparation and examination), virology (the study of viruses), and cytology (analysis of body cells).

Most medical technologists conduct tests in connection with the examination and treatment of patients; some do research on new drugs or on the improvement of laboratory techniques, and others teach or perform administrative duties.

The occupation of the medical technologist should not be confused with that of the medical technician or laboratory assistant. This statement does not include these workers, who usually perform simple, routine tests and related work that can be learned in a relatively short period.

Where Employed

It is roughly estimated that between 30,000 and 40,000 medical technologists were employed in 1962; most of them were women. In recent years, however, the number of men in the field has been growing. The great majority of medical technologists work in hospitals; most of the others are employed by laboratories, public health agencies, research institutions, and pharmaceutical manufacturers.

The Federal Government is the largest single employer of medical technologists. In 1962, over 800 were employed in hospitals and laboratories of the Veterans Administration, U.S. Public Health Service, and the Army, Navy, and Air Force.

Training, Other Qualifications, and Advancement

The completion of at least 3 years of college, including courses in chemistry, the biological sciences, and mathematics is required for entry into most of the 757 schools of medical technology that were approved by the American Medical Association (AMA) in 1962. A few schools require candidates for admission to have received the bachelor's degree. Most approved courses in medical technology last 12 months, although some schools have courses that vary in duration from 15 to 18 months. Most of the approved schools are connected with hospitals and are affiliated with colleges or universities. Usually the bachelor's degree is awarded upon completion of 3 years of college

and the prescribed courses in medical technology, including laboratory work. Several universities also offer advanced degrees in medical technology for those who plan to specialize in research or teaching.

Graduates of AMA-approved schools who pass an examination may qualify for listing with the Registry of Medical Technologists of the American Society of Clinical Pathologists (ASCP). Technologists registered with the ASCP are preferred by many employers, especially large hospitals and research laboratories. In four States—Alabama, California, Florida, and Hawaii—medical technologists must also be licensed.

Promotion may be to supervisory positions in certain areas of laboratory work or, after several years' experience, to the position of chief medical technologist in a large hospital. Graduate education in one of the biological sciences or in chemistry may be required for advancement in research laboratories.

Personal characteristics considered important for medical laboratory work include accuracy, patience, dependability, and the ability to work under pressure. Manual dexterity and good eyesight (with or without glasses) are essential.

Employment Outlook

Employment opportunities for well-qualified medical technologists are expected to remain excellent throughout the remainder of the 1960's. Many employers will seek new graduates with bachelor's degrees in medical technology to fill entry positions in hospitals; a particularly strong demand is anticipated for technologists with graduate training in biochemistry, bacteriology, immunology, and virology.

Over the long run, employment opportunities for medical technologists are expected to expand as a result of the increasing dependence of physicians upon laboratory tests and because of the construction of additional hospital and medical facilities. Other factors pointing toward growth in this field are the increasing complexity of laboratory work and the development of new drugs and techniques. Newly developed automatic analyzers are not expected to affect materially the demand for highly qualified medical technologists.

Replacement needs are likely to continue high because many workers in this field are young women who may leave their jobs for marriage and family responsibilities. Many opportunities for part-time employment are likely to continue to be available.

Earnings and Working Conditions

Average weekly salaries of women medical technologists employed by private and non-Federal Government hospitals in 15 metropolitan areas in 1960 ranged from \$69 in Philadelphia to \$109 in the Los Angeles-Long Beach area. Men usually received slightly higher salaries. In general, higher salaries were paid by government hospitals than by private hospitals in the same areas.

Newly graduated medical technologists employed by the Federal Government in early 1963 received a salary of \$4,565 a year. Most experienced technologists in Federal Government agencies earned annual salaries of between \$5,540 and \$7,205, and a few earned about \$10,000.

The average workweek of medical technologists is 40 hours. They generally receive vacations and sick leave benefits, and some are covered by retirement plans.

The laboratories in which medical technologists work are usually well-lighted and clean, although unpleasant odors and specimens of many kinds of diseased tissue are often present. Few hazards exist in laboratories using proper methods of sterilization and handling of specimens, materials, and equipment. Unless technologists exercise care while working, they may be cut by laboratory instruments and glassware or burned by chemicals.

Where To Go for More Information

Information about employment opportunities, as well as costs of and entrance requirements for schools of medical technology approved by the American Medical Association, may be obtained from:

American Society of Medical Technologists,
Suite 25, Hermann Professional Bldg.,
Houston, Tex., 77025.

Registry of Medical Technologists of the American
Society of Clinical Pathologists,
P.O. Box 44, Muncie, Ind., 47344.

Information about employment opportunities in Veterans Administration hospitals may be obtained from the hospitals or the Department of Medicine and Surgery, Veterans Administration, Washington, D.C., 20421.

Chiropractors

(D.O.T. 0-39.90)

Nature of Work

Chiropractic is a system of treatment based on the belief that the nervous system largely determines the state of health and that any interference with this system impairs normal functions and lowers the body's resistance to disease. Chiropractors treat their patients primarily by specific adjustment of parts of the body, especially the spinal column. Many also use such supplementary measures as diet, exercise, and rest, and water, light, and heat therapy. Because of the emphasis on the importance of the spine and its position, most chiropractors use X-ray extensively to aid in locating the source of patients' difficulties. Chiropractic as a system of healing does not include the use of drugs or surgery.

Where Employed

About 25,000 chiropractors were employed in the United States in early 1963. The greatest number were engaged in independent private practice. Some were employed by athletic organizations and industrial firms; others taught or did research work at chiropractic schools, or worked on the staffs of chiropractic clinics or as salaried assistants to established practitioners. About 40 percent of all chiropractors were located in California, New York, Texas, Missouri, and Ohio.

Training and Other Qualifications

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. As of early 1963, four States—Louisiana, Massachusetts, Mississippi, and New York—did not regulate the practice of chiropractic nor issue licenses to chiropractors.

Most States require 4 years of training in a chiropractic school following high school graduation. Over one-third of the States also require 1 or 2 years of preparatory college work before chiropractic training. In a few States, less than 4 years of chiropractic education is sufficient to qualify for a license. About half the States also require that chiropractors pass a basic science examination. Chiropractors licensed in one State may generally obtain a license in another State without further examination.

Approximately two-thirds of the 16 chiropractic schools in the United States in 1962 restricted their teaching to manipulation and spinal adjustments. The others offered a broader curriculum including such subjects as chiropractic physiotherapy and nutrition. In most chiropractic schools, the first 2 years of the 4-year curriculum are devoted chiefly to classroom and laboratory work in subjects such as anatomy, physiology, and biochemistry. The last 2 years are spent in obtaining practical experience in the schools' clinics. The degree of doctor of chiropractic (D.C.) is awarded by all schools to students completing chiropractic training.

Most newly licensed chiropractors open their own offices or purchase an established practice. Some start as assistants to other chiropractors in order to acquire experience and funds. A considerable financial investment is usually necessary to open and equip an office. Among the personal qualities considered desirable for a practitioner is the ability to deal with people sympathetically. The work does not call for unusual strength or endurance, but does require considerable dexterity with the hands.

Employment Outlook

The success of the new practitioner will depend in large part on proper selection of a location for

practice. Opportunities for beginning chiropractors will continue to be best in those parts of the country where chiropractic is most fully accepted as a method of treatment. Small towns or suburban areas, where the young practitioner can become known more quickly than in a big city, offer the best prospects for developing a practice.

The wide variation in community acceptance and in State laws is reflected in the concentration of chiropractors in certain areas. The ratio of chiropractors to population is highest in the Western States.

Employment opportunities are expected to be best for new entrants who are able to meet the highest State licensing requirements, including graduation from a 4-year course of 4,000 or more hours. In view of the trend in many States toward raising the educational requirements for chiropractic practice, thorough training will become increasingly important.

Women are expected to continue to find good opportunities, since some women and children prefer to go to women chiropractors for treatment. In 1960, about 10 percent of the chiropractors in practice were women. All chiropractic schools accept women as students.

Earnings and Working Conditions

In chiropractic, as in other types of independent practice, earnings are relatively low at the beginning but rise after the first few years. Though incomes of chiropractors vary widely, the average income above expenses was \$12,000 a year in early 1963, according to the limited data available.

Where To Go for More 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:

International Chiropractors Association,
741 Brady St., Davenport, Iowa, 52800.

National Chiropractic Association,
National Bldg., Webster City, Iowa, 50595.

Dietitians

(D.O.T. 0-39.93)

Nature of Work

Dietitians plan and supervise the preparation and serving of appetizing and nutritious meals to help people maintain or recover good health. Their work usually includes planning general menus and modified diets that meet nutritional requirements for medical treatment, supervising the personnel who prepare and serve the meals, managing purchases and accounts, and providing guidance toward good eating habits. Administrative dietitians form the largest group in this occupation; the remainder are therapeutic dietitians, teachers, or research workers.

Administrative dietitians apply the principles of nutrition to large-scale meal planning and preparation such as that done in restaurants, and in schools, hospitals, 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.

Therapeutic dietitians plan special meals for patients who have been placed on modified diets, by taking into consideration the nutritional value of foods, including vitamin and mineral content. They also supervise the serving of meals, discuss food likes and dislikes with patients, and note their intake of food. Other duties of therapeutic dietitians include 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 hospital, one person may serve as both the administrative and therapeutic dietitian.

Some dietitians, particularly those in hospitals affiliated with medical centers, teach subjects such

as dietetics, foods and nutrition, diet therapy, menu planning, budgeting, and institution management to dietetic, medical, dental, and nursing students. They may also supervise dietetic interns and provide dietary instruction to individuals or groups of patients. Other dietitians conduct studies or surveys of food and nutrition and take part in research projects, such as those concerned with the nutritional needs of the aging, persons with chronic diseases, or space travelers. A few dietitians act as consultants to public health agencies and food manufacturers.

Where Employed

Of the approximately 26,000 dietitians employed in 1962, about half worked in hospitals, including about 1,200 who were employed by the Veterans Administration and the U.S. Public Health Service. A sizable number were employed by colleges, universities, and public school systems as teachers or as dietitians in food-service programs. Most of the remainder worked for public health agencies as consultants, in public restaurants or cafeterias, and in large companies that operate food-service programs for their employees. About 300 dietitians were commissioned officers in the Armed Forces.

Most of the workers in this occupation are women. In 1960, only about 7 percent of all dietitians were men.



Therapeutic dietitian discusses food preferences with young patients

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 education can be obtained in the home economics departments of about 500 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 a 1-year dietetic internship program approved by the Association or, in lieu of this, 3 years of experience with 1 year of this experience under the supervision of a dietitian who is a member of the Association. Many employers prefer to hire dietitians who have completed an internship. An important phase of the intern's education is on-the-job experience; the remainder is spent in the classroom and on special projects. In 1962, 59 internship programs were approved by the American Dietetic Association; 50 of these were conducted in hospitals, 8 in business firms or colleges and universities, and 1 in a food clinic.

Experienced dietitians may be advanced to assistant director or director of a dietary department in a large hospital. Graduate education is usually required for advancement to the 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 considered essential 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 is also important.

Employment Outlook

Opportunities for qualified dietitians are expected to continue to be excellent throughout the remainder of the 1960's. The number of people completing dietetic internships in recent years has been considerably less than the demand for dieti-

tians. Because of the shortage, some hospitals and other establishments employ college graduates with suitable undergraduate education to assist dietitians. Small hospitals and some other institutions that cannot obtain full-time dietitians employ them on a part-time basis.

Over the long run, new and expanding hospital facilities and more widespread use of hospitals and medical services by the increasing population will intensify the need for dietitians in hospitals. In addition, the expected expansion in community health programs will increase the need for dietitians and nutritionists to act as consultants. An increasing number of dietitians will also be sought to direct food services for schools, industrial plants, and commercial eating places. Expansion of food and nutrition research programs may also contribute to the overall demand for dietitians. 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 will probably 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 and in commercial eating places.

Earnings and Working Conditions

In 1962, hospitals offered new graduates of approved internship programs annual salaries ranging from \$4,500 to \$5,500, according to the American Dietetic Association. College and school food services offered annual salaries ranging from \$4,500 to \$6,000 for staff dietitians, and from \$5,000 to \$12,000 or more for directors and supervisors. Teachers in colleges and universities were paid between \$6,000 and \$10,000 a year.

The entrance salary in the Federal Government for those who had completed their internship was \$5,540 a year in early 1963. New college graduates usually started at \$4,565 per year. Most experienced dietitians employed by the Federal Government earned between \$5,540 and \$8,700 per year; a few earned over \$12,000 annually. Dietitians who entered the Armed Forces with the rank of second lieutenant or ensign received an annual starting salary of \$4,265, including allowances, in

early 1963. Those who make the service a career can advance to higher ranks.

Nearly half the dietitians employed by State and local governments in 1962 earned between \$4,800 and \$6,000 a year, according to a private survey; one-fourth received salaries between \$3,600 and \$4,800, and the rest earned more than \$6,000.

Most dietitians work a regular 40-hour week; however, dietitians in hospitals may sometimes have to work weekends, and those in restaurants have somewhat irregular hours. Some hospitals provide room, laundry service, and meals in addition to salary. Paid vacations, holidays, and

health and retirement benefits are usually received.

Where To Go for More Information

Information on approved colleges and dietetic internship programs, scholarships, and employment opportunities 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.

Dental Laboratory Technicians

(D.O.T. 0-50.06)

Nature of Work

Making artificial dentures—teeth, crowns, bridges, or other dental and orthodontal appliances—used to be done chiefly by dentists. Now dental laboratory technicians do much of this highly skilled work. These technicians do not deal directly with patients but receive prescriptions from dentists, which are often accompanied by impressions of patients' mouths. Since no two patients have exactly the same dental problems, technicians must do varied work in carrying out dentists' prescriptions.

A first step in making many kinds of appliances is forming models in hard plaster (dental stone) from the impressions taken by dentists. Technicians may also make metal castings for dentures; polish and finish dentures; construct metal or porcelain crowns or inlays for partially destroyed teeth; make gold and other metal bridges; and make appliances to correct such abnormalities as cleft palates. In performing this work, dental laboratory technicians use small handtools, electric lathes and drills, high-heat furnaces, and other kinds of specialized laboratory equipment.

Some dental laboratory technicians are "generalists" who do all types of dental laboratory work. Others specialize in such areas as making crowns and bridges, arranging artificial teeth on dental appliances so that they function properly and look natural, processing plastic materials, working with ceramics (porcelain), or making

castings of gold or other metal alloys used in dentistry. The level of the work done ranges from semi-skilled to highly skilled, depending upon the qualifications of the individual technician and the requirements of the job. Technicians with limited training and experience ordinarily perform relatively simple jobs—for example, mixing and pouring plaster into casts and molds. Well-qualified dental laboratory technicians are assigned to the more difficult laboratory processes and may work with expensive metals.



Dental laboratory technician uses a small handtool to work on artificial teeth

Where Employed

It is estimated that roughly 25,000 dental laboratory technicians were employed in early 1963. Most of them worked in commercial laboratories, either as employees or as owners of the business. Commercial laboratories, which handle orders from any dentist, are typically small businesses; in mid-1959 (the latest year for which this information is available), more than one-fourth of all laboratories were 1-man shops and less than 15 percent had 10 workers or more. Between 1,000 and 2,000 laboratory technicians worked for individual dentists. Others worked in hospitals that provided dental services. Most of the remainder—about 650—were employed by the Federal Government, chiefly in the Veterans Administration and in the Department of the Army. Women, who account for less than 10 percent of all dental laboratory technicians, worked mainly in large commercial laboratories.

Dental laboratory technicians, like the dentists who use their services, are located mainly in big cities and in the States with the largest populations. More than half of all dental laboratory technicians are in cities of over 50,000 population. Moreover, they are concentrated in New York, California, Illinois, and Pennsylvania.

Training, Other Qualifications, and Advancement

The most common means of entering this occupation is to secure a trainee position and learn the craft on the job—usually in a commercial laboratory or a hospital offering dental services. Typically, an on-the-job training program lasts 3 or 4 years, depending on such factors as the student's previous experience and training, his ability to master the techniques, and the number of specialized areas to be learned. Courses in dental laboratory work are offered in some public vocational high schools and junior colleges. In addition, a few private schools offer 1- to 2-year courses in dental laboratory technology. But regardless of the student's educational background, actual work experience is always considered necessary by employers to qualify as a full-fledged technician.

The National Association of Dental Laboratories and the American Dental Association sponsor a certification program for dental laboratory technicians who can meet certain training and

other requirements. In early 1963, four schools had been accredited by the American Dental Association to provide high school graduates (or those with equivalent education) with the 2 years of training required under this program. Some scholarships are available in the accredited schools. The first year of training consists of formal classroom instruction in medical law and ethics, chemistry, ceramics, metallurgy, and other related subjects. During the second year, the student must complete 12 months of supervised practical experience in the school or a dental laboratory. He may receive some pay for work performed during this period. After completion of the 2-year training program, 3 years of experience in a dental office or a laboratory are required before the dental laboratory technician is eligible to take the examination for certification in one or more of five areas—generalist, full denture fabrication, partial denture fabrication, ceramic technique, and crown and bridge fabrication.

Among the personal qualifications which employers look for in selecting trainees are a high degree of manual dexterity, good color perception, patience, and a liking for detailed work. Preference may also be given young people who have completed high school courses in art, ceramics and pottery, sculpturing, blueprint reading, plastics, metalworking, and physiology.

Employment Outlook

Job opportunities for the well-qualified, all-round craftsmen and for specialists in ceramics, gold, and other metalwork are expected to be very good throughout the 1960's. Job opportunities for trainees will also arise each year. As in the recent past, the demand for dental laboratory technicians will probably stem largely from the need to replace technicians who transfer to other fields of work, retire, or die. Most opportunities for salaried employment, for both experienced and inexperienced dental laboratory technicians, will be with large commercial laboratories and in the Federal Government. Some experienced technicians will find favorable opportunities for establishing their own laboratories. A technician whose work has become known to several dentists in a community will have the best prospect of building a successful business.

A moderate increase in employment of dental laboratory technicians is anticipated over the long run. The anticipated growth in population, rising income, the growing public awareness of the importance of preventive dentistry, the mounting number of people in the older age groups and, with it, the number of people requiring artificial dentures, all point toward the need for more dental laboratory technicians. Moreover, the number of dentists is not expected to keep pace with population growth, and it is likely that dentists will send more and more of their laboratory work to commercial firms, to free themselves increasingly for "chairside" practice, research, and other professional activities.

In the future, certification may become important for obtaining employment as a dental laboratory technician, since many employers are likely to regard the certificate as the best readily available evidence of the technician's competence.

Earnings and Working Conditions

Inexperienced dental laboratory technicians employed in commercial laboratories in early 1963 typically earned between \$50 and \$65 a week, according to the National Association of Dental Laboratories. Experienced technicians in commercial laboratories generally earned between \$80 and \$150 a week, depending on their skill level and experience. Technicians who work with ceramics or gold and other metals received the highest salaries. Foremen and managers in large dental laboratories may earn \$200 or more per week. In general, earnings of self-employed technicians are higher than those of salaried workers.

Trainees employed in the Federal Government started at about \$75 a week in early 1963. The majority of experienced dental laboratory technicians employed in the Federal Government earned between \$106 and \$153 a week.

Salaried technicians usually work the standard 40-hour week, but self-employed technicians frequently work longer hours. Many technicians in commercial laboratories receive paid holidays and vacations, and some are also provided paid sick leave, bonuses, and other fringe benefits. Technicians employed by the Federal Government have the same benefits as other government workers.

The work of dental laboratory technicians is not strenuous and most jobs can be done by handicapped workers provided they have use of their hands and fingers.

Where To Go for More Information

Information about the training and other requirements for certification, as well as a list of approved schools, is available from:

American Dental Association, Council on Dental Education,
222 East Superior St., Chicago, Ill., 60611.

Information on career opportunities in commercial laboratories may be obtained from:

National Association of Dental Laboratories, Inc.,
201 Mills Bldg., Washington, D.C., 20006.

Information about employment in dental laboratories in veterans' hospitals may be obtained from local veterans' hospitals and offices throughout the country.

Veterinarians

(D.O.T. 0-34.10)

Nature of Work

Veterinarians (doctors of veterinary medicine) treat sick and injured animals. They also give advice regarding the care and breeding of animals and help to prevent the outbreak and spread of diseases among them, by physical examinations, tests, and vaccinations. Because many animal diseases can be transmitted to people, this work is important to the public health.

About 40 percent of all veterinarians are general practitioners who take care of both large and small animals. Of those who are specialists, the greatest number treat small animals, often operating hospitals with boarding facilities for dogs and cats. Others specialize in the treatment of certain kinds of animals, such as prize livestock, poultry, or thoroughbred horses. Many veterinarians inspect meat, poultry, and other foods as a part of the

Federal and State public health programs. A small number teach in colleges or do public health or other research related to animal diseases, drugs, and foods.

Since animals cannot describe how they feel, veterinarians must diagnose diseases and injuries on the basis of appearance and behavior, and by taking temperatures and making tests. When necessary, veterinarians operate on animals and prescribe and administer drugs, medicines, biologicals, serums, and vaccines. They use X-ray machines, hypodermic needles, syringes, and other medical equipment especially adapted for use with animals. They may treat animals on the farm—sometimes in open fields—or in veterinary clinics or hospitals.

Where Employed

About 21,000 veterinarians—fewer than 5 percent of whom were women—were at work in the United States in 1962. Of these, more than two-thirds were in private practice. The second largest number worked for the Federal Government—chiefly in the U.S. Department of Agriculture, which employed about 2,200 veterinarians; a few worked for the U.S. Public Health Service. More than 800 were commissioned officers in the Veterinary Corps of the Army and the Air Force. In addition, a substantial number worked for State and local government agencies and a few



Courtesy of U.S. Department of Agriculture

Veterinarians use special equipment to examine dairy cow

worked for international health agencies. Some were also employed by schools of veterinary medicine, agricultural colleges, large livestock farms, animal food companies, and pharmaceutical companies that manufacture drugs for animals.

In 1962, more than one-third of all veterinarians in the United States were in six States—California, with about 2,000, and New York, Illinois, Iowa, Texas, and Ohio, each with over 1,000. Veterinarians in rural areas chiefly treat large 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

To practice veterinary medicine in any State or the District of Columbia, one must have a license. An applicant for a license is required to be a graduate of an approved veterinary school and to pass a State Board examination. A few States also require some practical experience under the supervision of a licensed veterinarian. A limited number issue licenses without examination to veterinarians who have been licensed in another State.

For positions in public health or other research or college teaching, the master's or Ph. D. degree in a field such as pathology, public health, or bacteriology may be required, in addition to the degree of Doctor of Veterinary Medicine (D.V.M.), awarded upon graduation from veterinary school.

Two years of preveterinary college work followed by 4 years of professional study in a school of veterinary medicine are the minimum requirements for the D.V.M. It may take 3 years, however, to complete the preveterinary curriculum, which emphasizes chemistry and other science courses. The veterinary school training includes considerable practical experience in treatment of animals, as well as laboratory work in anatomy, biochemistry, and other scientific and medical fields.

There were 18 colleges of veterinary medicine in the United States in 1963. Each year many more young people apply for admission than can be accepted. Some of the qualifications considered in selecting students are a good scholastic record, amount and character of preveterinary

training (in 1962, about one-fifth of the students selected had a bachelor's degree), a farm background, good health, and a liking for animals. Since veterinary colleges are largely State supported, residents of the State in which the school is located are almost always given preference. In the South and West, regional educational plans have been developed that permit cooperating States without veterinary schools to send a few students to designated regional schools. In other areas, schools may informally decide to accept a certain number of students from other States, often giving priority to applicants from nearby States without veterinary schools. The number of women admitted to schools of veterinary medicine is relatively small.

Some veterinarians begin as assistants to, or partners of, established practitioners. Many establish their own practice and start with a modest financial investment in such essentials as drugs, instruments, and a car. To open an animal hospital or purchase an established practice requires a substantial investment. Newly qualified veterinarians who enter the Army or Air Force are commissioned as first lieutenants. New graduates of accredited veterinary schools can also qualify for Federal civil service positions as meat and poultry inspectors, disease-control workers, and research assistants. In addition, 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.

Employment Outlook

Graduates of schools of veterinary medicine will probably continue to have good employment opportunities throughout the remainder of the 1960's. The supply of graduates is not expected to meet the total demand for veterinarians in private practice, government service, and colleges and universities. Many of the opportunities to enter private practice or salaried employment will arise from the need to replace veterinarians lost to the profession through retirement or death. Because many veterinarians are in the older age groups, it is anticipated that these replacement needs will continue to absorb almost half of the nearly 900 veterinarians who will graduate each year from existing schools.

A gradual expansion in employment of veterinarians can be expected in the long run. More veterinarians will be needed to care for the increased number of animals required to feed the country's expanding population. The trend toward suburban living is expected to bring about a large growth in the pet population and thus create a greater demand for small pet animal specialists. Emphasis on scientific methods of raising and breeding livestock and poultry will continue to increase, and veterinary research will expand further. In addition, public health and disease-control programs are expected to grow. Developing programs in international public health will also offer some employment opportunities.

The need for replacements and the anticipated growth in demand for veterinary services, when related to the limited number of veterinarians who can be trained each year by existing schools, point toward continued favorable opportunities for veterinarians in the long run. However, the demand for veterinary service for large animals is closely related to economic conditions. Since the market value of a farm animal largely determines how much its owner will spend on its care, any major economic recession would greatly affect incomes and employment opportunities in this type of practice.

Earnings and Working Conditions

Veterinarians beginning their own practice can generally cover their expenses the first year and may often add to their earnings by working part time for government agencies. As they gain experience, their incomes usually increase substantially; however, income of the veterinarian in private practice depends largely on his location with respect to the availability of other veterinary services, and the attitude of potential clients toward the use of professional care for animals. According to a survey of a sample of the membership of the American Veterinary Medical Association, the average net income of reporting veterinarians was \$13,255 in 1960. Forty-five percent reported net incomes between \$8,000 and \$14,000; 17 percent earned less than \$8,000; and 38 percent, \$14,000 or more. About 1 out of 7 of the reporting veterinarians had net incomes of \$20,000 or more.

Newly graduated veterinarians had an annual starting salary of \$7,350 in the Federal Government in early 1963. Summer trainees in the U.S. Department of Agriculture were paid \$107 per week actually employed (representing a rate of \$5,540 per year). Veterinarians commissioned as first lieutenants in the Army and Air Force received pay and allowances totaling approximately \$6,300 per year.

Veterinarians are sometimes exposed to danger of physical injury, disease, and infection. Those in private practice are likely to have long and irregular working hours; those in rural areas may have to spend much time traveling to and from distant farms and may have to work outside 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.

Where To Go for More Information

Additional information on the earnings of veterinarians and 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, Washington, D.C., 20250.

Optometrists

(D.O.T. 0-39.92)

Nature of Work

Optometrists examine eyes and perform other services to safeguard and improve vision. They use special instruments and tests to find and measure defects in vision and, when needed, prescribe eyeglasses, contact lenses (invisible lenses), and eye exercises or other treatment that does not require drugs or surgery. Most optometrists supply their patients with the eyeglasses prescribed, though some do only minor repair work, such as straightening frames or replacing nose pieces on glasses. A few optometrists specialize in work such as fitting persons who are nearly blind with telescopic spectacles, studying the relationship of vision to highway safety, and analyzing lighting and other conditions that affect the efficiency of workers in industry or business. A few are engaged primarily in teaching, research, or a combination of the two.

Optometrists should not be confused with ophthalmologists, oculists, or dispensing opticians. Ophthalmologists and oculists are physicians who specialize in the medical and surgical care of the eyes and may prescribe drugs or other treatment, as well as lenses. Dispensing opticians (see index) fit and adjust eyeglasses according to prescriptions written by ophthalmologists or optometrists; they do not examine eyes or prescribe treatment.

Where Employed

Most of the 17,000 optometrists employed in 1962 were in private practice. However, some were salaried employees, working as assistants to established practitioners or for health clinics, hospitals, optical instrument manufacturers, or government agencies. A few taught in colleges of optometry or served as optometrists in the Armed Forces.

Optometrists are located chiefly in large cities and industrial areas, where many people are engaged in office work or other occupations which tend to create or emphasize vision problems. About 40 percent are in five States—California, New York, Illinois, Pennsylvania, and Ohio. Many small 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



Optometrist works with special instruments to improve patient's visual coordination

where he expects to practice. There were 10 schools of optometry in the country in 1963. Applicants with the necessary qualifications have an excellent chance of being admitted to one of these schools.

At least 5 years of college are needed to become an optometrist. The usual requirement is 2 years of preoptometry education in an approved college, followed by 3 years of training in an optometry school. However, completion of a 4-year course is required by some optometry schools after the 2 years of preoptometry study which are a prerequisite for admission. Preoptometry courses include mathematics, physics, biology, and chemistry, as well as English and other liberal arts courses. Students in schools of optometry have both classroom and laboratory work, as well as an opportunity to gain professional experience in the clinic run by the school. Most schools award the degree of Doctor of Optometry (O.D.), but some confer bachelor's degrees in science or optometry instead. Optometrists who wish to specialize often take additional training. A master's or Ph. D. degree in physiological optics or in a re-

lated 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.

The majority of optometrists start either by setting up a new practice or by purchasing an established one. Some begin as assistants to established practitioners, and young graduates are frequently advised to do this in order to acquire experience and the funds necessary to equip an office.

Employment Outlook

Employment opportunities for new optometry graduates are expected to remain favorable throughout the 1960's. During this period, the number of new graduates is likely to be considerably less than the number of experienced optometrists who retire or stop practicing for other reasons. As in the past, opportunities to set up a new practice will generally be best in small towns and in residential areas of cities, where the new optometrist can easily become known and where competition is not as keen as in large business centers. Communities, especially in the South, that have no optometric services available will also 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 medical eye specialists in the vicinity, in relation to size, occupations, age, and income level of the population in the area.

Over the long run, the demand for eye-care services will continue to grow. The importance of good vision to efficiency at work and in school is becoming more widely recognized; eye strain has been increased by many aspects of modern living; and the use of eyeglasses has come to be generally accepted. The volume of eye-care services needed will also be increased by the anticipated growth in population, especially by the expected sharp rise in the number of older people—the group most likely to need glasses—and because of the growing number of people employed in white-collar occupations. Although the ex-

panded demand will be met in part by medical doctors who are eye specialists, optometrists will continue to supply a substantial proportion of all eye-care services.

Women optometrists, who constitute about 5 percent of the profession, have many opportunities to work as salaried assistants in the field of visual training. Those in private practice have been particularly successful in work with children.

Earnings and Working Conditions

In optometry, as in some of the other health fields, a low income must be expected during the first few years of practice. As a practice becomes established, earnings usually rise significantly. In 1962, over half the optometrists had annual net incomes between \$7,000 and \$20,000, according to the American Optometric Association.

Newly graduated optometrists employed by clinics or other optometrists earned an average weekly salary of \$160 in early 1963, according to the limited data available. Experienced optometrists generally received \$200 or more a week.

Optometrists practicing in towns and small cities have higher average earnings than those in

large cities. However, some successful practitioners in big cities have very high incomes. Although optometrists in salaried positions may at first earn more than those who go into practice for themselves, the situation is likely to be reversed after a few years of experience.

Working hours in this profession are usually regular. Since the work is not strenuous, optometrists can often continue to practice after the normal retirement age.

Where To Go for More Information

Additional information on optometry as a career is available from:

American Optometric Association,
4030 Chouteau Ave., St. Louis, Mo., 63110.

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.

Osteopathic Physicians

(D.O.T. 0-39.96)

Nature of Work

Osteopathic physicians emphasize manual manipulation in treating patients, and in most States also use surgery, drugs, and all other accepted methods of medical care. Most 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. A growing number specialize in 1 of the following 12 fields: Internal medicine, neurology and psychiatry, ophthalmology and otorhinolaryngology, pediatrics, anesthesiology, physical medicine and rehabilitation, dermatology, obstetrics and gynecology, pathology, proctology, radiology, and surgery.

Where Employed

Nearly all of the 12,000 osteopathic physicians professionally active in the United States in early 1963 were in private practice. (This does not include about 1,500 osteopathic physicians in California who, since 1962, have been classified as medical doctors.) Less than 5 percent of all osteopathic physicians held full-time salaried positions, mainly in osteopathic hospitals and colleges. A few osteopathic physicians are employed by private industry or government agencies.

Osteopathic physicians are located chiefly in those States which have osteopathic hospital facilities. In 1962, about half of all osteopathic physicians were in the following five States: Michigan, Pennsylvania, and Missouri, each with more than 1,000; Ohio, with more than 900; and Texas, with more than 700. Twenty-one States and the

District of Columbia each had fewer than 50 osteopathic physicians. Over half of all general practitioners are located in towns and cities with under 25,000 population; the specialists, however, practice mainly in big cities.

Training and Other Qualifications

A license to practice as an osteopathic physician is required in all States. As of 1963, licensed osteopathic physicians were qualified to engage in all types of medical and surgical practice in three-fourths of the States and the District of Columbia. The remaining States, however, limit in varying degrees the use of drugs or the type of surgery that may be performed.

To obtain a license, a candidate must be a graduate of an approved school of osteopathy and pass a State board examination. In 21 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; some States also require a period of internship after graduation from osteopathic school. All States except Florida and Rhode Island will usually grant licenses, without further examination, to properly qualified osteopathic physicians already licensed by another State.

Three years of preosteopathic college work followed by 4 years of professional study in an osteopathic college are the minimum requirements for the degree of doctor of osteopathy (D.O.) Preosteopathic education must include a specified number of credits in chemistry, physics, biology, and English. During the first 2 years of professional training, emphasis is placed on basic sciences such as anatomy, physiology, and pathology and on the principles of osteopathy; the last 2 years are largely devoted to work with patients in hospitals and clinics.

After graduation, almost all doctors of osteopathy serve a 12-month internship at 1 of the 85 osteopathic hospitals which the American Osteopathic Association has approved for intern training. Those who wish to become specialists must have at least 3 years of additional training followed by 2 years of supervised practice in the specialty.

Every year, more young people apply for admission to the five approved schools of osteopathy

than can be accepted. In selecting students, consideration is given to grades received in preprofessional education, scores on medical aptitude tests, and the amount of preosteopathic college work completed (in 1962, about 70 percent of the students had bachelor's degrees). Also of great importance in the desire to serve as an osteopathic physician rather than as a doctor trained in other schools of medicine. Considerable weight is also given 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 carefully study the professional and legal requirements of the State in which he plans to practice. The availability of osteopathic hospitals and clinical facilities should also be taken into account when choosing a location.

Employment Outlook

Opportunities for osteopathic physicians will remain excellent through the rest of the 1960's in those parts of the country where osteopathy is a commonly accepted form of medical care. Greatest demand will probably continue to be in Pennsylvania and a number of Midwestern States; further growth in employment opportunities is also anticipated in the Southwest and Northwest. 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 can become known more easily than in the centers of large cities.

In the long run, opportunities for osteopathic physicians will probably continue to be good. There is likelihood of greater public acceptance of osteopathy, liberalization of certain State licensing laws, and the establishment of additional osteopathic hospitals. In addition, the demand for all kinds of medical care—including the services of osteopathic physicians—will continue to grow as a result of the increase in population, government provisions of medical services for veterans and members of the Armed Forces, the develop-

ment of prepayment plans for medical care and hospitalization, and the underlying trend toward higher standards of health care. At the same time, growth in the number of osteopathic physicians in the country will be slow, unless training facilities are expanded. Approximately 360 doctors of osteopathy were graduated in 1962 but most of these are needed to replace those who retire and die.

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 2 percent of the total enrollment in osteopathic colleges in 1962, 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 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. According to the most recent survey made by the American Osteopathic Association (1960), the average income above business expenses of general practitioners was \$15,400 a year, and of specialists, \$23,100 a year.

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

Where To Go for More 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.

Hospital Administrators

(D.O.T. 0-99.84)

Nature of Work

Hospital administrators hold the top-level executive jobs in a hospital. They have responsibility for directing the housekeeping and other administrative activities of hospitals and coordinating them with the medical services. General guidance for their work comes from a governing board with which they work closely in the development of plans and policies.

The day-to-day work of administrators involves keeping track of all the many and varied activities of the hospital, generally with the aid of a staff. They work closely with the doctors and nurses in charge of the medical and nursing services and make available to them the necessary personnel, equipment, and auxiliary services. Administrators are responsible for other management functions such as those concerned with hiring and training personnel; handling the budget, including setting the fee schedule to be charged patients

and establishing the accounting procedures for billing them; planning current and future space needs; adopting measures to insure 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. Many of these duties, particularly in a large hospital, are delegated to assistants or department heads, depending on the size and nature of the hospital organization.

Following the direction of the governing board, the administrators may carry out large projects concerned with expanding or developing the hospital's services. For example, they may organize fund-raising campaigns or plan new research programs.

Administrators meet regularly with their staff to discuss progress, make plans, and solve problems concerning the functioning of the hospital.



Hospital administrator makes sure attendants are properly trained to operate a sterilizer

In cooperation with the medical staff and department heads, they may also 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, or participate in study groups.

Where Employed

In 1961, an estimated 7,000 administrators were employed in hospitals; about two-thirds of them worked in nonprofit or private hospitals, and the remainder worked in Federal, State, and local government hospitals. Of those employed by the Federal Government, the largest numbers were in Veterans Administration hospitals; most of the remainder were employed in Army, Navy, Air Force, and Public Health Service hospitals. In addition to the administrators, about 5,000 people were working as assistants to hospital administrators. It is estimated that one-third of all the people in the field of hospital administration are women; many are members of religious orders. Some women administrators are registered professional nurses.

Hospitals are located in communities of all sizes and in rural areas. In small hospitals, typically located in rural or suburban areas, the administrator generally handles all management functions. In large hospitals, they are assisted by specialists who have been trained in hospital administration.

Training, Other Qualifications, and Advancement

The background needed to qualify for this work depends, to a large extent, on the qualifications established by individual employers. Most hospital boards and other employers prefer persons with a graduate degree in hospital administration. A few require that their administrators be qualified physicians or registered professional nurses. Others look for people who have formal training in law or business administration and also extensive experience in the health field. At least one State (Minnesota) requires all administrators of hospitals licensed in the State to be registered with the State Board of Health; to register, applicants must have a minimum of 2 years of experience or 1 year of formal training in hospital administration.

In 1962, a master's degree in hospital administration was offered in 17 colleges and universities. These programs usually involve a year of graduate work followed by a year of administrative residency in a selected hospital. The graduate training may include such courses as Introduction to Medical Care Administration, Hospital Organization and Management, Introduction to Data Processing, The Hospital in the Community, Accounting and Budgeting Control, Personnel Management, and Advanced Administrative Management. The residency involves an orientation to all of the hospital's activities under the supervision of the administrator or his assistant. In 1962, three universities offered a curriculum leading to a Ph. D. degree in this field. The American College of Hospital Administrators provides financial loans to a limited number of students for graduate work in hospital administration. The U.S. Public Health Service also offers awards for graduate work in this field.

Some persons gain experience that may qualify them for advancement to the administrator's job

by working in one of the specialized administrative areas, such as personnel, records, budget and finance, or data processing. With this experience or graduate work, they may be promoted to department head, assistant to the administrator, and eventually to administrator.

Personal qualifications needed for success in this field include good health and vitality as well as an interest in helping the sick. Skills in working with people, organizing and directing large-scale activities, and public speaking are important assets. Administrators of specialized hospitals (such as orthopedic or mental hospitals) are most frequently physicians whose medical specialty is the same as that of the hospital; hospitals that are run by religious groups usually seek administrators of the same faith.

Employment Outlook

New hospital administration graduates are expected to have good opportunities to enter the field during the remainder of the 1960 decade. Most of the opportunities for beginners will result from vacancies on administrative staffs. The position of hospital administrator, especially in a large hospital, represents a career goal, and these positions are likely to continue to be filled by promotion from within or by transfers from smaller hospitals. Some positions, including that of the administrator, are likely to continue to be filled by physicians and nurses; however, trained administrative specialists will be preferred for most positions. The great expansion in hospital services in recent years has contributed to the demand for specialists to handle the related increase in administrative-management functions.

As more and larger hospitals are built to take care of the increasing population, and as services are expanded, more staff positions are likely to be created. These positions will provide additional employment and promotional opportunities, especially for graduates of schools of hospital administration. Such graduates will also find increasing employment opportunities outside of hospitals in hospitalization and health insurance programs and other related areas.

Earnings and Working Conditions

Salaries of hospital administrators depend on factors such as the type of hospital, the size of its administrative staff and budget, and the policy of the governing board. New graduates in hospital administration received beginning annual salaries in 1962 of between \$6,000 and \$8,000, on the average, and administrators with several years of experience generally earned \$15,000 or more a year, according to the limited data available. New graduates employed in Veterans Administration hospitals started at about \$6,700 a year in late 1962. VA hospital administrators, most of whom are physicians, earned over \$16,000 a year.

Commissioned officers in the Armed Forces and in the U.S. Public Health Service working in the field of hospital administration hold ranks ranging from second lieutenant to colonel. In late 1962, the corresponding pay and allowances for these ranks ranged from about \$4,300 to \$14,000. Commanding officers of large hospitals of the Armed Forces are physicians, and they may hold higher ranks.

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. Many administrators receive free meals and, sometimes, housing and laundry service. Fringe benefits usually include paid vacations and holidays, sick leave, and pension and insurance coverage.

Where To Go for More Information

Additional information about hospital administration and a list of colleges and universities offering such training may be obtained from:

American College of Hospital Administrators,
840 North Lake Shore Dr., Chicago, Ill., 60611.

Information on awards available from the U.S. Public Health Service for graduate training in hospital administration may be obtained from that agency's Division of Community Services, Training Resources Branch, Washington, D.C., 20202.

Dental Hygienists

(D.O.T. 0-50.07)

Nature of Work

Dental hygienists, working under the supervision of dentists, 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. Some dental hygienists apply a fluoride solution to children's teeth to aid in preventing decay. They may also provide dental health education, including the techniques of mouth care and proper diet.

Dental hygienists who work in private dental offices may, in addition, take and develop X-rays, mix filling compounds, prepare solutions, sterilize instruments, and act as chairside assistants to the dentist. They may also make appointments and keep records. Those employed by school systems promote dental health by examining children's teeth, assisting dentists in determining 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 with advanced training may teach in schools of dental hygiene.



Courtesy of U.S. Department of Health, Education, and Welfare

Dental hygienists often work with children

Where Employed

Approximately 10,000 dental hygienists were in practice in the United States in 1962; almost all were women. The majority were employed in private dental offices; about one-fourth worked for public health agencies or school systems; a few worked in industrial plants, clinics, hospitals, and dental hygiene schools, and as civilian employees of the Armed Forces.

Although the majority of hygienists worked in the eastern section of the country, the number employed in other areas has been growing in the past decade.

Training and Other Qualifications

Dental hygienists must pass an examination and be licensed by the State in which they wish to practice. In all States except Alabama and Georgia, eligibility for the licensure examination is limited to graduates of accredited dental hygiene schools. In early 1963, candidates who passed the examination given by the National Board of Dental Examiners were eligible for certification in 32 States without taking a State examination. Upon being licensed, a hygienist becomes a Registered Dental Hygienist (R.D.H.). To practice in a different State, a licensed dental hygienist usually must take another examination.

In 1962, 43 schools of dental hygiene in the United States were accredited or provisionally accredited by the American Dental Association. Most of these schools provide a 2-year dental hygiene certification course. A few have 4-year programs leading to the bachelor's degree, and some offer both programs. Most of the schools admit only women.

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

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 pro-

gram only after they have completed 2 years of college. The majority of 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 classroom instruction, laboratory work, and clinical experience. Classroom work includes subjects such as anatomy, chemistry, histology, pathology, pharmacology, and English. The ability to work well with people, and patience as well as manual dexterity and attentiveness to detail are essential for work in this field.

Employment Outlook

The current shortage of qualified dental hygienists is expected to continue during the 1960 decade. In 1962, the American Dental Hygienists' Association reported twice as many job openings as qualified applicants, despite the sharp rise in the number of graduates from schools of dental hygiene in recent years.

Over the long run, the demand for hygienists will continue to grow as a result of the expanding population with higher income and educational levels. Growing interest in dental care programs for children will lead to more employment opportunities in school systems. Increased participation in dental prepayment plans and more group practice among dentists may also result in new jobs for dental hygienists. In addition, a great number of job openings will be created by young women who leave their jobs for marriage and family responsibilities.

Mature women who wish to return to the field and those who desire part-time positions can expect to find 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 part of the country in which the job is located.

More than four-fifths of all dental hygienists employed full time had annual incomes of between \$2,000 and \$8,000, according to a private

survey made in 1960. Hygienists employed in large metropolitan centers earned between \$100 and \$125 a week in 1960, according to limited data available. Dental hygienists employed in research, administrative, supervisory, or teaching positions often earned higher salaries. Those working in private dental offices are most often salaried employees, though some are paid a commission for work performed or a combination of salary and commission.

The annual beginning salary for a dental hygienist employed by the Federal Government was either \$4,110 or \$4,565 in early 1963, depending on education and experience. Most of those in the Federal Government earned between \$4,565 and \$6,005 per year.

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. Many hygienists work part time in private dental offices.

Working conditions are usually pleasant. Most hygienists are employed in clean, well-lighted offices, but may have to stand for long periods of time. The hygienist generally provides her own uniforms. 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.

Where To Go for More Information

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

American Dental Hygienists' Association,
100 East Ohio St., Chicago, Ill., 60611.

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

Physical Therapists

(D.O.T. 0-39.935)

Nature of Work

Physical therapists (formerly called physiotherapists) help persons with muscle, nerve, joint, or bone diseases or injuries to overcome their disabilities. Following physicians' instructions, they treat a variety of disorders through physical exercise, the use of mechanical apparatus, and applications of massage, heat, light, water, or electricity. Most of their patients are accident victims, crippled children, and disabled older persons.

To obtain information needed in developing a treatment program, physical therapists perform muscle and nerve tests. They also keep records of their patients' progress during treatments and attend conferences at which the progress of patients is discussed. In many instances, they help disabled persons to accept their physical handicaps and learn how to live with their limitations. Therapists teach patients how to perform exercises and to use and care for braces, crutches, and artificial limbs. They may also show members of patients' families how to continue treatments at home.

Physical therapists are members of a rehabilitation team which 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 all types of patients, some specialize in working with children, amputees, paraplegics, or victims of poliomyelitis, cerebral palsy, arthritis, or muscular dystrophy. They may instruct physical therapy students, as well as students of related professions and other health workers.

Where Employed

An estimated 9,000 qualified physical therapists were employed in 1962; about 80 percent were women. In recent years, the number of men entering this occupation has been growing.

The majority of physical therapists work in hospitals. About half of this group are employed by private hospitals, approximately one-fourth in State or local government hospitals, and most of the remainder—about 700—in Federal Govern-



Many physical therapists specialize in working with children

ment hospitals operated primarily by the Veterans Administration and the U.S. Public Health Service. Nearly 300 are commissioned officers in the Armed Forces. Most hospitals employing physical therapists are general hospitals, but some specialize in the care of pediatric, orthopedic, psychiatric, or chronically ill patients. In 1961, approximately one-half of the nearly 7,000 hospitals listed by the American Hospital Association had physical therapy facilities.

Approximately one-fourth of all physical therapists 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 with chronic diseases, and some have home visiting programs.

Some therapists work in physicians' offices or clinics, teach in schools of physical therapy, or

perform research. A few serve as consultants in government and voluntary agencies.

Training and Other Qualifications

Professional education for physical therapists in the United States may be obtained in 41 schools of physical therapy (including the Army Medical Service School) which have been approved by the American Medical Association and the American Physical Therapy Association. The majority of approved schools are part of large universities; the others are operated by hospitals, which usually have university affiliations.

Graduation from an approved school of physical therapy is necessary for licensing in some States. In 1962, 39 States and the District of Columbia required licensing or registration of physical therapists. Membership in the American Physical Therapy Association and registration with the American Registry of Physical Therapists also require graduation from an approved school.

About half of the approved schools offer 4-year programs in physical therapy leading to a bachelor's degree. Some approved schools provide 1- to 2-year undergraduate programs to students who have completed required courses in the biological, physical, and social sciences and through which students may earn either a degree or a certificate in physical therapy. Other schools accept those who already have a bachelor's degree, including the required courses, and give a 12- to 24-month course leading to the certificate. Many schools offer both degree and certificate programs.

The curriculum of approved schools includes anatomy, physiology, pathology, clinical medicine, and psychology, as well as courses in electrotherapy, heat therapy, hydrotherapy, massage, and exercise. 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.

Since an important part of a therapist's job is to help patients and their families understand the treatments and prepare them emotionally for the changes that occur, therapists must have patience, resourcefulness, and a sympathetic attitude toward people. Their work also requires good verbal expression, and the ability to plan their work and to schedule treatments so as to insure maximum use of time. In addition, physical therapists should have manual dexterity and physical stamina. For those wishing 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 remain excellent throughout the remainder of the 1960's. The demand for qualified physical therapists is likely to continue to exceed the supply unless the number of graduates from approved programs rises sharply. In recent years, schools of physical therapy have not been filled to capacity.

In the long run, more new positions will be available as rehabilitation centers are enlarged and new ones are built to meet the demands created by the increasing number of disabled people who require physical therapy and by the increasing public interest in rehabilitating handicapped persons. In addition, a sizable number of vacancies will continue to arise each year because many workers are young women who may leave the profession for marriage and family responsibilities. Programs to aid crippled children and vocational rehabilitation activities in which States are assisted by Federal funds, and possible expansion of public health services at the State and local levels will further add to the demand for physical therapists. More physicians are expected to recommend physical therapy for patients as techniques and equipment for treatment are improved.

Part-time positions will continue to be available in many communities. These positions are particularly attractive to married women who have physical therapy training and wish to return to work on a part-time basis.

Earnings and Working Conditions

Annual salaries of inexperienced physical therapists averaged \$5,250 in 1961, and those of experienced therapists, \$7,000, according to the American Physical Therapy Association. Salaries of coordinators, directors, and administrators were generally higher.

In early 1963, newly graduated therapists employed by the Federal Government received annual starting salaries of \$5,035; those who were exceptionally well qualified, however, were offered \$5,540. At the same time, an entrance salary

of \$4,265, including allowances, was paid to physical therapists commissioned in the Armed Forces as second lieutenants or ensigns and to junior assistants in the U.S. Public Health Service.

Most physical therapists work 40 hours a week. Almost all receive 2 or more weeks' vacation and the majority receive sick leave and other fringe benefits.

Where To Go for More Information

American Physical Therapy Association,
1790 Broadway, New York, N.Y., 10019.

Podiatrists

(D.O.T. 0-39.901)

Nature of 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 also take X-rays of the feet and utilize blood and other tests. Among the conditions podiatrists treat are corns, bunions, calluses, ingrown toenails, skin and nail diseases, deformed toes, and arch conditions. They refer patients to medical doctors whenever they observe symptoms in the feet and legs that may be evidence of diseases—such as arthritis or heart or kidney trouble—which also affect other parts of the body.

As a rule, podiatrists provide most types of foot care. Some, however, treat particular ailments, and others devote most of their practice to children. A few act as consultants to shoe manufacturers, and some do research or teach in colleges of podiatry-chiropody.

Where Employed

Nearly all of the approximately 8,000 podiatrists actively engaged in the profession in early 1963 were in private practice. The few who held full-time salaried positions worked mainly in hospitals or podiatry colleges, or for other podiatrists. A few were employed by the Veterans Administration; others were commissioned officers in the Armed Forces. Women represented between 3 and 4 percent of the profession.

Podiatrists practice mainly in large cities. More than half are in five of the most heavily populated States—New York, Pennsylvania, Illinois, California, and Ohio. There are many small towns and rural areas, especially in the South and the Northwest, where there are 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 have been graduated from a college of podiatry, and must pass a State board examination. In addition, three States—Michigan, New Jersey, and Rhode Island—require applicants to have completed a 1-year intern-



Podiatrist uses model of patient's foot to explain proposed treatment

ship in a hospital or clinic after graduation from a podiatry college; the State of Oklahoma requires those seeking a license to have completed 1-year of practice under the direct supervision of an experienced podiatrist. Over half the States grant licenses without further examination to podiatrists already licensed by another State.

The five podiatry colleges 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 or mathematics.

The first 2 years of podiatry training are devoted chiefly to classroom instruction and laboratory work in such basic sciences as anatomy, bacteriology, chemistry, pathology, and physiology, though in the second year students obtain some limited experience in the school clinics. During the final 2 years, students spend most of their time obtaining clinical experience. The degree of Doctor of Podiatry (Pod.D.), Doctor of Podiatric Medicine (D.P.M.) or Doctor of Surgical Chiropody (D.S.C.) is awarded upon graduation. Additional education and experience are necessary to qualify for membership in any one of the following specialty groups recognized by the American Podiatry Association: American College of Foot Surgeons, American College of Foot Orthopedists, American College of Foot Roentgenologists, American Society of Podiatric Dermatology, and the American Association of Hospital Podiatrists.

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 is also important.

Most newly licensed podiatrists open their own offices or purchase established practices. Some begin by taking salaried positions in hospitals, or with podiatrists already in practice, to gain experience and to save the money needed to equip an office. Podiatrists entering the Armed Forces are commissioned as second lieutenants or ensigns and may progress to higher ranks if they make the service a career.

Employment Outlook

The employment outlook for podiatrists is expected to be good for the rest of the 1960's, especially in those parts of the country where the services of podiatrists are widely used. New graduates of colleges of podiatry should generally be able to find favorable opportunities for establishing practices and some will also have opportunities for salaried employment.

In recent years, the number of new graduates has only slightly exceeded the number needed to replace members of the profession who retire or die. In 1963, the American Podiatry Association reported that there were unmet needs for podiatrists in some parts of the country.

In the long run, the demand for podiatrists' services is likely to grow, along with the demand for other health care. The rising population and the growing proportion of older people are two factors pointing in this direction; the American Podiatry Association estimates that over half the population, particularly people in the older age groups, need podiatrists' services. In addition, the trend toward providing preventive foot care for children is increasing. Additional podiatrists may be needed to fill salaried positions in schools, factories, and with organizations that provide all kinds of health services.

Location is one of the major factors in determining success of podiatrists opening their own offices. A practice can be developed most quickly in small cities and suburban areas, where the new podiatrist can easily become known in the community and where there is less competition from established practitioners.

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. In 1959—the most recent year for which this information is available—the average income above expenses for self-employed podiatrists was \$10,364, according to a survey by the American Podiatry Association.

Podiatrists do not have a standard workweek but set their hours to suit the needs of their practice.

Where To Go for More Information.

Current information on the requirements for licensure in a particular State may be obtained

from the State board of examiners in the State capital. Information on entrance requirements, curriculums, and scholarships is available from the colleges of podiatry. Additional information on podiatry as a career, as well as a list of colleges, may be obtained from:

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

Occupational Therapists

(D.O.T. 0-32.04)

Nature of Work

Occupational therapists, following physicians' instructions, select and direct educational, vocational, and recreational activities designed to meet the specific needs of patients. They work as members of a medical team whose purpose is to restore maximum function to mentally or physically disabled patients. In addition to physicians, the team may include physical therapists, nurses, social workers, and other specialists.

The rehabilitation goals set for the patient may include regaining physical, mental, or emotional stability; combating boredom during a long-term illness; developing maximum self-sufficiency in the routine of daily living (such as eating, dressing, writing, and using a telephone); and, in the latter stage of treatment, to perform jobs in a practical work situation.

As part of the treatment program, occupational therapists teach manual and creative arts 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. Therapists may be required to design and make special equipment or splints to aid some disabled patients in performing their activities. Other duties may include supervision of volunteer workers, student therapists, occupational therapy assistants, and auxiliary nursing workers.

The largest group of occupational therapists work with psychiatric patients; the next largest number work with persons having physical disabilities; a sizable number work with children, including those with cerebral palsy; and most of the remainder work with the mentally retarded or

elderly patients. 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, and acting as consultants to local and State health departments and mental health authorities.



Occupational therapist helps young patient regain the use of her hands

Where Employed

Most occupational therapists work in hospitals, rehabilitation centers, homes for the aged, nursing homes, school and out-patient clinics, and research centers. Some are employed in special workshops, sanitariums, camps for handicapped children, and in State health departments. A few are employed in home-visiting programs for patients unable to attend clinics or workshops.

In 1962, about 6,700 occupational therapists were registered with the American Occupational Therapy Association. Of these, nearly 5,000 worked in hospitals, including about 600 in hospitals operated by the Veterans Administration and the U.S. Public Health Service. In addition, about 130 were in the Armed Forces. The great majority of occupational therapists are women; in recent years, however, an increasing number of men have been entering the field.

Training, Other Qualifications, and Advancement

A general requirement for entry into the profession is graduation from a college or university offering courses in occupational therapy approved by the American Medical Association and the American Occupational Therapy Association. In 1962, 30 colleges and universities in the United States offered approved courses leading to a bachelor's degree with a major in occupational therapy. Nearly all of these schools offer 4-year programs to high school graduates, and the rest offer 2-year programs to students who have completed 2 years of college. About half of the schools also offer shorter programs to students with a bachelor's degree in another field; a certificate in occupational therapy is granted upon completion of these programs.

In addition to the required academic work, which emphasizes the health sciences and the application of occupational skills, a clinical practice period—9 to 10 months of supervised practice in hospitals or health agencies—is required to qualify for professional registration. Some colleges permit their students to take the clinical practice during the summer or during part of their senior year in college. 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 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). Many hospitals require that their occupational therapists be registered.

Five universities offer a program leading to a master's degree in occupational therapy. A graduate degree is often required for teaching, research, or administrative work.

Newly graduated occupational therapists usually begin as staff therapists and may qualify as senior therapists after several years on the job. Experienced therapists may become directors of occupational therapy programs in large hospitals, clinics, or workshops, or may become teachers. Some positions are available as program coordinators and as consultants with large institutions and agencies.

Personal qualifications needed in this profession include emotional stability, a sincere interest in helping people, and a sympathetic but objective approach to illness and disability. Manual dexterity, ingenuity, and imagination are also needed.

Employment Outlook

Opportunities for occupational therapists are expected to be excellent during the middle and late 1960's. A shortage of therapists existed in early 1963; the greatest demand was in and near metropolitan areas where medical and health facilities are generally located. Despite the increasing number of persons enrolled in occupational therapy courses, classes were not filled to capacity in the fall of 1962.

Over the long run, the demand for occupational therapists is expected to increase, owing to the growing public interest in the rehabilitation of disabled persons and the success of occupational therapy programs in helping to restore people to health. There will be numerous opportunities for work with psychiatric patients, children, and aged persons, as well as with persons suffering from cerebral palsy, poliomyelitis, tuberculosis, and heart disease. In addition, many openings will arise because of the need to replace the high pro-

portion of young women who leave the field for marriage and family responsibilities.

Although hospitals and other employers prefer to hire registered occupational therapists, their shortage will probably create continuing good employment opportunities for therapists who are not registered but have some of the required training and skills. Opportunities for part-time employment should be excellent in many areas.

Earnings and Working Conditions

Staff occupational therapists were most frequently paid annual salaries between \$4,800 and \$5,500 in late 1962, and senior therapists had earnings of \$5,300 to \$6,000, according to the American Occupational Therapy Association. Directors of occupational therapy programs received from

\$5,800 to \$8,000; a few consultants earned between \$6,800 and \$11,000 a year.

In the Federal Government, the beginning annual salary for an occupational therapist without experience was \$5,035 in early 1963. About one-third of all occupational therapists in the Federal Government earned \$6,675 or more a year; a few in top positions earned between \$10,000 and \$12,000.

Most occupational therapists work an 8-hour day, 40-hour week, with 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.

Where To Go for More Information

American Occupational Therapy Association,
250 West 57th St., New York, N.Y., 10019.

Medical Record Librarians

(D.O.T. 0-23.25)

Nature of Work

Medical record librarians plan, prepare, maintain, and analyze records and reports on patients' illnesses and treatments. They assist the medical staff in research projects; develop auxiliary records (such as indexes of physicians, diseases treated, and operations performed); compile statistics, especially those pertaining to services given patients; make summaries or "abstracts" of medical records; develop systems for preserving medical records; and direct the activities of the medical record department.

The number and kind of duties medical record librarians perform vary markedly, depending on the size and type of institution in which they are employed. In a large hospital, the chief medical record librarian supervises a staff of other medical record librarians, medical record technicians, and clerical workers. She usually represents her department at hospital staff meetings and may testify in court actions that involve medical records. In small hospitals, she may be the only employee in the medical record department, and may perform clerical as well as professional duties.

The records maintained by the medical record librarian contain medical and surgical information on each patient, including history of the ill-

ness, physical examination findings, doctors' orders and progress notes, nurses' notes, and reports on X-rays and laboratory findings. These records are used for research, insurance claims, legal actions, evaluation of treatment and medications, and for training medical, nursing, and related personnel. Medical information found in hospital records is also important in planning community health programs.



Courtesy of Veterans Administration

Chief medical record librarian explains preparation of records to interns

The occupation of medical record librarian should not be confused with that of medical librarian, whose work is chiefly confined to books, periodicals, and other publications. (See statement on Librarians.)

Where Employed

About 3,000 Registered Record Librarians were employed in 1962, according to the American Association of Medical Record Librarians. In addition, over 22,000 other medical record personnel were working in the field. Most of these people were employed in hospitals; the remainder worked in clinics, medical research centers, medical departments of insurance companies, industrial firms, and local and State health departments. Of those who worked in hospitals, about three-fourths were in general hospitals and the rest were in specialized hospitals. Although most medical record librarians are women, the number of men in the occupation is growing.

Training, Other Qualifications, and Advancement

The minimum requirement for registration as a medical record librarian is 2 years of general college work and 1 year of study in medical record science. However, the trend is toward higher educational requirements—a bachelor's degree in medical record science or a bachelor's degree supplemented by a 1-year course in medical record science.

Twenty-seven schools were approved by the American Medical Association for training medical record librarians in early 1963. Most of the schools were affiliated with colleges. About half of the schools admitted both men and women, and the rest admitted only women. Enrollment in these programs has been rising in recent years, but some classes still are not filled to capacity.

Curriculums at these schools lead to a bachelor's degree or a certificate in medical record science. In general, schools granting degrees require high school graduation for admission. Schools granting certificates upon completion of a 12-month course usually require that applicants have 2 or more years of college training or that they be registered nurses. A few schools require an applicant to have a college degree before entering the medical record science program.

Approved schools provide at least 50 weeks of theoretical instruction and practical experience. Included are courses in anatomy and physiology, fundamentals of medical science, medical terminology, medical record science, organization and administration, legal aspects of medical records, and ethics. 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 to take 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, meticulous, interested in detail, and willing to persist in obtaining data. Because the information is of a confidential nature, they must be especially discreet in processing and releasing it. They should be able to maintain accuracy despite pressure, since the work is exacting and yet subject to frequent interruption. Those in administrative and supervisory positions must be able to work effectively with other personnel, including physicians, nurses, heads of other departments, and the general public.

A medical record librarian may advance by being assigned to a supervisory or administrative position. She may be promoted to chief of a single department or become the coordinator of medical record departments of several hospitals.

Employment Outlook

Opportunities for qualified medical record librarians are expected to be excellent during the rest of the 1960's. For many years, shortages of personnel have been reported, despite the increase in newly trained persons. The shortage was so great in early 1963 that many hospitals were unable to hire registered personnel, and the American Association of Medical Record Librarians estimated that 3,000–4,000 more Registered Record Librarians were needed. Because of this shortage, many opportunities exist for high school gradu-

ates to become medical record technicians who assist the librarians with record work requiring less responsibility.

The increasing number of hospitals and the volume and complexity of hospital records will contribute to a growing demand for medical record librarians over the long run. The importance of medical records will continue to grow rapidly, owing partly to the increased demand for clinical data to be used in research on diseases and on the use of new drugs and other methods of treatment. Special interest in the aged may necessitate recording data on the conditions of persons in nursing homes and home care programs. More consultants and group supervisors will also be needed to help standardize records in areas where medical record librarians are not available. Replacement needs will probably remain high because many young women leave the field for marriage and family responsibilities.

Earnings and Working Conditions

Salaries of medical record librarians are influenced by the location, size, and type of employing agency, as well as by the nature of duties and responsibility of the position held. Average weekly salaries ranged from \$80 to \$112, according to a

survey of hospital employees in 15 metropolitan areas in mid-1960.

The average salary for chief medical record librarians (registered) in 1960 was estimated by the American Association of Medical Record Librarians to be \$5,200 a year. Those with the bachelor's degree in medical record science from an approved school earned, on the average, about \$300 more a year than graduates of schools that did not offer such degrees.

Newly graduated medical record librarians employed by the Federal Government started at \$4,565 a year in early 1963. Annual salaries of experienced medical record librarians in the Federal Government generally ranged between \$5,540 and \$8,700; a few in top positions earned over \$11,000 a year.

Medical record librarians usually work a regular 40-hour week and receive paid holidays and vacations. Working conditions are generally pleasant.

Where To Go for More Information

Information about approved schools and employment opportunities may be obtained from:

The American Association of Medical Record Librarians,
840 North Lake Shore Dr., Chicago, Ill., 60611.

ENGINEERING

Engineers contribute in countless ways to the welfare, technological progress, and defense of the Nation. They design and supervise the construction of highways, dams, and power and communications systems; design new industrial machinery and manufacturing processes; develop new consumer products; and plan rockets and spacecraft. They also conduct research aimed at supplying the basic technological data needed for the design and production of new or improved products or manufacturing processes. Engineers frequently provide technical and managerial leadership in industry and government.

Although most engineers eventually specialize in a specific branch of the profession, there is a considerable body of basic knowledge and methodology which is common to most areas of engineering. Therefore, it is useful for young people considering engineering as a career to become familiar with the general nature of engineering as well as with the various branches or fields within it. This chapter contains an overall discussion of engineering, followed by separate statements on the traditional branches of aeronautical, agricultural, ceramic, chemical, civil, electrical, industrial, mechanical, metallurgical, and mining engineering.

Nature of Work

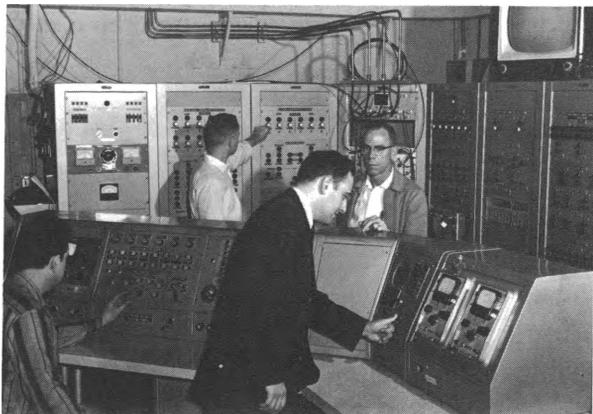
Engineers are concerned with determining the most practical methods of converting the raw materials and sources of power found in nature into goods and services. They apply the basic scientific principles discovered by scientists to the solution of the practical problems involved in creating a product or process at a reasonable cost in time and money. For example, a physicist may discover a new characteristic of electromagnetic waves which makes possible the amplifying of microwaves, but the engineer determines the practical applications of the discovery and how these applications can be produced effectively and economically. This emphasis on the practical application of scientific principles, rather than on their

discovery, is one of the main factors which distinguishes the work of the engineer from that of the scientist.

In designing or developing a new product, engineers must take many factors into consideration. In designing a space capsule, for example, they must calculate just 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. 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 engage in many other activities. A large number are in administrative and management positions, particularly in industries such as chemicals, electronics, aircraft, missiles, and spacecraft, where engineering methods are of great importance. Many plan and supervise factory and highway construction, or supervise production in mines and manufacturing plants. Others do inspection, quality control, analysis, or testing. Still others conduct research. Some engineers with considerable experience work as independent consultants or for consulting firms. Others are employed in sales positions, where they must be able to discuss the technical aspects of a product or assist in planning its installation or use. (See statement on *Manufacturers' Salesmen*.) A relatively small group of engineers teach in colleges and universities or engineering schools.

Most engineers eventually 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 the major branches—10 of which are dis-



Courtesy of U.S. Department of the Navy

Engineers design complex equipment used in thermonuclear research

cussed separately in this chapter—there are many subdivisions of these 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 early in their careers.

Where Employed

Engineering is the second largest professional occupation, exceeded in size only by teaching; for men it is the largest profession. Approximately 925,000 engineers were employed in the United States in mid-1962:

Manufacturing industries employ more than one-half of all engineers—primarily in the aircraft, missiles, and spacecraft, and electrical equipment industries. Other manufacturing industries employing large numbers are machinery, fabricated metal products, chemicals and allied products, and primary metals. Sizable numbers, approximately 225,000, are also employed by non-manufacturing industries, primarily the construction and transportation industries, engineering and architectural services (including consultants), and public utilities (including electric light and power and communication companies).

Federal, State, and local government agencies employ another large group of engineers—ap-

proximately 120,000 in 1962. Most of the 62,000 engineers employed by the Federal Government in 1962 worked for the Department of Defense. Other Federal agencies which employ significant numbers are the Departments of the Interior, Agriculture, and Commerce, and the National Aeronautics and Space Administration. Most engineers in State and local government service are employed by highway and public works departments.

Educational institutions employed approximately 30,000 engineers in 1962, in research as well as in teaching positions. A small number were employed by nonprofit 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 on these branches later in this chapter.

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 with training in physics, one of the other natural sciences, or in mathematics may qualify for some beginning positions in engineering. Some persons are able to enter the field without a degree, but only after long experience in a related occupation—such as draftsman or engineering technician—and some college-level training.

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

Education leading to a bachelor's or higher degree in engineering was offered in 1962 by 244 colleges, universities, and engineering schools. Although admission requirements vary considerably, engineering schools usually require a strong background in mathematics and the physical sciences, and place great emphasis on the general quality of an applicant's high school work.

In the typical 4-year engineering curriculum, the first 2 years are spent mainly in studying basic science courses—mathematics, physics, and chemistry—and the humanities, social sciences, and English. The last 2 years are devoted chiefly to engineering and to advanced mathematics and science courses, with some difference in courses depending on the branch of engineering in which the student is specializing.

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 55 engineering schools have arrangements with liberal arts colleges whereby a student spends 3 years in the college and 2 years in the engineering school and receives 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 such plans, classroom study is coordinated with practical industrial experience. In addition to the practical experience gained 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 new graduates 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, supervisory, and administrative positions and may eventually be promoted to top executive posts.

All 50 States and the District of Columbia have laws providing for licensing (or registration) of engineers whose work may affect life, health, or property. In 1962, about 265,000 engineers were registered under these laws in the United States. Generally, requirements for registration are 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

The outlook is for continued rapid expansion of the engineering profession throughout the remainder of the 1960's and over the longer run. Engineering has been one of the fastest growing professions in the past 50 years, and there is every indication that the demand for engineers will continue to grow.

The major factors which will tend to increase the need for engineering personnel are: The further growth of expenditures by both Government and industry for research and development, mostly in the realm of space and defense activities; and anticipated continued high levels of Government spending for space programs and for national defense, accentuated by the increasingly large amount of engineering time necessary for the development of modern weapons. The large sums already spent for research and development, in particular, have broadened existing areas of employment and have opened up new ones, such as those concerned with rocket propulsion, missile and spacecraft guidance, tracking and communication systems, and nuclear energy. Other factors which will tend to increase the demand for engineers are growth of population and the consequent demand for additional goods and services, expansion of industry, the growing complexity of industrial products and processes, and the increasing automation of industry.

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—estimated to be about 18,000 in 1962—are expected to rise in the future.

Despite the anticipated growth in demand for engineers, little or no increase in the annual number of bachelor's degrees awarded in engineering is expected during the middle and late 1960's. In 1962, 34,735 graduates received bachelor's degrees in engineering. Classes of this size are expected to fall short of meeting the demand for engineers in the years ahead. Thus, employment prospects for engineering graduates should continue to be very favorable throughout the remainder of the

1960's. For engineering graduates with ability and thorough training, there is every reason to believe that employment opportunities will remain very good for many years to come.

Women engineers, who represent less than 1 percent of the profession, are also expected to have favorable employment opportunities throughout the rest of the decade. Furthermore, there are some indications that employers are eliminating salary and other employment differences between men and women engineers of comparable education and experience who are doing similar work.

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

Engineering graduates with the bachelor's degree and no experience had an average (median) starting salary of \$6,925 in private industry in mid-1962, according to a survey made by the Engineering Manpower Commission. Graduates with the master's degree and no experience usually received from \$800 to \$1,500 a year more than those with only the bachelor's degree. Salaries for graduates with the doctor's degree were generally between \$9,700 and \$12,500 a year.

Salaries for beginning engineering graduates with the bachelor's degree vary by industry, as may be seen in the following tabulation based on the same survey.

<i>Industry</i>	<i>Median</i> ¹	<i>Upper decile</i> ²	<i>Lower decile</i> ³
Chemicals.....	\$6, 850	\$7, 450	\$6, 525
Communications.....	6, 275	6, 825	6, 025
Construction.....	6, 700	7, 500	6, 000
Consulting services.....	6, 300	6, 925	5, 425
Electrical machinery and electronics..	7, 175	7, 925	6, 575
Instruments.....	6, 975	8, 500	6, 525
Machinery (except electrical).....	6, 775	7, 675	6, 125
Missiles, aircraft, and parts.....	7, 275	8, 975	6, 525
Motor vehicles.....	6, 875	7, 400	6, 450
Petroleum.....	6, 725	7, 350	6, 100
Research and development activities..	7, 100	8, 250	6, 375
Utilities (electric and gas).....	6, 750	7, 350	6, 175

¹ 50 percent earned more and 50 percent earned less than amounts shown.

² 10 percent earned more than amounts shown.

³ 90 percent earned more than amounts shown.

In the Federal Government service in early 1963, engineers with the bachelor's degree and no experience could start at \$5,525 or \$6,650 a year,

depending on their college records. Beginning engineers with the bachelor's degree and 1 or 2 years of graduate work could start at \$6,650 or \$7,125. Those with the Ph. D. degree could begin at \$8,575 or \$9,475.

In colleges and universities, the total professional income of beginning engineers with the bachelor's degree averaged about \$5,425 a year; with the master's degree, \$7,000 a year; and with the Ph. D. degree, \$8,950. (See also statement on College and University Teachers.)

Most engineers can look forward to a marked increase in earnings as they gain experience. Thus, in industry in 1962, the average (median) salary of engineers with 20 years of experience was nearly twice that of beginning engineers. Only 10 percent of those with 20 years of experience earned less than \$9,700 a year, and about 10 percent earned \$18,000 or more. A small number in top-level executive positions had much higher earnings.

Where To Go for More Information

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

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 may also be obtained from the Engineers' Council for Professional Development. Information on registration of engineers may be obtained from the National Society of Professional Engineers.

The following organizations can furnish information on the respective branches of engineering:

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

American Institute of Aeronautics and Astronautics,
Inc.,
2 East 64th St., New York, N.Y., 10021.

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

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

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

American Society of Agricultural Engineers,
420 Main St., St. Joseph, Mich., 49085.

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

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

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

The above list does not include all the many engineering organizations; others 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),
900 F St., NW., Washington, D.C., 20004.

Aeronautical Engineers

(D.O.T. 0-19.03)

Nature of Work

Aeronautical engineers have played a vital role in America's space-age achievements. Engineers in this branch work on missiles and spacecraft, and on conventional aircraft. They are concerned with all phases of missile and aircraft development—from structures to propulsion systems and from the initial planning to the final design, manufacture, and testing. Engineers working in the missiles and spacecraft field may also be called aerospace or astronautical engineers.

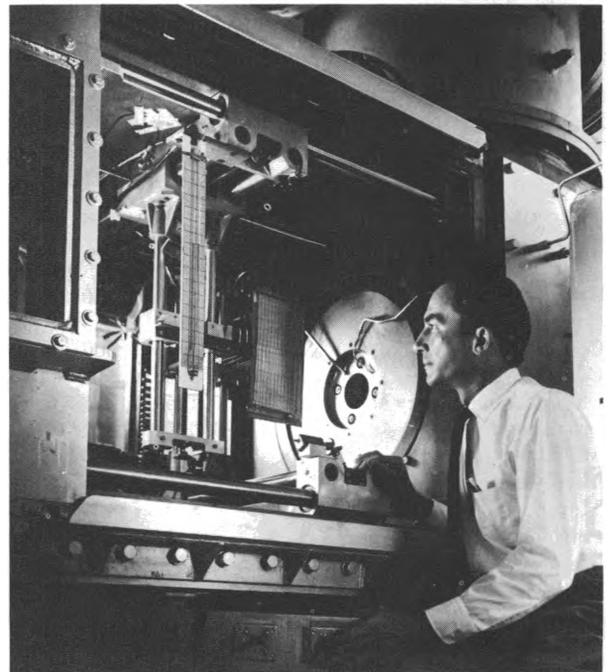
Aeronautical engineers usually specialize in a particular area of work, such as structural design, instrumentation, propulsion systems, materials, reliability testing, or production methods. They may also specialize in a particular type of aircraft, such as conventional propeller-driven planes, jet-powered or nuclear-powered aircraft, or spacecraft or missiles.

Where Employed

More than 55,000 aeronautical engineers were employed in mid-1962. Approximately four-fifths of all aeronautical engineers are employed in the aircraft, missile, and spacecraft industries. Some work for Federal Government agencies, primarily the Department of Defense and the National Aeronautics and Space Administration. Small numbers work for commercial airlines, consulting firms, and colleges and universities.

Employment Outlook

The outlook is for continued expansion of employment in aeronautical engineering throughout the remainder of the 1960's and over the longer run. Employment opportunities will increase chiefly as a result of continued growth expected



Courtesy of U.S. National Aeronautics and Space Administration

Aeronautical engineer uses low density wind tunnel in aerodynamic studies at simulated altitudes

in Government expenditures for missiles and spacecraft.

Recent technological developments have shifted the focus of aeronautical engineering from propeller-driven and jet-powered aircraft to rocket-powered missiles and spacecraft. The radically new and difficult problems created by space flight and the ever-increasing complexity of aerospace products are expected to continue to raise the demand for aeronautical engineers. Research aimed

at developing new aircraft—such as vertical take-off and landing and supersonic passenger planes—and improving those now in use will probably also require additional engineers. (See introductory section of this chapter for discussion on training required, earnings, and where to go for more information. See also chapter on Occupations in Aircraft, Missile, and Spacecraft Manufacturing.)

Agricultural Engineers

(D.O.T. 0-19.10)

Nature of Work

Agricultural engineers use basic engineering principles and concepts to develop equipment and methods to make farming easier, more productive, and more economical. They are concerned primarily with the design of farm machinery, equipment, and structures; the utilization of electrical energy on farms; the conservation and management of soil and water resources; and the processing of 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.

Where Employed

The relatively small number of agricultural engineers are employed primarily by private industry, especially manufacturers of heavy farm equipment and specialized lines of field, barnyard, and household equipment; electrical service companies; and distributors of farm equipment and supplies. Some work for engineering consultants

who supply technical or management services to farmers; others are independent consultants.

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

Employment Outlook

Employment of agricultural engineers is expected to grow throughout the remainder of the 1960's and over the longer run. 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, and the broadening use of agricultural products and wastes as industrial raw materials. Additional engineers will also be needed to work on problems characteristic of the modern farm, such as the enormous energy and power requirements. (See introductory section of this chapter for discussion on training required, earnings, and where to go for more information. See also chapter on Occupations in Agriculture.)

Ceramic Engineers

(D.O.T. 0-15.11)

Nature of Work

Ceramic engineers are concerned with the processing and manufacture of clay, silicates, and other nonmetallic minerals into a wide variety of ceramic products, ranging from glassware, ce-

ment, and bricks to coatings for missile 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 develop-

ment work. Some are employed in administration, management, 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); protective and refractory coatings for metals; glass; and abrasives.

Where Employed

Most of the estimated 5,000 to 10,000 ceramic engineers are employed in manufacturing industries—primarily in the stone, clay, and glass industry. Others work in industries which produce or use ceramic products such as the iron and steel, electrical equipment, and chemicals industries. Some are employed by educational institutions and independent research organizations. A few work for Federal Government agencies.

Employment Outlook

The outlook is for rapid growth in employment of ceramic engineers throughout the remainder of

the 1960's and over the longer run. Ceramic engineering is a small field, however, and opportunities for new entrants in any one year will be small compared with those in the large branches of engineering.

Growth of programs related to nuclear energy, electronics, and space exploration will provide many of the opportunities for ceramic engineers. Ceramic-coated metals 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, both for consumer and industrial use, will also require additional ceramic engineers to improve these products and adapt them to new requirements. The growing use of structural-clay and tile products in construction will also add to the opportunities for ceramic engineers. Furthermore, research aimed at developing new glass products—such as malleable glass that can be worked like plastic, or glass timber to be used in construction—probably will create additional openings for ceramic engineers. (See introductory section of this chapter for discussion on training requirements, earnings, and where to go for more information.)

Chemical Engineers

(D.O.T. 0-15.01)

Nature of Work

Chemical engineers are concerned primarily with designing and operating the chemical plants and equipment and developing the processes required to manufacture chemicals in large quantities. The manufacturing processes used are made up of various combinations of operations such as mixing, crushing, heat transfer, distillation, oxidation, hydrogenation, and polymerization. The chemical engineer determines the combination of operations which will result in the most effective manufacturing process.

The work in this branch of engineering is so complex that chemical engineers frequently become specialists in a particular type of operation, such as oxidation or polymerization, or in the

products of one industry, such as petroleum, plastics, paper, or rubber. Chemical engineers may be engaged in research and development, production, plant operation, design, sales, management, or teaching.

Where Employed

Approximately four-fifths of the nearly 45,000 chemical engineers in the United States in 1962 were employed in manufacturing industries—primarily in the chemicals and petroleum industries. Some are employed by government agencies and by colleges and universities. A smaller number work for independent research institutes or engineering consulting firms, or as independent consulting engineers.

Employment Outlook

Chemical engineering is one of the youngest of the major branches of engineering. The outlook is for continued growth in this branch of engineering throughout the remainder of the 1960's and over the longer run.

The major factors which should continue to be important to the growth of the chemical engineering profession are expansion of industry—the chemicals industry in particular—and increases in research and development activities, in which about one-third of all chemical engineers are employed. The increasing complexity of chemical processes and the growing trend toward automation of these processes, especially in the chemicals and petroleum industries, will require additional chemical engineers for work related to

designing, building, and maintaining the necessary plants and equipment. Chemical engineers will also be needed in many relatively new areas of work, such as the design and development of nuclear reactors 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 plastics, drugs, and paints will probably create additional openings for chemical engineers. (See introductory section of this chapter for discussion on training required, earnings, and where to go for more information. See also statement on Chemists and chapter on Occupations in the Industrial Chemical Industry.)

Civil Engineers

(D.O.T. 0-16.01)

Nature of Work

Civil engineering is one of the oldest and largest branches of engineering. In 1962, about 170,000 engineers were employed in this branch of the profession.

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

Many civil engineers are in supervisory or administrative positions, ranging from that of site supervisor of a construction gang or head of a drafting department to top-level executive posts. Others are engaged in design, planning, research, inspection, and maintenance activities.

Where Employed

The great majority of civil engineers are employed by Federal, State, and local government agencies and the construction industry. Large numbers are also employed by consulting engineering and architectural firms, or work as independent consulting engineers. Others are employed by public utilities, railroads, and by educational in-

stitutions. Still others are employed in the iron and steel industries and other major manufacturing industries.

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 or in foreign countries. Furthermore, civil engineers in some positions are often required to



Courtesy of Bureau of Reclamation

Civil engineers study model of a canyon in designing a bridge

move from place to place to work on different projects.

Employment Outlook

Employment in civil engineering is expected to grow, both in the near future and over the long run. Growth in this field, however, is not likely to be as rapid as in electrical and mechanical engineering, the other large branches of the profession. Growing needs for housing, industrial buildings, and highways created by an increasing population and expanding economy will provide expanding employment opportunities for civil engineers. New programs in areas related to water and sewage systems, flood control, air and water

pollution, and reclamation, as well as urban redevelopment, will also probably require additional civil engineers.

Large numbers of civil engineers will also be needed each year to replace those leaving the field. As a group, civil engineers are older than engineers in other specialties and the proportion lost to the profession each year by retirement or death is therefore relatively high. The number of civil engineers needed annually to fill such vacancies—estimated to be 3,300 in 1962—will probably rise slowly throughout this decade. (See introductory section of this chapter for discussion on training required, earnings, and where to go for more information.)

Electrical Engineers

(D.O.T. 0-17.01 and .02)

Nature of Work

Electrical engineering (including electronics engineering) is the largest and one of the most rapidly growing branches of the profession. In 1962, about 195,000 electrical engineers were employed in the United States.

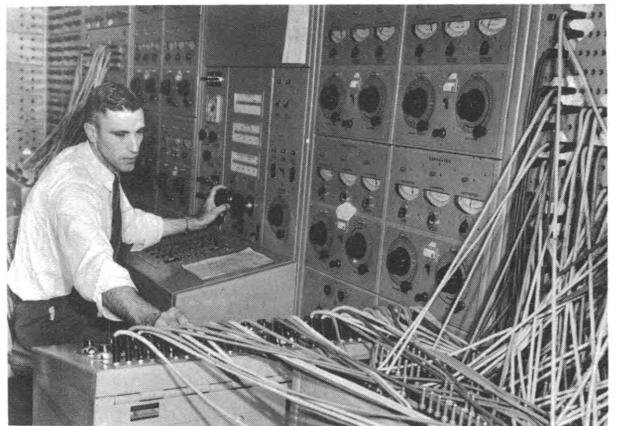
Electrical engineers design, develop, and supervise the manufacture of electrical and electronic equipment—including electric motors and generators; communications equipment; electronic apparatus such as television, radar, computers, and missile guidance systems; and electrical appliances of all kinds. 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 are employed in administrative and management positions. Others are employed in various manufacturing operations or in technical sales or teaching positions.

Where Employed

Electrical engineers are employed chiefly by manufacturers of electrical and electronic equipment, aircraft and missiles, business machines, and professional and scientific equipment. Many are employed by telephone and telegraph and electric light and power companies. Sizable numbers are employed by government agencies and by colleges and universities. Others work for construction firms, for engineering consultants, or as independent consulting engineers.



Courtesy of Bureau of Reclamation

Electrical engineer uses A.C. network analyzer to study operating conditions of a power system

Employment Outlook

The outlook is for continued rapid growth of employment in this branch of the engineering profession throughout the remainder of the 1960's and over the longer run. Requirements of the military and space programs for new and improved types of electronic and electrical equipment are expected to continue to be a major factor in increasing the demand for electrical engineers. These needs, added to those of producers of consumer goods, are expected to result in continued rapid growth of the electrical and electronics equipment industry. The electric utility and the telephone and telegraph industries are also expected to grow. Newer areas of work such as those

concerned with nuclear energy, missiles and spacecraft, communication and weather satellites, electronic computers, and automation will probably continue to require large numbers of electrical engineers.

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 such vacancies, estimated to be about 2,500 in 1962, will probably rise slowly throughout the 1960's. (See introductory section of this chapter for discussion on training required, earnings, and where to go for more information. See also chapter on Occupations in Electronics Manufacturing.)

Industrial Engineers

(D.O.T. 0-18.01)

Nature of Work

Industrial engineers are concerned primarily with the effective utilization of machines, materials, and personnel. They often specialize in planning plant layouts so that the production process will be efficient, or in selecting and designing the machines and equipment to be used in manufacturing operations. They are also concerned with the planning of automated manufacturing processes and the installation of industrial equipment. Among their numerous other specialties are time, motion, and incentive studies; production methods and standards; cost control and records; quality control; safety engineering; systems engineering; and operations research.

Where Employed

More than two-thirds of the estimated 100,000 industrial engineers employed in 1962 were in manufacturing industries. Some worked for insurance companies, construction and mining firms, and utilities. Others were employed by retail organizations, mail order houses, and other large business enterprises to improve the efficiency of clerical and other operations. Still others worked

for government agencies, educational institutions, and consulting engineering firms. A few were independent consulting engineers.

Employment Outlook

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 factors expected to increase the demand for industrial engineers in the middle and late 1960's and over the longer run. Growing recognition of the importance of scientific management and safety engineering in reducing costs and increasing productivity is expected to stimulate further the demand for persons in this branch.

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 such vacancies, estimated to be approximately 1,600 in 1962, will probably rise slowly in the future. (See introductory section of this chapter for discussion on training required, earnings, and where to go for more information.)

Mechanical Engineers

(D.O.T. 0-19.01, .05, .81, and .91)

Nature of Work

The field of mechanical engineering is exceeded in size only by electrical engineering. In 1962, more than 170,000 engineers were employed in this branch of the profession.

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—refrigerating and air-conditioning equipment, elevators, machine tools, printing presses, steel rolling mills, and many others. Large numbers of mechanical engineers are engaged in research and development, design, and administrative and management activities. Others work in production, operations, maintenance, and sales positions.

Many specialized areas of work have developed within mechanical engineering. Among the 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.

Where Employed

Nearly three-quarters of all mechanical engineers are employed in manufacturing industries

—mainly in the primary and fabricated metals, machinery, transportation equipment, and electrical equipment industries. However, nearly all manufacturing and nonmanufacturing industries employ some members of the profession. Many are employed in government agencies, educational institutions, and consulting engineering firms. Some work as independent consulting engineers.

Employment Outlook

The outlook is for rapid growth in this branch of engineering throughout the remainder of the 1960's and over the longer run. Growth of industry, and the increasing technological complexity and automation of industrial machinery and processes will be major factors contributing to greater employment. Expansion of research and development activities in the industries which are major employers of mechanical engineers will also be a factor in their growth. Moreover, newer areas of work, such as atomic energy, missile and spacecraft development, and automation 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 such vacancies was estimated to be 2,600 in 1962; the annual replacement need will probably rise slowly throughout the remainder of the 1960's. (See introductory section of this chapter for discussion on training required, earnings, and where to go for more information.)

Metallurgical Engineers

(D.O.T. 0-14.10 and .20)

Nature of Work

Metallurgical engineers are concerned with the processing of metals and their conversion into useful products. These engineers usually work in one of two main branches of metallurgy—extractive or physical. Extractive metallurgy deals with the extraction of metals from their ores, and with refining it 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.

Persons working in the field of metallurgy may be referred to as either metallurgists or metallurgical engineers. However, metallurgists are generally engaged in such activities as research and development or analysis and testing, whereas

metallurgical engineers are engaged mainly in directing the extraction and processing of ores.

Where Employed

The metalworking industries—primarily the iron and steel and nonferrous metals industries—employ over one-half of the relatively small number of metallurgical engineers. Many metallurgical engineers work in the machinery, electrical equipment, and aircraft, missile, and spacecraft industries. Others are employed in the mining industry, and in 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, both in the

near future and over the long run. Increasing numbers of metallurgical engineers will be needed by the metalworking industries to work on problems involved in the adaptation of metals and alloys to new needs. For example, the development of such products as supersonic jet aircraft, missiles, satellites, and spacecraft has brought about a need for light-weight metals capable of withstanding both extremely high and extremely low temperatures. Metallurgical engineers will also be needed to solve metallurgical problems connected with the efficient use of nuclear energy. 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 required, earnings, and where to go for more information. See also chapter on Occupations in the Iron and Steel Industry.)

Mining Engineers

(D.O.T. 0-20.01 and .11)

Nature of Work

Mining engineers are responsible for the efficient extraction of minerals from the earth. They plan and supervise the construction of mine shafts and tunnels, devise means of extracting minerals, and plan the methods to be used in transporting the minerals to the surface. They also direct the operation of mines and are responsible for mine safety. Some mining engineers work with geologists and other specialists in searching for ore-bearing rock or for deposits of petroleum, coal, or other minerals.

Mining engineers frequently specialize in the extraction of metals, coal, nonmetallic minerals, or petroleum and natural gas. Petroleum engineering, for example, has become so specialized that it is, in some cases, considered a separate branch of the engineering profession. Specialization of mining engineers may also extend to a particular type of work, such as mine safety, mine appraisal, or exploration.

Where Employed

Approximately three-quarters of the estimated 13,000 mining engineers were employed in the

mining and petroleum industries in 1962. Most of the remainder worked for colleges and universities or government agencies, or as independent consultants.

Mining engineers are usually employed at the location of mineral deposits. They may work near small communities or in out-of-the way places—in mountains or deserts. However, those engaged in research, teaching, management, or consulting, are often located in large metropolitan areas.

Employment Outlook

In the middle and late 1960's, the opportunities for employment in mining engineering will probably be less favorable than in most other branches of engineering. Exploration for most minerals has declined in recent years and it is unlikely that these activities will expand significantly in the near future. Furthermore, since mining engineering is one of the smaller branches of the profession, opportunities for many engineers to fill new positions and to replace those retiring or otherwise leaving the field will be small compared with such opportunities in the larger branches of engineering.

In the long run, however, as easily mined deposits are exhausted and as needs for metals increase with the expansion of industry, mining engineers will be needed to devise ways of mining poorer deposits and those which are difficult to mine at a competitive cost. Additional areas of employment for mining engineers will arise as the development of new alloys and the discovery of new uses for metals increase the demand for less

widely used ores. In the petroleum industry, some mining engineers will be needed to locate and utilize new oil fields, both in the United States and abroad. (See introductory section of this chapter for discussion on training required, earnings, and where to go for more information. See also chapter on Petroleum Production and Refining Occupations.)

PHYSICAL SCIENCES

The physical sciences deal with the basic laws of the physical world. Many scientists in this broad field 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.

The physical sciences are usually subdivided into four broad specialties—chemistry, physics, metallurgy, and astronomy. The largest of these fields is chemistry, with 120,000 chemists employed in mid-1962. Smaller numbers are in physics (35,000), metallurgy (15,000), and astronomy (1,000).

In recent years, employment in the physical sciences has grown rapidly, and the outlook is

for continued rapid growth over the remainder of the 1960's. The single most important factor in this anticipated growth will be the likely increase in research and development expenditures. Such expenditures, which nearly tripled in the 8-year period ending in 1962, are expected to continue to rise during the remainder of the decade. Missiles and spacecraft, atomic energy, and electronics are but a few of the fields in which large increases in employment opportunities for physical scientists are anticipated. Other factors in the expected growth of employment are the increasing complexity of industrial products and processes and sharp increases in science enrollments in colleges and universities.

This chapter includes descriptions of three major physical science occupations—chemist, physicist, and astronomer. Many other professions also require a good background in the physical sciences. Among these are engineering and the earth science occupations described in separate chapters in this *Handbook*.

Chemists

(D.O.T. 0-07.02 through .85)

Nature of Work

The work done by chemists helps to provide many products which make our lives healthier, more productive, and more comfortable. They may develop vaccines and medicines, new methods of preserving food, and new and improved materials and rocket fuels for use in the exploration of space. As a result of their discoveries, entirely new industries have been created, for example, plastics, frozen foods, and synthetic textile fibers.

Chemists are concerned with the composition and properties of substances and changes in their composition; they search for new knowledge of the chemistry of substances and for ways of using this knowledge. To study and measure substances,

chemists use instruments such as balances, spectrographs, radioactive isotope counters, titrimeters, refractometers, and microbalances. They maintain accurate records of the work performed and prepare clear and concise reports showing the results of the tests or experiments.

About one-half of all chemists are engaged in research and development. Most research chemists work on applied research projects aimed at creating new products or improving and finding new uses for existing ones. Chemists in applied research have helped to develop a vast range of new products, including antibiotics and other wonder drugs, plastics, foam rubber, detergents, insecticides, and fabrics made from synthetic fibers. Many chemists work on basic research projects to



Courtesy of U.S. Department of the Navy

Chemists use protective equipment in metallurgy tests

extend scientific knowledge rather than to solve immediate practical problems. However, many important practical applications have resulted from basic research. For example, research on polymerization—how and why certain small molecules unite to form giant molecules—resulted in the development of synthetic rubber, nylon, and plastics.

Analysis and testing is another major activity of many chemists, since various kinds of tests must be made at practically every stage in the manufacture of a product, from its initial development to final production. Sizable numbers of chemists are employed in activities such as college teaching and administrative work. Smaller numbers are employed as sales representatives by chemical companies and other manufacturers, usually when the product is such that the salesmen must be able to discuss its technical aspects and tell the customers how it can be used. Other chemists are employed in supervision of production processes, patent work, technical writing, materials purchasing, and marketing research. A few work as independent consultants.

Chemists usually specialize in one or more branches of chemistry, and sometimes in a subdivision of one of these branches. *Organic chemists*, the largest group, deal primarily with carbon compounds, most of which are substances originally derived from animal and vegetable matter. *Inorganic chemists* are chiefly concerned with compounds of elements relatively free of carbon, including most of the minerals and metals. *Physi-*

cal chemists study the quantitative relationships between chemical and physical properties of both organic and inorganic substances—for example, how these substances are affected by electricity, pressure, heat, and light. *Analytical chemists* determine the exact chemical composition of substances and test them to determine their quality, purity, and other characteristics. *Biochemists* are concerned with chemical reactions occurring in plants and animals, such as the effects of foods, drugs, or chemicals on plant and animal tissues, and with the influence of chemicals in life processes. *Agricultural* and *food chemists* are biochemists who specialize in problems related to food production and preservation.

Some chemists specialize in a particular industry or product, such as petroleum, plastics, or rubber. Such work often requires a knowledge of more than one branch of chemistry. The specialist in plastics, for example, may need a knowledge of physical as well as organic chemistry. However, all chemists must know the fundamentals of chemistry—the composition and properties of substances and how they can be changed.

Where Employed

Chemistry is by far the largest field of employment in the sciences. There were approximately 120,000 chemists in the United States in mid-1962; about 5 percent were women. Chemists are employed in all States, and in small cities as well as large.

Approximately three-fourths of all chemists are employed by private industry. The major industrial employer of chemists is the chemicals industry, which employed more than two-fifths of all chemists in private industry in mid-1962. Other industries utilizing relatively large numbers of chemists are petroleum, food, primary metals, electrical equipment, aerospace, paper, and rubber.

Many chemists are employed in colleges and universities. Although most of these chemists teach, some work full or part time in research and development, often on projects for the Federal Government. Sizable numbers of chemists are also employed directly by government agencies, chiefly by the U.S. Departments of Defense; Health, Education, and Welfare; Agriculture; the In-

terior; and Commerce. A few work for research institutes, foundations, and other nonprofit organizations.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in chemistry is usually the minimum educational requirement for young people seeking careers as chemists. Graduate training is essential for many positions, particularly in research and teaching.

Graduates with the bachelor's degree usually qualify for positions in analysis and testing, quality control, technical service, and sales, or as trainees for administrative or laboratory research and development work. Most chemists with the bachelor's degree are employed by private industry and the government. In industry, employers often have special training programs for beginning chemistry graduates. These programs are designed to supplement college training with specific industry techniques and to aid in determining the type of work for which the individual is best suited. Some chemists with the bachelor's degree and above average grades are employed in colleges and universities as research or teaching assistants while working toward advanced degrees. Many new graduates go into high school teaching positions; these are usually regarded as teachers rather than as chemists.

Chemists with the master's degree can often qualify for applied research positions in government or private industry. They can also qualify for many teaching positions in colleges and universities.

The Ph. D. degree is generally required for positions in basic research and for higher level teaching positions in a college or university. It may also be important for advancement to top-level positions in other activities.

Many colleges and universities offer an undergraduate major in chemistry. In the typical 4-year chemistry curriculum, about two-fifths of the work consists of chemistry courses. A few of the courses usually taken by undergraduates in the field of chemistry are quantitative and qualitative analysis, inorganic, organic, and physical chemistry. Courses in mathematics (especially analytical geometry and calculus), physics, biology, English, and one foreign language are also required.

Advanced degrees in chemistry are awarded by a large number of colleges and universities, many of which offer financial assistance to above average undergraduates interested in further study. In graduate school, the academic work of chemistry students consists heavily of courses in his specialty or field of interest. Requirements for the master's or doctor's degree usually include classroom studies, laboratory research, library research, and preparation of a thesis.

Personal qualifications needed for a career in chemistry include an orderly mind, above average intelligence, and an interest and facility in mathematics. Since chemists usually work in teams, an ability to communicate and work with others is important.

Employment Outlook

Employment opportunities for well-trained chemistry graduates are expected to be good throughout the 1960's, and the longrun outlook is for continued expansion of the profession. As in recent years, there will be a particular need for chemists with advanced degrees for research and teaching positions. For women chemists qualified to do research and teaching, employment opportunities are also expected to be good.

One of the major factors which will tend to increase employment of chemists is the anticipated growth in expenditures for research and development, in which about one-half of all chemists are engaged. Total expenditures for research and development have increased rapidly in recent years and are expected to continue to grow during the next decade. Continued expansion of the industries employing the largest numbers of chemists will also be an important factor increasing employment opportunities for these scientists. The chemical industry, especially, is expected to expand rapidly in response to growing demands for such products as drugs and pharmaceuticals, synthetic fibers, detergents, fertilizers, plastics, and high energy fuels for missiles and rockets.

The demand for chemists to fill college and university teaching positions will also rise substantially, because of the large increases in college enrollments expected during the late 1960's. The greatest demand will be for those with Ph. D. degrees, but there will be many positions for chem-

ists with the master's degree. (See index for page number of statement on College and University Teachers.)

In addition to those needed to fill new positions, many chemists will also be needed each year to replace those who retire, die, or transfer to other occupations. These losses to the profession were estimated to be approximately 2,000 in 1962 and may rise considerably during the late 1960's.

Along with the expected growth in demand for chemists, a steady increase is expected in the number of chemistry graduates, particularly at the bachelor's level. If chemistry graduates continue to represent the same proportion of all college graduates as in recent years, the number seeking employment in the profession will rise rapidly throughout the 1960's. Thus, there may be competition for the better paying entry positions in chemistry, particularly among graduates with only the bachelor's degree. However, the rising demand will continue to provide favorable opportunities for chemists with ability and thorough training for many years to come.

Earnings and Working Conditions

Inexperienced chemistry graduates with a bachelor's degree had an average (median) starting salary of \$6,300 a year in private industry in 1962, according to a survey conducted by the American Chemical Society. Inexperienced graduates with the master's degree averaged about \$7,400 a year and those with the Ph. D. degree, about \$10,200.

In academic institutions, the average (median) annual starting salary for the few entrants with the bachelor's degree only and with no experience was \$4,500, according to the American Chemical Society. The average salary for inexperienced graduates with the master's degree was about \$5,600, and for those with the Ph. D. degree,

\$6,900. Many experienced chemists in educational institutions supplement their regular salaries with income from consulting, lecturing, and writing books and articles.

In Federal Government positions in early 1963, the annual starting salary for inexperienced chemists with the bachelor's degree was either \$5,525 or \$6,650, depending on the individual's college record. Beginning chemists with 1 full year of graduate study could start at \$6,650, and those with 2 full years of graduate study at \$7,125. Chemists with the Ph. D. degree could start at \$8,575 or \$9,475.

Most chemists can look forward to a marked increase in earnings as they gain experience. According to preliminary data from the National Science Foundation's 1962 National Register of Scientific and Technical Personnel, the average (median) salary of chemists with 5 to 9 years of experience was \$9,000 a year and that of chemists with 20 or more years of experience was about \$13,000, compared with \$7,000 for chemists with only 1 year of experience.

Chemists spend most of their time working in modern, well-equipped, well-lighted laboratories, offices, or classrooms. Chemists may be subjected to minor hazards such as inhalation of fumes, contacts with acids, and open flames. However, if safety regulations are followed, health hazards are negligible.

Where To Go for More Information

American Chemical Society,
1155 16th St. NW., Washington, D.C., 20036.
Manufacturing Chemists' Association, Inc.,
1825 Connecticut Ave. NW., Washington, D.C., 20009.

For additional sources of information, see also statements on Chemical Engineers and Industrial Chemical Industry. (Refer to index for page numbers.)

Physicists

(D.O.T. 0-35.73)

Nature of Work

Physics, one of the most rapidly growing scientific professions, is concerned with energy in all its forms, with the structure of matter, and with

the relationship between matter and energy. Physicists investigate and attempt to understand the fundamental laws of nature and how these laws may be formulated and put to use. Much of

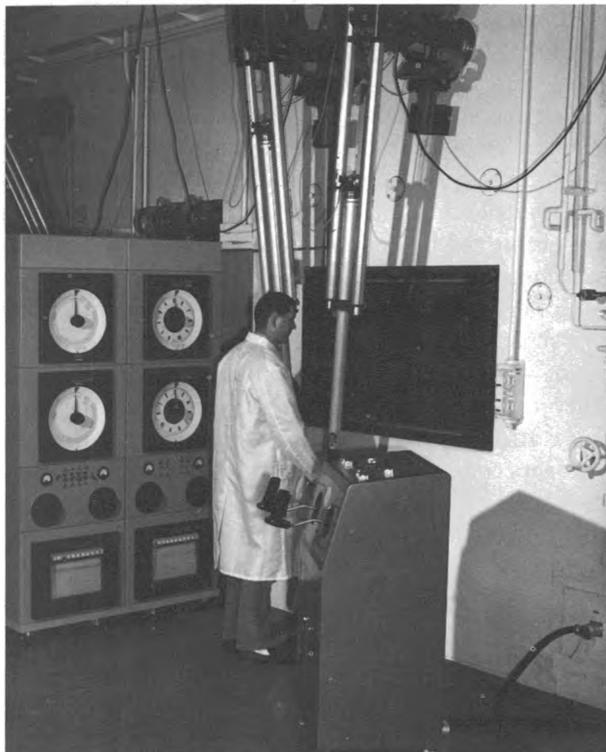
the scientific progress in the past several decades stems from discoveries made by physicists in such critical fields as nuclear energy, cosmic rays, and electronics.

Most physicists are engaged in research and development. A sizable number conduct basic research, designed to increase scientific knowledge with only secondary regard to its practical applications. Some of these, called theoretical physicists, seek to work out mathematical descriptions of the relationships between physical phenomena. Others, called experimental physicists, make careful, systematic observations and perform experiments to identify and measure the elements of matter and energy and their interactions. For example, they try to identify and measure the lifetime of tiny antiparticles of matter which may exist within the core of the atom. Experimental physicists use apparatus such as particle accelerators, X-ray spectrometers, electron diffraction cameras, microwave devices, 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 scientists are skilled in both types of work.

A large number of physicists do applied research. They use the knowledge gained from basic research to solve practical problems and to create new products for industry or for national defense. For example, the work of physicists specializing in solid-state physics led to the development of transistors, now used in place of vacuum tubes in many types of electronic equipment ranging from hearing aids to guidance systems for missiles.

Many physicists teach in colleges and universities, often combining research with teaching. Some are engaged in the management and administration of scientific activities, especially research and development. Still others do work related to the production of industrial products, including inspection and quality control. A few physicists do technical writing or consulting work.

Most physicists specialize in one or more branches of the science—mechanics, heat, optics, acoustics, electricity and magnetism, electronics, atomic and molecular physics, nuclear physics, physics of fluids, solid-state physics, or classical theoretical physics. In addition, new fields are continually emerging; for example, cryogenics,



Courtesy of U.S. Department of the Navy

Nuclear physicist uses power-driven manipulators to handle irradiated research materials

plasma physics, and ultrasonics have developed in recent years. Since all physics specialties rest on the same fundamental principles, nearly all are closely related and the physicist's work may overlap a number of specialties.

Physicists often apply the theories and methodology of their science to problems originating in other sciences, including geology, biology, chemistry, and astronomy. Some people have become specialists in both physics and a related science. Thus, a number of specialties have developed on the borderline between physics and other fields—geophysics, biophysics, physical chemistry, and astrophysics. (Information on these occupations is contained elsewhere in the *Handbook*. See index for page numbers.) Furthermore, the practical applications of physicists' work has increasingly merged with engineering.

Where Employed

Approximately 35,000 physicists were employed in the United States in mid-1962. About 15,000

were employed by private industry. Nearly two-thirds of this group are employed in the aerospace and electrical equipment industries. Other industries using relatively large numbers of physicists include chemicals, professional and scientific instruments, telecommunications and broadcasting, petroleum, and machinery. A few physicists are employed by independent laboratories and research institutes.

Colleges and universities employed about 14,000 physicists in mid-1962. Although teaching is the main activity of most physicists in colleges and universities, a sizable number employed by such institutions work full time in research, often on projects conducted for Federal Government agencies such as the Atomic Energy Commission and the National Aeronautics and Space Administration.

Federal Government agencies also employ large numbers of physicists—approximately 4,700 in mid-1962. The agencies employing the most physicists are the Department of Defense, the National Aeronautics and Space Administration, and the National Bureau of Standards. A few members of the profession work for the Atomic Energy Commission, the Department of the Interior, and the Department of Agriculture.

Relatively few physicists are women—only about 3 percent, according to the National Science Foundation's National Register of Scientific and Technical Personnel.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in physics is the minimum entrance requirement for young people seeking careers as physicists, and graduate training is highly desirable.

A doctor's degree is required for high-level research positions in academic institutions, industry, and the Federal Government. It is also helpful for promotion in many areas of work including advancement in most colleges and universities.

Physicists with master's degrees are able to qualify for many research activities in private industry, educational institutions, and government; some also obtain positions as instructors in colleges and universities. Frequently, graduate students working toward a doctor's degree are assigned to teach elementary college courses, conduct labora-

tory sessions, or aid senior faculty members on research projects.

Physicists with bachelor's degrees can 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. Some persons with only a bachelor's degree in the science do not work as physicists but go into nontechnical work or, sometimes, into engineering positions.

Training leading to the bachelor's degree in physics was offered by approximately 740 colleges and universities in 1962. In addition, many engineering schools offered a physics major as part of the general engineering curriculum. A few of the physics courses typically offered in an undergraduate program are mechanics, electricity and magnetism, optics, thermodynamics, and light and atomic physics. In addition, courses in chemistry and mathematics are required.

Master's degrees in physics were offered by approximately 200 colleges and universities in 1962, and the Ph. D. was offered by approximately 100. In graduate school, the student builds upon the broad background in the fundamentals of physics acquired in his undergraduate studies, placing emphasis on his major field of interest.

Among the chief personal qualifications needed for a career in physics are a creative imagination and a highly inquisitive mind. Strong interest and facility in mathematics are also essential.

Employment Outlook

Employment opportunities for physicists are expected to be excellent throughout the remainder of the 1960's, and continued growth in the profession is anticipated over the long run. As in recent years, there will probably be a particular demand for physicists with Ph. D. degrees who are qualified to teach advanced physics courses and do high-level research and development work. Research organizations, whether those of government, universities, or industry, have had considerable difficulty in filling their requirements for physicists with advanced degrees, and their needs for such physicists will probably continue to increase.

Among the major factors which should continue to make physics one of the most rapidly growing science fields throughout the 1960's is the continued increase in expenditures for research and development by both industry and government. Such expenditures, which nearly tripled in the 8-year period ending in 1962, are expected to continue to rise during the next decade. Moreover, much of this increase will take place in those industries which employ large numbers of physicists—particularly the electrical equipment, and aircraft, missiles, and spacecraft industries.

Demand for physicists qualified to teach in colleges and universities is also expected to increase substantially, both to provide for the much larger enrollments of physics students expected in the late 1960's and to meet the growing need for advanced physics training in other science fields and in engineering. During the early 1960's, many colleges were unable to recruit sufficient numbers of well qualified physics teachers, and this problem may well become more acute during the next decade. (See index for page number of statement on College and University Teachers.)

Along with the anticipated rise in demand for physicists, an increase is expected in the number of physics graduates, especially at the bachelor's degree level. If physics graduates continue to represent the same proportion of all college graduates as in recent years, the number seeking employment in the profession will rise rapidly during the late 1960's. Nevertheless, the demand for physicists is expected to be greater than the number of new graduates available for employment. Thus, for graduates with advanced degrees and for well qualified graduates with the bachelor's degree, excellent employment opportunities are in prospect in the profession throughout the rest of the decade.

Earnings and Working Conditions

Starting salaries for physicists with bachelor's degrees were usually between \$5,800 and \$6,700 a year in private industry in 1962, according to the limited information available. Physicists with master's degrees received starting salaries about \$500 to \$1,000 higher than those with bachelor's degrees. Annual salaries for new graduates with Ph. D. degrees ranged roughly from \$7,500 to as high as \$15,000.

In the Federal Government service in early 1963, physicists with the bachelor's degree and no experience could start at either \$5,525 or \$6,650 a year, depending on their college records. Beginning physicists who had completed all requirements for the master's degree could start at \$6,650 or \$7,125. Physicists with the Ph. D. degree could begin at \$8,575 or \$9,475.

Starting salaries for physicists with the Ph. D. degree employed as college and university teachers were about \$7,000 to \$8,000 a year in mid-1962. (For further information, see statement on College and University Teachers.) In addition to their regular salaries, many physicists in educational institutions obtain income from other sources, such as consulting work and special research projects.

Most physicists can look forward to a marked increase in earnings as they gain experience. According to the National Science Foundation's 1962 National Register of Scientific and Technical Personnel, the average (median) salary of physicists with 15 to 19 years' experience was \$14,000 a year, twice the average for physicists with 1 year's experience.

Where To Go for More Information

American Institute of Physics,
335 East 45th St., New York, N.Y., 10017.

Astronomers

(D.O.T. 0-35.61)

Nature of Work

Astronomy, often considered the most theoretical of all sciences, has many practical applications. Astronomical observations of the sun, moon, planets, and stars are the basis for sea and air navigation, the calendar, and the accurate measurement

of time. Astronomy provides both a proving ground for theories of time and space and a laboratory where matter may be observed under the most extreme conditions of temperature and density. Astronomy also helps fill in gaps in the understanding of the physical world. For ex-

ample, astronomers who have studied the behavior of atoms under stellar temperatures have made valuable contributions to thermonuclear research and to knowledge of the atom.

Astronomers study the universe and all its celestial bodies. They collect and analyze data on the sun, moon, planets, and stars and attempt to determine sizes, shapes, brightnesses, and motions of these bodies. They compute the positions of the stars and planets; 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.

In making their 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, and specialized devices for making particular types of observations are often attached to it. Among these devices are the spectrometer, which produces a spectrum and enables the wave lengths of radiant energy

to be measured; the photometer, which measures the intensity of light; and various other photoelectric, photographic, and electronic instruments and devices. Although most observations are made by means of telescopes permanently mounted in observatories, astronomers are increasingly gathering information by means of spacecraft and earth satellites containing various measuring devices. In processing and analyzing the vast amounts of data derived from their observations, astronomers often make use of high-speed electronic computers.

Astronomers usually specialize in one of the many branches of the science. In *astrophysics*, they are concerned with the application of physical laws to stellar atmospheres and interiors. Some astronomers work in the field of *celestial mechanics*, one of the oldest fields of astronomy and one that has recently acquired new importance. Celestial mechanics 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 guided missiles. *Radio astronomy* is the study, by means of radio telescopes of extraordinary sensitivity, of the source and nature of celestial radio waves. Among the other specialties are *astrometry* (measurement of apparent positions 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 3 out of every 4 astronomers are engaged in teaching, research, or a combination of the two. In colleges and universities without separate departments of astronomy or with 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 development and design of astronomical instruments, administration, technical writing, and consulting.

Where Employed

Astronomy is one of the smallest of the science fields; in mid-1962, the total number of astrono-



Courtesy of U.S. Department of the Navy

Astronomer uses a 12-inch refracting telescope to measure visually the position of stars

mers in the United States was estimated to be approximately 1,000. More than half of all astronomers are employed by colleges and universities. Many of these work in university-operated observatories, where they usually devote most of their time to research, working alone or in cooperation with other astronomers.

The Federal Government provides employment opportunities for approximately 150 astronomers. Among the major Government agencies employing astronomers are the National Aeronautics and Space Administration, which is responsible for directing and implementing the Nation's research efforts in aeronautics and the exploration of space; the U.S. Naval Observatory, which determines the Nation's official time, provides data for air and sea navigation, and conducts research in astrometry and stellar astronomy; the Naval Research Laboratory, which does research in radio astronomy and space astronomy; and the Army Map Service, which utilizes astronomers in measuring exact distances and in determining the positions of points on the earth's surface. Government positions in astronomy are also found at the Air Force Cambridge Research Center (Bedford, Mass.), the Smithsonian Astrophysical Observatory, the U.S. Coast and Geodetic Survey, the National Bureau of Standards, and other agencies.

A very small but growing number of astronomers are employed in private industry, mostly by firms in the aircraft, missile, and spacecraft field. A few astronomers work for museums, planetariums, and other nonprofit organizations.

Training, Other Qualifications, and Advancement

Young people seeking professional careers in astronomy should obtain an advanced degree—preferably the Ph. D. The doctorate is usually required for high-level teaching and research positions and is important for other types of work. Although the bachelor's degree is adequate preparation for some entry jobs, promotional opportunities for astronomers without graduate training are usually limited.

Undergraduate training leading to the bachelor's degree in astronomy is offered by a relatively small number of schools. In 1962, only about 35 colleges and universities offered such a degree. The undergraduate work of the prospective astronomer

is weighted heavily with courses in physics and mathematics (in addition to astronomy). A reading knowledge of at least one foreign language (German, French, or Russian) is required in the undergraduate program, and training in chemistry, statistics, and electronics is useful. A few of the courses often taken by undergraduates in the field of astronomy 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 does not offer a major in astronomy. Well-qualified students with degrees in physics or mathematics are usually able to qualify for positions in astronomy or to pursue graduate work leading to the Ph. D. degree in the science, since the undergraduate work required is similar.

Training leading to the doctorate in astronomy may be obtained in about 25 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. A reading knowledge of two foreign languages (German, French, or Russian) is required. Some schools require that graduate students spend several months in residence at an observatory. In most institutions, however, 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 with bachelor's or master's degrees in astronomy usually begin as assistants in observatories, planetaria, large departments of astronomy in colleges and universities, Government agencies, or industry. Some persons with 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 to the problems at hand. New graduates with the doctorate can

usually qualify for college teaching positions and for research positions in educational institutions, Government, and industry.

Among the personal qualifications needed by prospective astronomers are a deep curiosity about the nature of the physical world, precise and logical thought processes, a strong interest and facility in mathematics and physics, and a fertile imagination. Astronomers should also be able to express themselves clearly and simply, both in writing and speaking, since their work often requires them to communicate not only with other astronomers and scientists, but with the public as well.

Employment Outlook

Employment opportunities for astronomers with the Ph. D. degree are expected to be excellent throughout the remainder of the 1960's. Well-trained persons with only bachelor's or master's degrees in astronomy will also have good 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 with the doctorate.

The outlook is for rapid growth of this small profession, both through the remainder of the 1960's and over the longer run. The advent of the space age—the age of rockets, missiles, manmade earth satellites, and space exploration—has heightened interest in astronomy and is opening up large new fields for astronomers. These scientists will be needed to aid in the development of guidance systems and other instrumentation for missiles and satellites and to help solve many of the practical problems connected with the flights of missiles and spacecraft.

Increased research activities in astronomy by educational institutions, government, and industry are also 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. In all probability, government support for research in this area will continue, and additional astronomers will be needed to conduct further research, especially on problems in exploration of space.

The growing public interest in satellites and space exploration has created a demand for a greater amount of information on astronomy. Furthermore, enrollments in astronomy courses in colleges and universities are likely to increase, not only as a result of this heightened public interest but also because of the growing awareness of the value of astronomical training in many other scientific and engineering specialties. These factors, coupled with the anticipated rapid increases in college enrollments in the late 1960's, are expected to create many new openings for teachers of the science.

Since astronomy is a small profession, the number of job openings in any one year will not be large. On the other hand, the number of college students receiving degrees in astronomy has so far been small. Thus, the young men or women who obtain the necessary training should have excellent employment opportunities during the 1960's.

The most favorable opportunities for women astronomers—particularly those with the Ph. D.—will be in research positions in Government agencies and in the larger observatories. Women's colleges and other educational institutions are also expected to offer some employment opportunities for women astronomers. In addition, some openings for research assistants in observatories or universities will probably arise for women with bachelor's or master's degrees in astronomy.

Earnings and Working Conditions

In the Federal Government service, in early 1963, beginning astronomers with the Ph. D. degree were eligible to enter at \$8,575 or \$9,475 a year, depending on their college record. Astronomers with the bachelor's degree could start at \$5,525 or \$6,650 a year; those with a bachelor's degree and some graduate study could begin at \$6,650 or \$7,125. The provision for salary increases, vacations, sick leave and other benefits are the same as for other civil service employees. (See chapter on Occupations in Government.)

Astronomers in educational institutions receive roughly the same salary as other faculty members. (See statement on College and University Teachers.) Astronomers in educational institutions often add to their professional income by doing consulting work or summer school teaching. A

few astronomers earn extra income from lectures and from writing books and articles.

Some astronomers spend much time in night-work, making visual photographic or photoelectric observations. Others make observations only 4 or 5 nights each month 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 are not heavy and can be met by a reasonably healthy person.

Where To Go for More Information

The American Astronomical Society,
Princeton University Observatory,
265 FitzRandolph Rd., Princeton, N.J., 08540.

Board of U.S. Civil Service Examiners for Scientific
and Technical Personnel of the Potomac River
Naval Command,
Washington, D.C., 20415.

EARTH SCIENCES

The earth sciences are concerned with the history, composition, and characteristics of the earth, its oceans, and its atmosphere. Most scientists in this field are engaged in exploration for new sources of oil and minerals. Some do basic research designed to increase scientific knowledge with little regard to its practical applications. Others are concerned mainly with applied research, using the knowledge gained from basic research to solve practical problems. Meteorologists, for example, apply their scientific knowledge of the atmosphere to forecast weather for specific localities. Earth scientists also teach in colleges and universities and administer scientific programs and operations.

The earth sciences are relatively small fields of scientific employment. In mid-1962, the number

of earth scientists at all levels of professional education totaled about 27,000—only about 7 percent of all natural scientists. The largest earth science occupation is geology, with 15,000 scientists employed in mid-1962. Smaller numbers are employed in geophysics (6,000), meteorology (3,000), and oceanography (2,500).

Many earth scientists specialize in one particular branch of their broad occupational field. Geophysicists, for example, may be specialists in hydrology or seismology; oceanographers, in physical or biological oceanography. This chapter discusses the specialties and the employment outlook for the four major earth science occupations—geologist, geophysicist, meteorologist, and oceanographer.

Geologists

(D.O.T. 0-35.63)

Nature of Work

Geology is the science of the earth. Geologists study the earth's history, structure, and composition as revealed by rock formations and by animal and vegetable fossils. They search for fuels, minerals, and water supplies and study the physical and chemical processes which bring about changes in the earth's structure and surface.

Most geologists spend a large amount of their time in field exploration. They study rock cores and cuttings from deep holes drilled into the earth; collect and examine rocks, minerals, and fossils found at or near the surface of the earth; record data; and prepare geological maps. Geologists also spend considerable time in laboratories, where they study geological specimens, analyze geological materials under controlled temperature and pressure, and do other research on geological processes. In offices, they assemble and analyze field and laboratory data, and prepare reports, articles, maps, and other illustrations. Geologists use a variety of 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 may also engage in and administer research projects.

Geologists usually specialize in one branch of the science. *Economic geologists* find and supervise the development of mineral and fuel resources. *Petroleum geologists*, who make up a large majority of all geologists, are economic geologists specializing 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 structures. *Stratigraphers* study the distribution and relative arrangement of sedimentary rock layers in the earth's crust; *sedimentologists* determine the processes and products involved in the formation

of sedimentary rocks; and *paleontologists* identify and classify fossils found within the sediments. *Petrologists* and *petrographers* study the arrangement of minerals within rocks, to classify the rocks and determine their origins. *Mineralogists* are concerned with the classification and the physical and chemical properties of minerals which compose rocks and mineral deposits. *Geomorphologists* analyze the form of the earth's surface and the processes—such as erosion and glaciation— which change it.

Increasing numbers of geologists specialize in new and rapidly growing fields that require a detailed knowledge of both geology and one or more other sciences. Among these specialists are *geochemists*, who are concerned with the chemical composition of and the changes in minerals and rocks, and *astrogeologists*, who apply geological knowledge to interpretation of data on surface conditions on the moon and the planets, as collected by various means.

Where Employed

In 1962, there were approximately 15,000 geologists in the United States. About 3 out of every 4 worked for private industry. The petroleum and natural gas industry employs most of these scientists, chiefly in Texas, Louisiana, California, Oklahoma, and Colorado; some, employed by American companies, are assigned to work in foreign countries for varying periods of time. Geologists are also employed by mining and construction companies, by railroads and other public utilities, and by manufacturing concerns, especially in the primary metals and stone and clay products industries. Others work for consulting firms or as independent consultants, providing services on a fee or contract basis to companies interested in exploration for and extraction of minerals and fuels.

A number are employed by the Federal Government, mostly the U.S. Geological Survey. Other Federal agencies employing geologists include the Army Corps of Engineers, the Soil Conservation Service, and the Bureau of Reclamation. State agencies also employ geologists, some of whom work on surveys conducted in cooperation with the U.S. Geological Survey. Most government positions are located in the United States, though some Federal jobs are outside the United States.

Some geologists are employed in colleges and universities. A few work for nonprofit research institutions and museums.

Training, Other Qualifications, and Advancement

Young people seeking professional careers in geology should obtain an advanced degree. The master's degree is required for beginning research and teaching positions and for most positions in exploration. For advancement in college teaching as well as for high-level research and administrative posts, the Ph. D. degree is required. The bachelor's degree is considered adequate training for only a few entry jobs, primarily closely supervised routine work in exploration or preparation of geological maps.

Many colleges, universities, and institutes of technology offer education in geology. In the typical undergraduate curriculum, students devote about a fourth of their time to geology courses, including physical geology, historical geology, mineralogy, and invertebrate paleontology. About a third of the work is in related natural sciences and in mathematics, and the remainder in subjects such as English composition, economics, and foreign languages. The academic work of the graduate student seeking an advanced degree in geology consists primarily of advanced courses in geology, with major emphasis on the student's field of interest.

The student planning a career in geology should have an aptitude not only for geology, but for physics, chemistry, and mathematics as well. He should be energetic, like outdoor activities, and have the physical stamina to participate in geological fieldwork, which sometimes necessitates camping out under somewhat primitive conditions.

Employment Outlook

Employment opportunities for geologists with the Ph. D. or the master's degree are expected to be favorable throughout the 1960's. For those with only the bachelor's degree, including those who rank high in their class, there will be keen competition for the few available entry positions. A number of new graduates with only the bachelor's degree may find it necessary to enter semi-professional positions, take training in teaching



Courtesy of U.S. Department of the Interior

Geologists may do much of their work out of doors

methods and related subjects to qualify as science teachers in secondary schools, or seek other work outside the field of geology. However, should the recent decline in the number of graduates receiving the bachelor's degree in geology continue, beginning geologists with this level of education would have improved employment opportunities.

Private industry is expected to increase its employment of geologists moderately during the next few years. Exploration for oil and most minerals has declined in recent years and these activities are unlikely to expand significantly during the 1960's. There will, however, be increasing opportunities for geologists to help in solving engineering problems; work on programs related to water supplies in many parts of the country; and do research on the development of new devices and processes for geological investigations.

In Federal agencies, demand for geologists is also expected to grow moderately, primarily owing to expansion in the programs of the U.S. Geological Survey. Employment of geologists in colleges and universities will probably rise slightly; the need will be primarily for those with Ph. D. degrees who are capable of doing high-level research. However, if the recent declining trend in the number of students majoring in geology should be reversed, an increased demand by educational institutions would result.

Replacement needs are expected to be the chief source of openings during the remainder of the

1960's. Several hundred new geologists will be needed each year to replace those who are promoted to managerial positions or who transfer to other fields of work, retire, or die.

The longrun employment outlook in the profession is more favorable. As the world's population expands and nations become increasingly industrialized, the demand for petroleum, minerals, and water supplies will increase, and there will be a rising demand for geologists to locate these resources. Geologists with advanced training will be needed to devise new techniques for exploring deeper within the earth's crust and to search underseas areas; to do more intensive research and analysis of geological data; and to work with petroleum engineers in developing more efficient methods of finding and recovering crude oil. It is likely that increasing space-age activities will require some geologists to study data concerning the surface conditions of planets.

Only a small number of women are professional geologists, primarily because fieldwork positions usually are considered unsuitable for them. Some well-qualified women with advanced degrees will be able to find positions as teachers in colleges and universities, or to obtain laboratory or office positions in industry and government.

Earnings and Working Conditions

Annual starting salaries for new geology graduates with bachelor's degrees were typically between \$5,500 and \$6,000 in private industry in 1962, according to the limited information available. New graduates with master's degrees usually started at between \$6,500 and \$7,000 a year. Starting salaries for those with doctor's degrees ranged from \$8,000 to \$11,000, depending upon individual qualifications.

In the Federal Government, new graduates with bachelor's degrees could begin at either \$5,365 or \$6,465 a year in early 1963, depending on their college records. Those with master's degrees could start at \$6,465 or \$6,675, and those with the Ph. D. degree at \$8,045 or \$9,475.

In general, earnings of geologists are usually somewhat higher in industry and in government than in educational institutions. However, teachers often supplement their salaries by research, consulting, or other work done during

vacation periods. Extra allowances are generally paid geologists for work outside the United States.

The work of geologists is often active and sometimes strenuous. Because much of their work is out of doors, 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 are often uncertain because their field activities are affected by weather and travel.

Where To Go for More Information

American Geological Institute,
2101 Constitution Ave. NW., Washington, D.C., 20418.

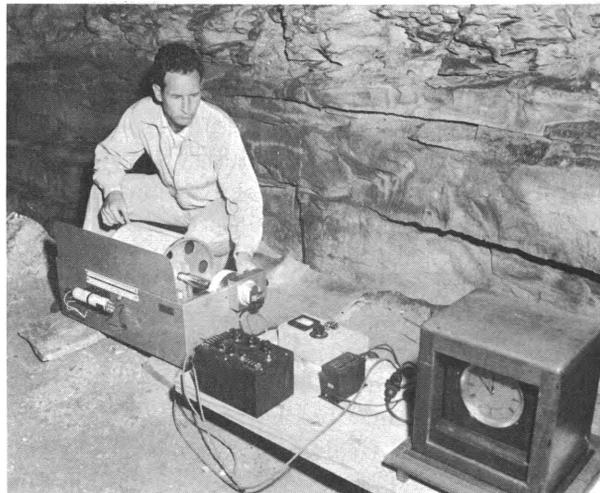
Geophysicists

(D.O.T. 0-35.65)

Nature of Work

Geophysics is an overall term covering a number of sciences concerned with the composition and physical aspects of the earth—its interior and atmosphere, as well as the land and bodies of water on its surface and underground. Geophysicists make use of the principles and techniques of physics, geology, mathematics, chemistry, and engineering in studying the earth's physical characteristics, including magnetism, electrical effects, gravity, radioactivity, seismology, and the earth's interior heat flow, and solar radiation. They use many instruments, including highly complex precision ones such as the seismograph, which measures and records the transmission time of vibrations through the earth; the magnetometer, which measures variations in the earth's magnetic field and the different ways this field is affected by particular kinds of rocks; and the gravimeter, which measures minute variations in gravitational attraction.

Exploration geophysicists, sometimes known as prospecting geophysicists, are the largest group of geophysical scientists. Most of these scientists search for oil and mineral deposits, though some are engaged in research, usually aimed at developing new or improved techniques and instruments for prospecting. *Hydrologists* study the occurrence, circulation, distribution, and chemical 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. Others specialize in studies of glaciers and sedimentation and in forecasting the flow of rivers. *Seismologists* study the structure of the earth's interior and the vibrations of the earth caused by earthquakes or manmade explosions. They may explore for oil



Courtesy of U.S. Coast and Geodetic Survey

Geophysicist uses seismology instruments in a cave to study earth vibrations

and minerals, provide information for use in designing bridges 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 the force of gravity. They also help track satellites orbiting in outer space. *Geomagneticians* are concerned with the variations in the earth's magnetic field, and with many aspects of space science. *Tectonophysicists* study the structure of mountains and ocean basins, the properties of the materials forming the earth's crust, and the physical forces that cause movements and changes in it.

Oceanographers and meteorologists, often classified as geophysical scientists, are discussed sepa-

rately, as is the closely related occupation of geologist.

Where Employed

The number of geophysicists in the United States (excluding oceanographers and meteorologists) was estimated to be approximately 6,000 in mid-1962. Private industry employs a majority of all geophysicists, chiefly in the petroleum industry. Some are employed by mining companies, exploration and consulting firms, and research institutions. A few are in business for themselves as consultants and provide services on a fee or contract basis to companies and individuals engaged in prospecting or other activities utilizing geophysical techniques.

Geophysicists in private industry are employed mainly in the southwestern and western sections of the United States, 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.

Geophysicists are also employed by the Federal Government—mainly by the Coast and Geodetic Survey, the U.S. Geological Survey, the Army Map Service, and the Naval Oceanographic Office. Colleges and universities, State governments, and nonprofit research institutions also employ 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 geophysics. However, a bachelor's degree in a related science or in engineering, and with courses in geophysics, physics, geology, mathematics, chemistry, and engineering is also adequate preparation for many beginning jobs, especially in geophysical exploration. For example, in the Federal Government the minimum educational requirement for beginning positions in geophysical exploration is a bachelor's degree with at least 30 semester hours in a combination of courses consisting of 12 hours in geology, 12 hours in physics, and the remaining 6 hours in geology, physics, or geophysics.

For geophysical specialties other than exploration, and for the more desirable positions in ex-

ploration work, graduate education in geophysics or in a related physical science is usually required. A doctor's degree with a major in geophysics or a related science, including advanced courses in geophysics, is generally required for teaching careers. The Ph. D. degree is also frequently required for positions involving fundamental research and for advancement in most types of geophysical work.

The bachelor's degree in geophysics may be obtained in only a very small number of schools. These undergraduate programs provide training chiefly in exploration geophysics, although the curriculums may have titles such as geophysical technology or geophysical engineering. Some students take undergraduate training at colleges offering degree programs in engineering geology or petroleum geology.

Master's and Ph. D. degrees in geophysics also were granted by only a few colleges and universities in 1962. An undergraduate major in geophysics is not usually required for admission to these schools; 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 general, the graduate student should attend the school in which he can take advanced courses and carry out research projects in the particular aspect of geophysical science in which he is interested.

Beginning geophysicists with 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's college work did not include courses in geophysics, 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 have an aptitude and interest in mathematics and the physical sciences. He should be energetic and in excellent health, since geophysicists often have to work outdoors under somewhat rugged conditions. A willingness to travel is also important, since geo-

physicists may be required to move from place to place in the course of their employment.

Employment Outlook

Employment opportunities for the few new graduates with degrees in geophysics are expected to be favorable throughout the 1960's. Opportunities will be best for those with the master's or doctor's degree. There should also be some opportunities in geophysical work for well-qualified graduates with degrees in other sciences who have some formal training in geophysics.

The demand for geophysicists is expected to grow moderately during the decade. Federal Government agencies will most likely need some additional men and women geophysicists for new or expanded geophysical programs. The petroleum and mining industries may also need a few additional geophysicists for exploration work. However, exploration for oil and mineral deposits, which has declined in the last few years, is not expected to rise significantly in the next few years. In colleges and universities, employment of teachers of the geophysical sciences will probably increase because of the anticipated rise in the number of students majoring in the geophysical sciences. Some additional geophysicists will also be needed 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 with degrees in the science is also expected to be small. In 1962, only 87 degrees in the geophysical sciences were granted—26 bachelor's, 44 master's, and 17 doctor's degrees—according to the U.S. Office of Education. As in past years, the number of graduates with degrees in geophysics will probably be insufficient to meet employers' needs, and well-trained persons with degrees in related sciences and in engineering will probably continue to be hired to fill 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 sites of fuels

and minerals which are more concealed. 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 with advanced training in hydrology, seismology, geodesy, and other geophysical specialties. In Federal Government agencies, additional geophysicists will probably be needed to study the problems of the Nation's water supplies; work on flood control; do research in radioactivity and cosmic and solar radiation; and explore the outer atmosphere and space, using such vehicles as sounding rockets and artificial satellites.

Opportunities for women have been and will continue to be limited, mainly because of the strenuous nature of much of the work. However, a small number of well-qualified women will be able to find positions in offices and laboratories or as teachers in colleges and universities.

Earnings and Working Conditions

In the Federal Government in early 1963, new graduates with bachelor's degrees could enter most types of geophysical work at either \$5,525 or \$6,650 a year, depending on their college records. Those who had completed all requirements for the master's degree could start at \$6,650 or \$7,125; those with the Ph. D. degree could start at \$8,575 or \$9,475. Exploration geophysicists had somewhat lower starting salaries. Geophysicists stationed outside the United States are paid an additional amount. The provisions for salary increases, vacations, sick leave, pensions, life and health insurance, and other benefits are the same for geophysicists as for other civil service employees. (See chapter on Occupations in Government.)

In private industry in 1962, new graduates with bachelor's degrees typically received starting salaries between \$5,500 and \$6,000 a year, according to limited information available. New graduates with master's degrees received between \$6,500 and \$7,000; those with doctor's degrees between \$8,000 and \$11,000, depending upon individual qualifications. In industry, as in Government, geophysical scientists working outside the United States usually receive extra bonuses and allowances.

In general, starting salaries in educational institutions are lower than in private industry or

in the Federal Government. However, university teachers may supplement their income by doing consulting, writing, or research work.

The work of geophysicists is often active and sometimes strenuous. Because much of their work is done out of doors, they may be exposed to all kinds of weather conditions. Geophysicists frequently have to be away from home for long periods of time. Their working hours are usually

irregular and are frequently determined by travel, weather conditions, and the requirements of field activities.

Where To Go for More Information.

American Geophysical Union,
1515 Massachusetts Ave. NW., Washington, D.C.,
20005.

Society of Exploration Geophysicists,
Box 1536, Tulsa, Okla., 74101.

Meteorologists

(D.O.T. 0-35.68)

Nature of Work

Meteorology is the science of the atmosphere. Its aim is understanding of the atmosphere—not only its physical characteristics and movements, but also its effects upon the earth and upon people. Weather forecasting is the best known application of the science and the type of work in which most meteorologists are engaged. However, they may do many other types of meteorological work.

Research is the major activity of a growing number of meteorologists. These workers investigate such subjects as atmospheric electricity, cloud and precipitation mechanisms, hurricane dynamics, and the best and quickest means of using the vast amount of weather data collected from orbiting weather satellites. They may also conduct research on radioactive fallout, severe weather phenomena, weather modification, weather conditions affecting the behavior of forest fires, and other problems. In both weather forecasting and research, meteorologists make use of electronic computing machines to process large amounts of data.

Some meteorologists teach in universities or colleges, where they may also engage in research. In colleges without separate departments of meteorology, they may teach subjects such as geography, mathematics, physics, and geology, as well as meteorology.

Meteorologists usually specialize in one branch of the science. Weather forecasters, technically known as *synoptic meteorologists*, are the largest group of specialists. They interpret current weather information (air pressure, temperature, humidity, wind velocity) reported by observers



Courtesy of U.S. Weather Bureau

Meteorologist receives weather chart transmitted by a facsimile network

in many parts of the world and make short- and long-range forecasts for given regions. *Climatologists* analyze past records on wind, rainfall, sunshine, temperature, and other weather data for a given area to determine the overall, general pattern of weather which makes up the area's climate. *Dynamic meteorologists* investigate the physical laws governing air currents. *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. Specialists in applied meteorology,

sometimes called *industrial meteorologists*, are concerned with the relationship between weather and specific human activities, biological processes, and agricultural and industrial operations. For example, they make special forecasts for individual companies, attempt to induce rain or snow in a given area, and work on such problems as smoke control and air pollution.

Where Employed

More than 3,000 civilian meteorologists were employed in the United States in mid-1962. The U.S. Weather Bureau, by far the largest employer of meteorologists, employed approximately 1,900 of these scientists at 300 stations maintained by the Bureau in all parts of the United States, the polar regions, Puerto Rico, Wake Island, and other sites in the Pacific area. A growing number of meteorologists work for other Government agencies, such as the Forest Service of the Department of Agriculture, the Department of the Interior, the Federal Aviation Agency, and the National Aeronautics and Space Administration. The Armed Forces also employ civilian meteorologists, chiefly in research work.

Aside from the Federal Government, the largest fields of employment for meteorologists are commercial airlines, educational institutions, and weather consulting services. In mid-1962, the airlines employed about 300 meteorologists to forecast the weather along the companies' flight routes and to brief pilots on weather conditions. Colleges and universities employed another 300, principally in teaching and research. Private weather consulting firms, which provide special weather information for a fee, employed more than 150. In addition, some were working for companies that design and manufacture meteorological instruments, as well as for a number of large firms in the aircraft, insurance, utilities, and other industries. A few worked for nonprofit organizations, presented radio and television weather programs, or worked as editors and librarians.

In addition to the meteorologists in civilian employment, more than 3,000 members of the Armed Forces were engaged in meteorological work in 1962. Of these, approximately 2,800 were on active duty in the Air Force. Meteorologists in the Armed Forces usually make weather forecasts that are needed to plan military operations.

Only a small number of women are meteorologists. Of these, some work as forecasters for the Weather Bureau; a few are on active duty in the Armed Forces; small numbers are employed by colleges and universities, primarily in research positions; and a very few work for commercial airlines.

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 courses in meteorology are included. For example, the Weather Bureau's minimum requirement for beginning positions is a bachelor's degree with at least 20 semester hours of study in meteorology and with training in physics and mathematics.

For research and teaching positions and for many top-level positions in other activities, an advanced degree in meteorology is highly desirable, although persons with graduate degrees in other sciences may also qualify if they have taken advanced courses in meteorology, physics, mathematics, and chemistry. The Ph. D. degree is usually essential for high-level teaching and research positions.

Degrees in meteorology were awarded by about 25 colleges and universities in 1962. However, many other institutions offered courses in meteorology.

Meteorological training is also given by the Armed Forces. For example, each year the U.S. Air Force selects over 250 new college graduates who have received Air Force commissions and sends them to civilian universities for a special 1-year program in meteorology. Graduates of this program are then assigned to meteorological work. The Armed Forces also send a number of military meteorologists to universities or to military training centers for advanced training leading to the master's or doctor's degree. Ex-servicemen with military training and experience as meteorologists are given preference for civilian positions with the Armed Forces; they can also qualify for positions with other employers of weather personnel.

The Weather Bureau has an in-service training program in which scholarships are granted to

some of its meteorologists to enable them to take advanced and specialized training. In addition, college students preparing for careers in meteorology may obtain summer jobs with the Weather Bureau, where they may get permanent positions after they receive their bachelor's degrees.

Promotions in the Weather Bureau, as in other Federal Government agencies, are given according to Civil Service regulations. (See section on Occupations in Government.) With the airlines, the chances for advancement are somewhat limited. However, after considerable work experience, some meteorologists in the largest airline companies may advance to the position of flight dispatcher, or to various supervisory or administrative positions. A few well-trained meteorologists with a background in science, engineering, and business administration may be able to establish their own weather consulting services.

Among the personal characteristics needed by meteorologists are mathematical aptitude and an interest in the physical sciences. For some jobs, the ability to draw quickly and neatly is important. Since most of the work is done in an office, the physical requirements are not heavy and can be met by any reasonably healthy person.

Employment Outlook

Employment opportunities for meteorologists are expected to be very good throughout the 1960's and, over the long run, further expansion of the profession is anticipated.

The age of supersonic aircraft, missiles, and spacecraft has broadened considerably the scope of meteorology and opened up new fields of meteorological activity. Opportunities will be particularly good for meteorologists who can perform research on the information obtained by missiles, satellites, and spacecraft, and on methods of processing, analyzing, interpreting, and disseminating the information quickly and accurately. Meteorologists will also be in strong demand for work in developing and improving weather instruments for collecting and processing weather data. In addition, there will be a continuing demand for meteorologists to work on improving short- and long-range forecasts which are indispensable for spacecraft flights and which are becoming increasingly valuable to government, industry, and individuals. Replacement of meteorologists who

retire or otherwise leave the profession will also provide some opportunities.

The Weather Bureau anticipates that it will seek both new graduates and experienced men and women throughout the 1960's to fill vacancies in existing programs such as weather forecasting, severe storm research, storm warnings, flood forecasting, and air pollution research. The Bureau estimates that each year during this decade, it will hire more than 150 meteorologists with bachelor's or advanced degrees to fill new positions and to replace workers who resign, retire, or die. The Bureau also expects continuing increases in its professional staff over the long run, primarily because of intensified research activities and expansion in civilian aviation which will require new airports and weather stations.

An increase is also expected in the number of meteorologists employed by the airlines. As the speed of aircraft and the number of flights increase, more meteorologists will be needed to assist in determining the routes and flight levels for the safest and smoothest flights. Employment opportunities for meteorologists with other private companies and research organizations and in weather consulting services are also expected to increase somewhat, as the value of weather information receives further recognition. The number of teaching positions for meteorologists in colleges and universities should also rise in the years ahead, primarily because of increases in total college enrollments. Opportunities for civilian meteorologists in the Armed Forces are not expected to increase significantly during the next decade. However, there will probably be a growing need for military meteorologists throughout the latter 1960's, mostly to replace those reaching retirement age.

Since meteorology is a relatively small profession, job openings will not be numerous in any year. On the other hand, the number of new graduates with degrees in meteorology probably will continue to be small. In 1962, only 179 bachelor's, 81 master's, and 13 doctor's degrees were granted. Furthermore, graduates with majors in other fields and with some training in meteorology have not recently entered the profession because of the opportunities in other scientific fields. Military meteorologists who leave the Armed Forces have usually left the profession al-

together. Unless there is an unexpected change in these conditions, new graduates should have favorable employment opportunities.

Earnings and Working Conditions

In early 1963, meteorologists with the bachelor's degree and no experience could start in the Federal Government service at \$5,525 or \$6,650 a year, depending on their college records. Meteorologists who had completed all requirements for the master's degree could start at \$6,650 or \$7,125; those with the Ph. D. degree could begin at \$8,575 or \$9,475. Workers stationed outside the United States are paid an additional amount. The provisions for salary increases, vacations, sick leave, pensions, life and health insurance, and other benefits are the same for meteorologists as for other civil service employees. (See section on Occupations in Government.)

In mid-1962, airline meteorologists were receiving a starting salary of approximately \$6,000 a year, according to the Air Transport Association.

Meteorologists generally receive the same benefits as other airline employees. (See chapter on Occupations in Civil Aviation.)

Jobs in weather stations, which are operated on a 24-hour, 7-day week basis, often involve night-work and rotating shifts. Most stations are at airports or at places in or near cities; some are in isolated and remote areas.

Where To Go for More Information

American Meteorological Society,
45 Beacon St., Boston, Mass., 02108.

The U.S. Weather Bureau, Washington, D.C., 20235, will provide information on employment opportunities with that agency and on its student-trainee program.

Information on the Air Force meteorological training programs may be obtained from the nearest USAF recruiting office or by writing to Commander, USAF Recruiting Service, Wright-Patterson AFB, Ohio, 45899.

Oceanographers

(D.O.T. 0-35.65)

Nature of Work

The ocean, which covers more than two-thirds of the earth's surface, supplies food and minerals, influences the climate, provides a medium of transportation, and offers means of recreation. Oceanographers are the scientists who study the ocean in all its aspects—its characteristics, movements, and plants and animals. The results of their studies not only extend basic scientific knowledge, but also contribute to the development of practical methods for use in such operations as charting and forecasting currents, ice conditions, and ocean waves; improving fisheries; and providing defense against enemy attack.

Oceanographers plan extensive tests and observational programs and conduct detailed surveys and experiments to obtain information about the ocean. They collect and study data on such subjects as the ocean's chemical and physical composition, including its tides, currents, waves, temperature, density, and acoustical properties; its bottom contours and composition; ice floes; and sea plants

and animals. They analyze the samples, specimens, and data collected, often using electronic computers. To present the results of their studies, they compile special charts, tabulations, reports, and manuals.

In developing and carrying out their tests and observational programs, oceanographers make use of the principles and techniques of physics, chemistry, geology, biology, meteorology, mathematics, and related sciences. They use a variety of special instruments and devices such as the magnetometer, which measures the earth's magnetic field; the echo sounder, which measures distances to the sea bottom by means of sound impulses; the heat flow probe, which penetrates the ocean bottom and measures flow of heat from the earth's interior; and special thermometers and bathythermographs which measure water temperature at and below the surface. Oceanographers use specially developed cameras with lights and flash attachments to photograph marine organisms and the ocean bottom. When their work requires new oceanographic in-



Courtesy of U.S. Coast and Geodetic Survey

Geological dredges are used to collect ocean specimens for examination

struments or analytical techniques, they usually devise and test them.

Oceanographers are usually specialists in one of the four main branches of the profession. *Biological oceanographers* (marine biologists) study the ocean's plant and animal life, which ranges from microscopic plankton to giant squid and whales. *Physical oceanographers* study the physical aspects of the ocean, such as its density, temperature, and ability to transmit light and sound, and the movements of the sea, such as waves, tides, and currents, and the relationship between the sea and the atmosphere. *Geological oceanographers* (marine geologists) study the ocean bottom—its topographic features, and the rocks and sediments found there. *Chemical oceanographers* investigate the chemical composition of the ocean waters and bottom, which include at least traces of more than half of the total number of known physical elements.

Nearly 3 out of every 4 oceanographers are engaged primarily in performing or administering research and development activities. A small but growing number of oceanographers teach in colleges and universities; a few are engaged in ad-

ministration of activities other than research, and in technical writing, consulting, and other activities.

Most oceanographers spend at least part of their time aboard oceanographic ships at sea; such voyages may last from 3 weeks to several months. A few oceanographers in survey positions spend nearly all their time aboard ship. On the other hand, a few oceanographers never go to sea, but analyze data collected by other scientists or pursue mathematical studies ashore.

Where Employed

Oceanography is one of the smallest of the science fields; the total number of oceanographers and closely related scientists in the United States was estimated to be approximately 2,500 in mid-1962. The largest number of oceanographers are employed by colleges and universities and university-operated oceanographic laboratories, where they are usually engaged primarily in research.

The Federal Government also employs a substantial number of oceanographers, mainly in the Bureau of Commercial Fisheries of the Department of the Interior, the Naval Oceanographic Office of the Department of the Navy, and the Coast and Geodetic Survey of the Department of Commerce. There are also a few positions in oceanography in other parts of the Department of the Navy, in the Weather Bureau, and other Government agencies.

A small but growing number of oceanographers are employed in private industry, mostly by consulting or other firms which design and develop instruments for oceanographic research. Some oceanographers work for nonprofit laboratories other than those operated by colleges and universities. A few work for fishery laboratories of State and local governments.

Training, Other Qualifications, and Advancement

The minimum educational requirement for beginning positions in oceanography is the bachelor's degree with a major in physics, chemistry, biology, or some other science, and preferably with some courses in oceanography. For professional positions in research and teaching, and for advancement to high-level positions in most types

of work, graduate training in oceanography or in a related field is usually required.

Undergraduate training in oceanography was offered by relatively few colleges and universities in 1962, and only one institution offered the bachelor's degree with a major in the subject. A prospective oceanographer is not unduly handicapped, however, if he is unable to obtain undergraduate training in oceanography, provided that while in college he obtains a broad knowledge and understanding of the related sciences. Such training, when coupled with a sincere interest in oceanography, is usually adequate preparation for many beginning positions in the field, or for entry into graduate school.

Important undergraduate courses for the prospective oceanographer include, in addition to oceanography, mathematics, physics, chemistry, geology, meteorology, biology, and zoology. In general, the student should specialize in the particular science field which is closest to his area of interest in oceanography. For example, those students interested in physical oceanography should major in physics or mathematics, whereas those interested in chemical oceanography should obtain a bachelor's degree in chemistry.

Training leading to advanced degrees in oceanography is offered by about a dozen colleges and universities, and about 35 institutions offer advanced courses in the subject or in related fields, such as marine biology or fisheries. The academic work of the graduate student in oceanography consists primarily of extensive training in oceanography combined with further training in the marine aspects of his selected area of marine specialization—usually chemistry, geology, biology, or physics. A few of the oceanography courses typically offered in graduate school concern underwater acoustics, waves, and tides, marine vertebrates and invertebrates, marine ecology, marine sediments, ocean circulation, and marine hydrodynamics. Some institutions also require the graduate student to spend part of his time aboard ship—doing oceanographic research, acquiring familiarity with the sea and the techniques used to obtain oceanographic information, and learning the basic elements of navigation and seamanship.

Beginning oceanographers with the bachelor's degree usually start as research or laboratory assistants, or in routine positions involving data

collection, analysis, or computation. Most new graduates are given on-the-job training in the application of oceanographic principles to the problems at hand. If a beginner has had no basic courses in oceanography, he is often given these courses as part of his on-the-job training.

Beginning oceanographers with advanced degrees can usually qualify for teaching and research positions. Experienced oceanographers, particularly those with the Ph.D. degree, may advance to administrative positions, in which they may supervise a research laboratory or lead specific oceanographic or survey research projects.

Among the qualities desirable in the prospective oceanographer are an aptitude and interest in mathematics and the sciences, a disciplined and creative imagination, and a highly inquisitive mind. Since the oceanographer's work entails dealing with scientists in many other fields, he must be able to work effectively with people and to express himself well. A liking for the sea and for life aboard ship is also important.

Employment Outlook

Employment opportunities for oceanographers are expected to be excellent throughout the 1960's, particularly for those with advanced degrees. Well-trained persons with bachelor's degrees in related sciences and with some formal training in oceanography should also have favorable opportunities, primarily as research assistants and in routine analytical positions.

The outlook is for rapid growth of this small profession, both during the 1960 decade and over the long run. In recent years, the growing realization of the importance of the oceans to the Nation's welfare and security has heightened interest in oceanography and has opened up new fields for specialists in the science. Oceanographers will be needed for research in such areas as underwater acoustics, surface and subsurface ocean currents, and ocean floor topography, all of which are of great importance in improving the Nation's defense against submarines and surface vessels and in planning and conducting amphibious military operations. There will also be a demand for oceanographers to supply improved navigational charts, sailing directions, and weather and iceberg forecasts; to study the air-sea interaction in order to improve weather forecasts; to solve problems

related to the mining of the sea and sea bottom, to predict or control damage caused by tidal and storm waves, and to prevent beach erosion. Additional oceanographers will be needed to make studies of marine plants and animals for use in improving methods for deriving food supplies from the oceans, in developing and managing fisheries, and in classifying marine animals and plants.

The demand for oceanographers qualified to teach in colleges and universities is also expected to expand. Increased student interest in oceanography will likely result in a rise in the number of courses in oceanography, and this will create openings for more teachers of the science. Replacement of oceanographers who retire or otherwise leave the profession will also provide some opportunities in Government and private industry, as well as in colleges and universities.

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 with degrees in this science is extremely small and is expected to remain so. Thus, oceanography graduates should continue to have excellent opportunities.

Opportunities for women have been and probably will continue to be limited because much of oceanographic work is carried on at sea, where living quarters for women are usually not available. However, some well-qualified women may be able to find employment in shore laboratories and in teaching.

Earnings and Working Conditions

In the Federal Government service in early 1963, most oceanographers with the bachelor's de-

gree and no experience could begin at \$5,525 or \$6,650 a year, depending on their college records. Beginning oceanographers who had completed all requirements for the master's degree could start at \$6,650 or \$7,125; those with the Ph. D. degree could begin at \$8,575 or \$9,475. Oceanographers in biological and geological specialties had somewhat lower starting salaries. The provisions for salary increases, vacations, sick leave, pensions, life and health insurance, and other benefits are the same as for other Civil Service employees. (See chapter on Occupations in Government.)

Beginning oceanographers in educational institutions have roughly the same salary as other beginning faculty members. (See College and University Teachers. Consult index for page number.) In addition to their regular salaries, many experienced oceanographers in educational institutions obtain income from consulting, lecturing, and writing books and articles.

Oceanographers engaged in research requiring seagoing voyages are frequently away from home for weeks or months at a time, sometimes under somewhat cramped living and working conditions. Young people who like the sea, however, may find this aspect of oceanographic work very satisfying.

Where To Go for More Information

American Society of Limnology and Oceanography,
Sapelo Island Research Foundation,
Sapelo Island, Ga., 31327.

Board of U.S. Civil Service Examiners for Scientific
and Technical Personnel of the Potomac River
Naval Command, Washington, D.C., 20415.

Interagency Committee on Oceanography,
Room 1714, Bldg. T-3, 17th and Constitution Ave.
NW., Washington, D.C., 20360.

BIOLOGICAL SCIENCES

The biological sciences are concerned with the world of living things—men and microbes, wild and domestic animals, plants and insects, birds and fish. Some scientists in this field conduct research to expand our knowledge about living organisms; others teach in colleges and universities. Still others apply biological knowledge to the solution of practical problems, such as the development of new drugs and vaccines or new strains of plants. Among professional workers in applied fields are foresters, soil scientists, and soil conservationists, whose work is discussed elsewhere in this *Handbook*. (See index for page numbers.)

Nature of Work

Biological scientists, who may also be called life scientists, study the structure of living organisms, their life processes and evolutionary development, and the relation between these organisms and their environment. The number and variety of plants and animals are so vast and the life processes so varied and complex that biologists must, of necessity, become specialists. Some biologists learn as much as possible about a particular kind of animal or plant. Others, interested in how an animal or 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 mechanism of heredity, or the ways environmental factors, such as major changes in climate or radioactivity, affect life processes. In general, biological scientists specialize in one of the three broad areas of the life sciences—biological, medical, or agricultural science.

A substantial number of biological scientists are engaged in research and development. Many conduct basic research, aimed at adding to our knowledge of living organisms regardless of its immediate practical use. Nevertheless, the development of insecticides, disease-resistant crops, and antibiotics have all stemmed from basic research in the biological sciences.



Courtesy of Bureau of Reclamation

Biological scientists study effects of a herbicide on water weeds

Biological research 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, as is an entomologist working in a laboratory testing various chemical insecticides for effectiveness and for possible hazards to human and animal life.

Regardless of the type of research in which they are engaged, biologists must be familiar with fundamental biological research techniques and with the use of microscopes and other laboratory equipment. In the experimental research fields, which include microbiology, physiology, genetics, biochemistry, biophysics, and pharmacology, advanced techniques and tools drawn from chemistry or physics are frequently used. Also, because of the enormous number of variable factors involved in biological research, a knowledge of mathematical and statistical procedures, as well as of the operation of electronic computers, is often needed.

Teaching in colleges and universities is the major function of a sizable number of biological sci-

entists. Many college teachers of biological sciences combine independent research with their regular teaching duties, and in some large institutions spend the major portion of their time on research.

Some biological 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 act as liaison between the Federal Government and the agricultural experiment stations at State universities, and aid in the planning, development, and evaluation of research programs at these stations.

Relatively small numbers of biologists 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.

Biological scientists may be classified into three broad groups characterized by the type of organism with which they work: Botanists, who study plants; zoologists, who are concerned with animals; and microbiologists, who work with microorganisms. Some biological scientists whose work cuts across more than one of these major groupings, as is frequently the case with college teachers, may simply call themselves biologists.

Biological scientists may also be classified according to their specialities—some of which are wholly within one of the three major groupings, and some of which cut across them. For example, some biological scientists are classified according to the specific type of organism studied, as in the case of mycologists, who are botanists concerned with the study of fungi; others are classified according to the sort of approach used in studying organisms, as in the case of geneticists, who may be botanists, zoologists, or microbiologists studying the mechanisms of the heredity of a particular plant, animal, or micro-organism. A description of the work of some biological scientists follows.

Botanists (D.O.T. 0-35.23) study plant life. Some, known as plant taxonomists, specialize in the identification and classification of plants. Others are plant morphologists, primarily concerned with the structure of plants and plant cells; plant physiologists, whose primary interest

is in the life processes of plants; or specialists in still other phases of plant life.

Microbiologists (D.O.T. 0-35.33) investigate bacteria, viruses, molds, and other organisms of microscopic or submicroscopic size. They work with test tubes, cultures, microscopes, and a variety of other specialized laboratory equipment. The terms bacteriology and microbiology are sometimes used interchangeably, but microbiology, the broader term, is preferable when referring to the study of all microscopic organisms. Some microbiologists study medical problems, such as the relationship between bacteria and infectious disease. Others specialize in soil bacteriology (the study of bacteria, molds, algae, protozoa, and other micro-organisms in soils, and the relation of such organisms to soil fertility), virology (the study of viruses which may cause diseases in animals or plants), immunology (study of mechanisms by which the body fights off infection), or serology (the study of animal and plant fluids, including blood serums). Still others specialize in the study of the fermentations involved in the manufacture of beer, wine, flax, tobacco, and leather, or in the search for new or better antibiotics. Many specialize in the production and testing of biological products or in the testing of food products and water supplies.

Zoologists (D.O.T. 0-35.28) 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 usually use titles which indicate the kind of animal studied; thus, ornithologists study birds; herpetologists study reptiles and amphibians; ichthyologists study fishes; and mammalogists, mammals.

Agronomists (D.O.T. 0-35.01) are concerned with the growing, breeding, and improving of field crops, such as corn, wheat, tobacco, cotton, and sugar. They develop new, hardier varieties of crops and search for 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 (D.O.T. 0-35.36) study the form and structure of organisms and the structure and organization of specialized organs. They may

study 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; others compare animal and plant species.

Biochemists (D.O.T. 0-07.02) use chemical methods to study the composition of biological materials and the molecular mechanism of biological processes. They may conduct research on the chemical reactions involved in the functioning of living tissues and organs, or the relationships of nutrients contained in food to plant and animal nutrition, digestion, energy, metabolism, growth, health, and disease. (Biochemistry is often considered a branch of chemistry and is also discussed in the statement on Chemists. See index for page number.)

Biophysicists (D.O.T. 0-35.49), who are trained in both physics and biology, are concerned with the physical properties and relationships of living cells and organisms, and with the response of living organisms to physical forces—including heat, light, radiation, sound, and electricity. They may use the electron microscope to make tissues visible down to their smallest units, or they may use nuclear reactors to study the effect of high energy radiation on cells and tissues.

Embryologists study the development of an organism from the fertilization of the egg until it becomes a complete organism. They study the physiological, biochemical, and genetic mechanisms which control and direct the processes of development and how this control is accomplished.

Entomologists (D.O.T. 0-35.30) study insects and their effect on people, animals and plants. Some entomologists specialize in identifying and classifying the enormous number of different kinds of insects. Many entomologists do research on methods of controlling harmful insects which carry disease and spoil food supplies. Others study ways to utilize beneficial insects such as honey bees.

Geneticists (D.O.T. 0-35.35) are concerned with the nature and transmission 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

fundamental laws of heredity and the mechanisms which produce heritable traits in plants, animals, or humans.

Horticulturists (D.O.T. 0-35.05) are concerned with orchard and garden plants such as fruits, nuts, vegetables, flowers and ornamental plants, and nursery stocks. They develop new or improved plant varieties and try to find 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) (D.O.T. 0-35.13, .14, and .15) carry out investigations and experiments on the breeding, feeding, management, and diseases of farm livestock and other domestic animals to improve the health and yield of these animals.

Nutritionists study the processes through which human beings and animals utilize food; the kinds and quantities of food elements, such as the minerals, vitamins, fats, sugars, and proteins essential to build and repair body tissues and maintain health; and how these food elements are transformed into body substances. Nutritionists also analyze foods to determine their composition in terms of essential ingredients or nutrients.

Pathologists study the causes and processes of disease, degeneration, and abnormal functioning in human or animal organisms. They may specialize in the study of the effects of diseases, parasites and insect pests on organs and tissues; in histology, which is the microscopic study of animal and plant tissues; or in the structure or anatomy of diseased organs. The term "pathologist" is normally reserved for students of 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 later under the latter heading.

Pharmacologists (D.O.T. 0-35.34) are concerned primarily with the effect of drugs on life processes and with the discovery and development of new or improved chemical compounds which will have certain desired effects on organisms. They conduct tests on animals to determine the physiological effects of drugs, gases, dusts, poisons, and chemicals on tissues and organs, and

correlate their findings with clinical medical data on the effects of such substances on human beings.

Physiologists (D.O.T. 0-35.13) study the functioning of cells, tissues, and organisms and the effects of environmental factors on life processes. They may specialize in the study of the heart, circulatory system, glands, nerves, or cellular activities, or of the digestive, excretory, reproductive, or other systems. The knowledge gained in such studies provides the basis for the work of many other specialists, such as pathologists, pharmacologists, or nutritionists.



Courtesy of Argonne National Laboratory

Physiologist uses rat in research on cell behavior

Phytopathologists (D.O.T. 0-35.26), also called plant pathologists, specialize in the causes and control of plant diseases produced by parasitic organisms, viruses, chemicals, and other agents. Some specialize in the pathology of a specific plant or group of plants, such as forest trees, vegetable crops, ornamental plants, and field crops. Others work only with certain organisms or groups of organisms affecting plants, such as fungi, viruses, or bacteria.

Where Employed

About 100,000 persons were employed in mid-1962 in the biological sciences and in the closely related fields of medical and agricultural sciences. The largest number of these—about half of the total—are employed by colleges and universities. Although higher institutions employ scientists in almost all the biological specialties, they employ particularly large numbers of biochemists, physiologists, microbiologists, zoologists, and botanists. State agricultural colleges and universities and agricultural experiment stations operated by universities in cooperation with Federal and State Governments employ sizable numbers of agronomists, horticulturists, animal husbandry specialists, entomologists, and other agriculture-related specialists.

The Federal Government employed about 25,000 biological scientists in mid-1962. The Department of Agriculture, the principal Government employer of these scientists, employs primarily entomologists, agronomists, plant pathologists, plant physiologists, and animal husbandry specialists. The Interior Department employs nearly all the fish and wildlife biologists in the Federal Government. The Defense Department—principally the Army—and the National Institutes of Health employ many bacteriologists, physiologists, and pharmacologists, as well as smaller numbers of specialists in other branches of biology. State and local governments also employ sizable numbers of biologists—mostly fish and wildlife specialists, microbiologists, and entomologists—for work in conservation, detection and control of disease, and plant breeding.

Some biological scientists—primarily microbiologists, pharmacologists, and entomologists—work for private industry. Among the major industrial employers are firms manufacturing pharmaceuticals and chemicals, seed processors, dairy companies, and food manufacturers. A small number of biological scientists work for nonprofit organizations—mainly hospitals, clinics, and privately financed research organizations or foundations. A few are self-employed.

An estimated 10 percent of biological scientists are women; the largest numbers specialize in microbiology, biochemistry, botany, zoology, and physiology.

Training, Other Qualifications, and Advancement

Young people seeking professional careers in the biological 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 biological sciences is adequate preparation for many beginning jobs, but promotional opportunities for those without graduate training may be limited to intermediate level positions.

The Ph. D. degree is generally required for higher level college teaching positions and for independent research in experimental biology. It is also necessary for an increasing number of other positions involving the administration of research programs.

Biologists with master's degrees can qualify for most entry positions in applied research and for some types of positions in college teaching and basic research.

New graduates with bachelor's degrees can qualify for positions involving inspection and testing, production and operation work, technical sales and service, and administrative duties in connection with the enforcement of government regulations. They may also obtain positions as senior technicians, particularly in the area of medical biology. Those who graduate near the top of their class may have opportunities to do research, although mostly of a routine nature or under close supervision. Some graduates with bachelor's degrees take courses in education and choose a career as a high school teacher of biology rather than one as a biological scientist. (See statement on Secondary School Teachers.)

Training leading to a bachelor's degree with a major in biology or in one of the biological or agricultural specialties is offered by most colleges and universities. Courses differ greatly from one college to another and it is important that a student find out which college program best fits his interests and needs. In general, liberal arts colleges and universities emphasize training in the basic biological sciences and in the medical aspects of biological 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 biological scientists should obtain the broadest undergraduate training possible in all branches of biology and in related sciences, particularly organic and inorganic chemistry, physics, and mathematics. Courses in statistics and biometrics are becoming increasingly essential. Important also are training and practice in laboratory techniques, in the use of laboratory equipment, and in fieldwork.

Advanced degrees in the biological sciences are also conferred by a large number of colleges and universities. Requirements for advanced degrees usually include fieldwork and laboratory research, as well as classroom studies, library research, and preparation of a thesis.

Qualities needed by young persons planning a career in the biological sciences include considerable interest in and curiosity about living things; an aptitude for biology, chemistry, and mathematics; keen powers of observation; logical thought processes; imagination; and patience. The biological scientists must also be able to communicate his findings simply and clearly, both in writing and speaking.

Employment Outlook

Employment opportunities for biological scientists with graduate degrees are expected to be very good throughout the rest of the 1960's, and continued growth in the profession is anticipated over the long run. There will be particular need for biological scientists with doctorates in biophysics, biochemistry, microbiology, physiology, pathology, and pharmacology to do research on problems important to medicine, and for scientists with advanced degrees in microbiology, animal and plant science, and entomology for research positions in agriculture. Employment opportunities are also likely to be favorable for persons with master's degrees and for those with bachelor's degrees who graduate near the top of their class, particularly in the fields of entomology, fish and wild life biology, and microbiology. There will also be many opportunities for new graduates with the bachelor's degree to work as research assistants or in technician jobs while continuing their graduate education.

One of the major factors which will tend to increase employment of biological scientists is the anticipated growth in research and development

activities. Research in the biological and agricultural sciences, which has increased greatly in recent years, is likely to continue to grow because of expanding programs conducted or sponsored by the National Institutes of Health, Department of Agriculture, National Science Foundation, and Department of Defense. Moreover, in the years ahead, especially rapid growth is anticipated in such relatively new areas as space biology (study of problems concerned with physical, chemical, and biological stresses of space flight and survival of men in space and on other planets) and radiation biology (research on the effects of high energy radiation on the human body). Medical research programs sponsored by voluntary health agencies, including those promoting study of heart disease, cancer, and tuberculosis, will also probably increase.

Industry is expected to increase its spending for research and development. Furthermore, the more stringent health standards established by Congress and the Federal regulatory agencies are also expected to result in a need for additional biological scientists to perform industrial research and testing before new drugs, chemicals, and processing methods may be used in medicine and agriculture.

Another factor which will tend to increase employment of biological scientists will be the substantially larger college and university enrollments expected during the remainder of the 1960's. The resulting rise in demand for teachers will be to a large extent for Ph. D.'s, but there will also be many openings for qualified people holding master's degrees.

Earnings and Working Conditions

In the Federal Government, in early 1963, biological scientists with the bachelor's degree could begin at \$4,565 or \$5,540 a year, depending on their college record. Beginning biological scientists with the bachelor's degree and some graduate

study could start at \$5,540, \$6,675, or \$8,045; those with the Ph. D. degree could begin at \$8,045 or \$9,475. Pharmacologists had somewhat higher starting salaries than other biological scientists.

Biological scientists with the Ph. D. degree employed as college and university teachers typically received starting salaries between \$6,000 and \$8,000 a year in 1962, according to the limited information available. (For further information, see statement on College and University Teachers.) Biologists in educational institutions sometimes supplement their regular salaries with income from consulting work and special research projects.

In general, biological scientists in private industry tend to have higher salaries than those in either colleges and universities or Government employment. For example, the median annual salary of biological scientists was about 25 percent greater in private industry than in either educational institutions or Federal Government employment, according to the National Science Foundation's 1962 Register.

Biologists can usually look forward to an increase in salary as they gain experience. According to the 1962 Register, the average (median) salary of biologists with 20 years or more of experience was \$12,000 a year, roughly double the average yearly salary of biologists with only 1 year of experience.

Where To Go for More Information

American Institute of Biological Sciences,
2000 P St. NW., Washington, D.C., 20036.

Federation of American Societies for Experimental
Biology,

9650 Wisconsin Ave. NW., Washington, D.C., 20014.

Office of Personnel, U.S. Department of Agriculture,
Washington, D.C., 20250.

Employment Officer, U.S. Department of Health,
Education, and Welfare,

National Institutes of Health, Bethesda, Md., 20014.

MATHEMATICS AND RELATED FIELDS

Mathematics is both a profession and a tool essential for many kinds of work. Although mathematics has always been of fundamental importance in science and engineering, it is only since electronic computers have become widely available that its potentialities as a field of employment have been as fully realized as they are today. Electronic computing equipment has opened up broad new horizons for the application of mathematics—not only in the natural sciences and engineering, but also in connection with medicine, social science research, and the solution of management and administration problems. As a result, employment opportunities for mathematically trained persons have expanded remarkably in the past 15 years.

This chapter includes descriptions of the occupation of mathematician and two closely related occupations—statistician and actuary. For entrance into any of these fields, college training in mathematics is required. For many types of work, graduate education is necessary.

In addition to the professions covered in this chapter, workers in many others use mathematics extensively in performing their jobs. These include engineers, chemists, physicists, astronomers, geophysicists, and oceanographers, whose work is discussed elsewhere in the *Handbook*. Secondary school teachers of mathematics are not covered in this chapter but are included in the statement on Secondary School Teachers.

Mathematicians

(D.O.T. 0-35.76)

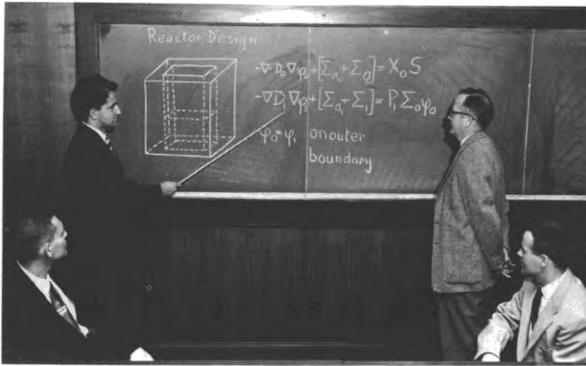
Nature of Work

Mathematics is one of the oldest and most basic fields of science. It is also one of the most dynamic and rapidly growing professions. Mathematicians today are engaged in a wide range of activities, including research on the behavior of the atom, calculating orbits of earth satellites, and translating business and scientific problems into mathematical terms for solutions by electronic computers.

Mathematical work may be divided into two broad classes: pure or theoretical mathematics; and applied mathematics, which includes mathematical computation. Theoretical mathematicians are concerned with the development of mathematical principles and the discovery of 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-Euclid-

ean 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 techniques and approaches to solve practical problems in the physical, biological, and social sciences. They analyze the various parts of a problem and describe the existing relationships in mathematical terms. Applied mathematicians work on problems ranging from 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, Isaac Newton developed differential calculus to describe and analyze the velocity and acceleration of moving objects—something which could not be done satisfactorily by earlier systems of mathematics.



Courtesy of National Bureau of Standards

Mathematicians work differential equations for reactor research

An important part of the work in applied mathematics involves using mathematical knowledge and modern computing equipment (ranging from desk calculators to complex electronic computers) to obtain numerical answers to specific problems. Some work in this area, such as developing advanced techniques for solving complex engineering problems, requires a very high level of mathematical knowledge and skill. However, much of this work, such as that of programmers for digital computers, does not require the advanced training and inventiveness of the mathematician. (See index for page number of statement on Programmers. For other occupations related to the mathematics profession, see statements on Statisticians and Actuaries in this chapter.)

The largest number of mathematicians are engaged in research to increase the knowledge of basic mathematics or to solve practical problems. Many teach in colleges and universities, where they often combine teaching and research. Others are engaged in the management and administration of scientific activities, and a few do consulting work.

Where Employed

Approximately 38,000 mathematicians were employed in the United States in mid-1962; about 10 percent were women. Nearly one half of all mathematicians are employed by private industry, primarily in the aircraft, missiles, spacecraft, and the electrical equipment industries. These, together with the machinery, fabricated metal products, and chemical industries, accounted for more than

three-fourths of the mathematicians employed in private industry in 1962.

Colleges and universities employ about two-fifths of all mathematicians; many of these work full time on research projects in the university laboratories. A substantial number are employed by Government agencies, chiefly the Department of Defense, the National Aeronautics and Space Administration, and the Bureau of Standards of the Department of Commerce. A few work for nonprofit organizations.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in mathematics is the minimum educational requirement for entrance into this field. Graduate training is required for many mathematical positions, particularly in research and teaching, and for advancement in many areas of mathematical work.

Advanced degrees are required for an ever-increasing number of jobs in industry and Government—in research and many other areas of applied mathematics. The Ph. D. degree is necessary for most high-level college and university teaching positions and for the more advanced research work, such as formulating mathematical theories to describe an engineering or scientific situation.

The bachelor's degree is adequate preparation for many private industry and Federal Government positions, particularly those connected with computer work. Some new graduates with the bachelor's degree assist senior mathematicians by working out computations and solving minor mathematical problems in applied research. Others work as graduate teaching or research assistants in colleges and universities while working toward advanced degrees.

For teaching and other work in applied mathematics, training in the field to which the mathematics will be applied is important. For many applied mathematicians, the fields of application are physics and engineering; other fields include business and industrial management, economics, statistics, chemistry, and biology. Some college graduates with majors in these fields and a good background in mathematics can qualify as applied mathematicians.

The recent development of high-speed electronic computers has brought a growing need for mathematicians who are qualified to work with these

machines. Training in numerical analysis and programming is especially desirable for this work. A small but growing number of colleges and universities are offering such training.

Some personal qualifications needed by mathematicians are: A keen logical mind, imagination, intellectual curiosity, and the desire and ability to analyze and solve new and difficult problems. Mathematicians must also be able to express mathematical ideas clearly and concisely for scientists, engineers, and others who use mathematics but are not mathematicians.

Employment Outlook

The outlook is for continued rapid growth in employment of mathematicians throughout the 1960's and over the long run. As in the early 1960's, there will be a particular demand for mathematicians with Ph. D. degrees—for research, teaching, and many applied mathematics positions. Women mathematicians who are qualified for research and teaching should have good employment opportunities.

A major factor which should continue to make mathematics one of the most rapidly growing scientific fields is the growth in research and development, in which two-fifths of all mathematicians are engaged. Since 1953-54, total expenditures for research and development have nearly tripled, to more than \$15 billion in 1961-62, and they are expected to continue to rise rapidly during the 1960's. Much of the expected increase will take place in industries which employ large numbers of mathematicians, particularly the electrical equipment and aircraft, missiles, and spacecraft industries.

The demand for mathematicians in research and development is closely associated with the use of high-speed electronic computers. These computers have made it possible to solve a wide variety of complex problems in the physical, biological, and social sciences, and also have opened broad new fields for mathematics in business management. Using these computers, mathematicians can provide information to business managers and officials to help them solve problems in such areas as production programming, operations research, product distribution, sales promotion, advertising, and inventory control.

The demand generated by these computers is not only for mathematicians but also for people who can apply mathematics to specific problems. Part of this demand will be satisfied by including more advanced mathematical training in the education of engineers, physicists, biologists, and specialists in other fields. However, there will be a growing need for applied mathematicians who have a high degree of mathematical competence and a broad knowledge of the field of application. The demand for people to do mathematical computation work will also expand.

Employment of mathematicians as college and university teachers should also rise substantially during the late 1960's when enrollments are expected to grow rapidly. Not only will the number of students majoring in mathematics increase, but the number of mathematics courses taken by those majoring in other fields will also rise. The greatest demand in college teaching will be for mathematicians with Ph. D. degrees. Colleges and universities will continue to provide most of the employment opportunities for specialists in theoretical mathematics.

Along with the anticipated rise in demand for mathematicians, a significant increase is expected in the number of graduates with degrees in mathematics, particularly at the bachelor's level. If graduates in this field continue to increase as rapidly as they have in recent years, the number seeking employment in the profession will rise sharply during the late 1960's; by 1970, it may be nearly three times the number at the beginning of the 1960 decade. Thus, new graduates with only the bachelor's degree may face increasing competition for entry positions in mathematics in the late 1960's. Nevertheless, graduates with advanced degrees and those with bachelor's degrees who rank high in their class should continue to have excellent employment opportunities in the profession. The training required of mathematics graduates also serves as an excellent foundation for employment in many occupations, including high school teaching and certain engineering, economics, and statistics jobs.

Earnings and Working Conditions

Annual starting salaries in private industry for mathematicians with bachelor's degrees were about \$6,000 in 1962, according to the limited in-

formation available. New graduates with the master's degree received starting salaries about \$500 to \$1,000 a year higher. Yearly salaries for new graduates with Ph. D. degrees, most of whom usually have some experience, ranged from about \$9,000 to \$16,000 in 1962.

In the Federal Government service in early 1963, mathematicians with the bachelor's degree and no experience could start at either \$5,525 or \$6,650 a year, depending on their college records. Beginning mathematicians who had completed all requirements for the master's degree could start at \$6,650 or \$7,125; those with the Ph. D. degree could begin at \$8,575 or \$9,475. The provisions for salary increases, vacations, sick leave, pensions, life and health insurance, and other benefits are the same for mathematicians as for other civil service employees. (See section on Occupations in Government.)

In colleges and universities, starting salaries for mathematicians with the Ph. D. degree who were employed as teachers in 1962 ranged from

about \$4,500 to \$9,000 for 9 months of teaching. (See index for page number of statement on College and University Teachers.) Mathematicians in educational institutions can sometimes supplement their regular salaries with income from special research projects, consulting work, and writing for publications.

Most mathematicians can look forward to an increase in earnings as they gain experience. According to the National Science Foundation's 1962 National Register of Scientific and Technical Personnel, the average (median) salary of mathematicians with 20 or more years' experience was \$13,000 a year, nearly twice that of mathematicians with 1 year's experience.

Where To Go for More Information

American Mathematical Society,
190 Hope St., Providence, R.I., 02906.
Mathematical Association of America,
University of Buffalo, Buffalo, N.Y., 14214.

Statisticians

(D.O.T. 0-36.51)

Nature of Work

The studies planned and conducted by statisticians help natural and social scientists extend their knowledge and provide government and business officials with the statistical information needed in making major decisions. Statisticians use scientific methods to collect, analyze, and interpret numerical data. Their prime objective is to obtain sufficient information on the subject being studied with a minimum expenditure of time and money.

Statisticians specialize either in the application of statistical methods to a subject-matter field or in mathematical statistics. Applied statisticians use statistical methods to collect and analyze data in a particular subject-matter field, such as economics, agriculture, psychology, public health, demography, physics, or engineering. They may forecast population growth or economic conditions, estimate crop yield, predict and evaluate the results of a new marketing program, or help engineers and scientists determine the best design for a jet airplane.

Mathematical statisticians use mathematical techniques to design and improve statistical methods for obtaining and interpreting numerical information. They are primarily theoreticians, concerned with developing new statistical tools in areas such as probability theory, experimental design, and regression analysis. Unlike applied statisticians, they usually do not specialize in a subject-matter field. However, they frequently work with applied statisticians in making statistical studies.

Most statisticians are engaged in planning surveys, designing experiments, or analyzing data. Those who plan surveys choose the source from which the data are to be collected, determine the type and size of the sample to be studied, and draw up the questionnaire or reporting form. They may also prepare instructions for the workers who will collect the data and for the statistical clerks who will code and tabulate the returns. Statisticians who design experiments prepare mathematical models which can be tested to confirm or contradict a particular theory. Those who are engaged

in analytical work interpret data already collected and summarize their findings in tables, charts, and written reports. Some statisticians perform administrative functions in connection with statistical research programs. Others teach in colleges and universities—often combining research with teaching activities.



Courtesy of U.S. Department of the Navy

Statisticians use complex data-recording systems in conducting studies

Because statistics is a tool used in many different fields, it is sometimes difficult to distinguish people who are primarily statisticians from those who are chiefly subject-matter specialists with only a limited knowledge of statistics. For example, an applied statistician who works with data on economic conditions may have the title of economist instead of statistician, or a mathematical statistician engaged in applying probability theory to the development of new statistical methods may be classified as a mathematician.

Where Employed

Approximately 21,000 professional workers were employed as statisticians in 1962; nearly one third were women. The largest number of statisticians are employed by private industry, mostly in market research, quality control, production and sales forecasting, and administration of statistical programs. Federal Government agencies also employ a sizable number of statisticians, primarily in the Departments of Defense; Commerce; Agriculture; Health, Education, and Wel-

fare; and Labor. Colleges and universities employ some applied statisticians and are a major source of employment for mathematical statisticians. Some statisticians are employed by State and local governments, and nonprofit organizations. Others work for consulting firms or as independent statistical consultants.

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 applied and mathematical statistics. For some beginning positions in applied statistics, however, a bachelor's degree, with a major in economics or some other applied field and a minor in statistics, is acceptable preparation. A master's degree in statistics or mathematics is required for many entrance positions in mathematical statistics and teaching, and is almost indispensable for promotion to high-level positions in mathematical statistics. The Ph. D. degree is essential for advancement to top-level teaching positions and is an asset in obtaining high-ranking administrative positions and consulting work. Furthermore, for advancement in analytical and survey work, there is a trend toward requiring advanced academic 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. However, most schools offer either a degree in mathematics or a sufficient number of courses in statistics to qualify graduates for beginning positions in statistics. Courses essential for prospective statisticians include college algebra, plane trigonometry, analytical geometry, differential and integral calculus, linear algebra, and at least one course in statistical methods. Other courses of importance to prospective statisticians include sampling, correlation analysis, design of experiments, probability theory, and courses bearing on the use of computers. 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 business administration or a related field are helpful.

Graduate instruction in statistics was offered by approximately 25 colleges and universities in 1962. A bachelor's degree with a good background in mathematics is the usual requirement for admission to these schools. In general, the student interested in applied work should attend a school in which he can take advanced courses in statistics and carry out research projects in the subject-matter field in which he is interested.

Inexperienced statisticians with only the bachelor's degree often spend much of their time in clerical work or its supervision on their first jobs. As they gain experience, statisticians usually move up to positions of greater technical and often supervisory responsibility. Those with exceptional ability and interest may advance to high-level supervisory or administrative positions.

Among the personal qualifications needed by statisticians are a logical and inquiring mind, an interest and facility in mathematics, and the ability to translate practical problems into statistical terms. They should be able to express themselves clearly and concisely in order to work with scientists, business officials, and others who must use statistics but are not statisticians.

Employment Outlook

The outlook is for substantial growth in employment of statisticians, both in the next few years and over the long run. Growing emphasis on modern statistical methods in conducting research and increasing use of electronic computers are major factors in the growing demand for statisticians in private industry, government, and colleges and universities.

The largest expansion in employment is expected to occur in private industry. Persons who have broad training in mathematics and statistics, as well as a knowledge of engineering or the physical sciences, will be needed for quality control work in manufacturing and for work with scientists and engineers in research and development activities, including space research. Business firms are also expected to rely more and more on statisticians in forecasting sales, analyzing business conditions, modernizing their accounting procedures, and solving other management problems.

Employment of statisticians in Federal Government agencies will probably increase moderately.

Additional personnel will be needed not only in research and development work, but also for expanded programs in such fields as social security, health, and education. Some statisticians will also be needed to fill positions in continuing programs which involve the collection and analysis of social and economic data of many kinds.

Employment of statisticians as college and university teachers is also expected to rise through the 1960's, primarily as a result of the overall increase in enrollments. Furthermore, it is anticipated that many colleges will offer additional courses in statistics, as the importance of statistical training in government, business, academic, and industrial research becomes even more widely recognized.

In addition to the number needed to fill new positions, several hundred statisticians will be required each year to replace members of the profession who retire, die, or transfer to other occupations.

Well qualified women statisticians should have favorable opportunities in all phases of statistical work. Opportunities for advancement for women statisticians will probably be best in teaching and in research positions in the social sciences.

Earnings and Working Conditions

Starting salaries for new college graduates employed as applied statisticians in private industry generally averaged between \$5,000 and \$5,500 a year in 1962, according to the limited information available. Starting salaries for mathematical statisticians with the bachelor's degree were usually somewhat higher. Salaries for beginning statisticians with the master's degree averaged between \$600 and \$1,200 a year more than those with only the bachelor's degree.

In the Federal Government service in early 1963, analytical and survey statisticians with the bachelor's degree and no experience could start at either \$4,565 or \$5,540 a year, depending on their college records. Beginning analytical and survey statisticians who had completed all requirements for the master's degree could start at \$5,540 or \$6,675. Those with the Ph. D. degree could begin at \$8,045 or \$9,475. In the Federal Government, mathematical statisticians had somewhat higher starting salaries than analytical and survey statisticians.

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 obtain income from outside research projects, consulting work, and writing for publications.

Where To Go for More Information

American Statistical Association,
810 18th St. NW., Washington, D.C., 20006.

Actuaries

(D.O.T. 0-36.55)

Nature of Work

Actuaries are mathematically trained workers who are responsible for developing and keeping insurance and pension plans on a sound financial basis. Using mathematical methods and techniques, they evaluate the probability of loss on whatever is to be insured. They develop and analyze statistical tables on mortality (death) and morbidity (sickness) rates. Actuaries are also concerned with the frequency of injuries and with personal and property losses from fire, burglary, explosion, and other hazards, and with the resulting costs. Taking into consideration the estimates of payments to policyholders as well as estimates of their company's future expenses and investment income, actuaries determine the premium rates for each particular type of insurance policy. They may also analyze company earnings and prepare policy contract provisions.

To perform their duties effectively, actuaries must keep abreast of general business trends and legislative, health, social, and other developments that may affect the soundness of insurance practices. Because of their broad knowledge of the insurance field, actuaries frequently work on problems arising in several different departments of their companies, such as the investment, underwriting, group insurance, and pension sales and service departments. Those in executive positions may help to determine general company policy and may testify before public agencies on proposed legislation which would affect the insurance business or on the justification for intended changes in company premium rates or contract provisions.

Actuaries employed by the Federal Government usually deal with a particular Government in-

surance program, such as social security (old-age, survivors, and disability insurance) or life insurance for veterans and members of the Armed Forces. Actuaries in State government positions are involved in the supervision and regulation of insurance companies and State retirement or pension systems, and may work on problems connected with unemployment insurance or workmen's compensation. Consulting actuaries perform services, on a fee basis, for private companies, unions, and government agencies. They often set up employee pension and welfare plans and periodically make actuarial valuations of them.

Where Employed

Approximately 2,000 actuaries were employed in the United States in 1962. About four-fifths of all actuaries work in the life insurance field and one-fifth in property and casualty insurance (which includes workmen's compensation, automobile, accident and health, and fire insurance).

A large majority of all actuaries are employed by private insurance companies. The size of an insurance company's actuarial staff depends upon the volume and nature of its insurance work. Large companies may employ as many as 50 to 100 actuaries, whereas small companies may have only 1 or 2 actuaries on their staffs or may rely entirely on consulting firms or rating bureaus (associations which supply actuarial data to member companies).

Several hundred actuaries are employed by consulting firms or are in business for themselves. The Federal Government employs about 60 persons in actuarial positions, primarily in the De-

partment of Health, Education, and Welfare and the Veterans Administration. Some actuaries are employed by State government agencies, property and casualty insurance rating bureaus, and educational institutions. A few are employed by private firms other than insurance companies to administer private pension and welfare plans.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in mathematics is usually required for entry into actuarial work. Some new graduates with a major in such fields as economics or business administration and a minor in mathematics can qualify for beginning actuarial positions. Although only a few colleges and universities offer training specifically designed for young people seeking actuarial careers, many institutions offer the necessary mathematics courses, which include algebra, analytical geometry, differential and integral calculus, mathematical statistics, probability, and finite differences. Other desirable courses include insurance law, economics, investments, accounting and other aspects of business administration, and English composition and speech.

To gain full professional status, actuaries must pass a series of examinations, which cover general mathematics, specialized actuarial mathematics, and all phases of the insurance business. The beginning examinations cover general mathematics, and it is desirable for the student to take these examinations while still in college. Success in passing these examinations helps the student determine whether he has the ability to become an actuary, and those who pass have better opportunities for employment and a higher starting salary. The more advanced examinations, usually taken by those in junior actuarial positions, require extensive home study and experience in insurance work. It usually takes from 5 to 10 years after entering for a beginning actuary to complete an entire series.

The actuarial examinations for the life insurance field are given by the Society of Actuaries, and those in property and casualty insurance by the Casualty Actuarial Society. Associate membership is awarded after completion of part of the examination series. The designation of "Fellow" is conferred after successful completion of either

all 10 examinations given by the Society of Actuaries or the 8 examinations of the Casualty Actuarial Society.

Besides mathematical ability, applicants for beginning actuarial positions are likely to be evaluated also on personal characteristics, such as ability to deal with people, leadership qualities, and interest in business problems. Preference is usually given to applicants who have passed at least two of the actuarial examinations, and to those with some actuarial experience. This experience is provided in many insurance companies which hire and train college undergraduates during the summer months.

A beginning actuary is usually rotated among different jobs in the actuarial department to learn the various actuarial operations and become acquainted with different phases of insurance work. At first, the trainee may make calculations or tabulations for actuarial tables or for the annual statement. Later, he may supervise actuarial clerks and be concerned with correspondence and reports.

Advancement to more responsible work as an assistant and later as associate or chief actuary depends largely upon on-the-job performance and the number of actuarial examinations successfully completed. Some actuaries, because of their broad knowledge of the insurance and related fields, qualify for administrative positions in other company activities, particularly in the underwriting, accounting, or investment departments. A significant number of actuaries advance to top executive positions.

Employment Outlook

Employment opportunities for actuaries are expected to be very good throughout the 1960's and over the long run. New graduates with the necessary mathematical education who have passed some examinations of either professional society will be in particular demand.

Employment of actuaries is expected to increase in both the life and casualty insurance fields, primarily because of anticipated growth in the number and type of insurance policies and employee-benefit plans. (See chapter on Insurance Occupations.) More actuaries will be needed to solve the increasing number of problems arising from continuously changing and increasingly com-

plex insurance and pension coverage. The rapidly growing number of group life insurance plans and health and pension plans will require additional actuarial service. In the property and casualty insurance field, additional actuaries will be needed to make studies which are used in determining policy rate changes, and to justify these changes before State regulatory agencies. There will be continuing strong demand for actuaries capable of working with the electronic computers in widespread use by large insurance companies. Besides actuaries needed to fill new positions, a few will have to be trained to replace those who retire, die, or transfer to other occupations.

Employment opportunities will probably continue to be good for the few women who seek actuarial work. Advancement opportunities will also be good for women actuaries who complete the years of continuous training and study required to pass the actuarial examinations to gain full professional status.

Earnings and Working Conditions

Annual starting salaries of new college graduates entering actuarial work in insurance companies were generally about \$5,500 in 1962, ac-

ording to the limited information available. Those who had passed some of the preliminary actuarial examinations or who had gained some experience in the summer programs offered by insurance companies usually received considerably higher starting salaries.

In the Federal Government service in early 1963, new graduates with the bachelor's degree entering actuarial work could start at either \$5,525 or \$6,650 a year, depending on their college records. (See chapter on Occupations in Government.)

Beginning actuaries can look forward to a marked increase in earnings as they pass the examinations of either Society and gain professional experience. Most Fellows of either the Society of Actuaries or the Casualty Actuarial Society earn over \$12,000 a year. Many actuaries earn more than \$18,000 a year and some in executive positions in large insurance companies earn over \$25,000.

Where To Go for More Information

Society of Actuaries,
208 South LaSalle St., Chicago, Ill., 60604.
Casualty Actuarial Society,
200 East 42d St., New York, N.Y., 10017.

TECHNICIAN OCCUPATIONS

Technicians make up one of the fastest growing occupational groups in the United States. In recent years, the needs of the Nation's defense and space programs, added to those of an expanding and increasingly technical economy, have greatly intensified the demand not only for engineers and scientists but also for the technical workers who assist them. This chapter

is concerned with these technicians who work with engineers and scientists, and with draftsmen and surveyors, also usually considered technicians. Information on technical occupations in the health field—including medical technologists, dental laboratory technicians, medical X-ray technicians, and dental hygienists—is presented elsewhere in the *Handbook*. (See index for page numbers.)

Engineering and Science Technicians

(D.O.T. 0-50.20 through .99)

Nature of Work

The term "technician" has no generally accepted definition. It has been used by different employers to refer to workers in a great variety of jobs, with many different job titles and requiring a wide range of education and training. In some cases, it has been applied to employees doing relatively routine work; in others, to persons performing work requiring skills within a limited sphere; and again to persons who do complex work of a highly technical nature as assistants to engineers and scientists. The workers' job titles may be descriptive of their technical level (for example, engineering technician, biological aid, or junior engineer) or they may relate to the nature of the work (for example, ceramic analyst, production analyst, tool designer, or time-study analyst). Some employers use the word "technician," preceded by adjectives such as mechanical, electrical, electronics, or chemical, descriptive of areas of technology in which personnel are employed.

As used here, the term "technician" refers to technical workers whose jobs require knowledge and use of scientific and mathematical theory and specialized education or training in some aspect of technology or science, and who, as a rule, work directly with scientists and engineers. In general, the jobs are technical but more limited

than those of the engineer or scientist, and have a greater practical orientation. Many of these technician jobs require the ability to analyze and solve engineering and science problems and prepare formal reports on experiments, tests, or other projects. Some require considerable 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. Still 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. Nearly all technician jobs, however, require the ability to communicate clearly, both orally and in writing.

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.

Technicians work in virtually every aspect of engineering and scientific work. One of their largest areas of employment is research, development,

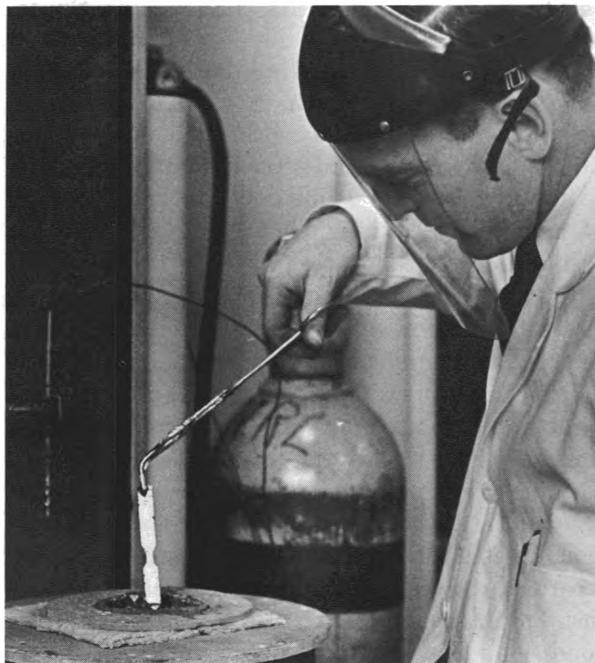
and design work, in which they generally serve as direct supporting personnel to engineers or scientists. In the laboratory, they conduct experiments or tests; set up, calibrate, and operate instruments; and make calculations. They assist scientists and engineers in developing experimental equipment and models by making drawings and sketches and, under the engineer's direction, frequently handle certain aspects of the design work.

Technicians also work in jobs related to production, usually following a course laid out by the engineer or scientists, but often without close supervision. They may aid in the various phases of production planning, such as working out specifications for materials and methods of manufacture. Sometimes technicians devise tests to insure quality control of products, or make time and motion studies designed to improve production flow and the efficiency of particular work operations. They may also 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 advise on installation and maintenance problems, serve as technical sales or field representatives of manufacturers, or work as technical writers of specifications and manuals. (See statement on Technical Writers.)

The following sections describe a number of areas of technology 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, and of propulsion systems, controls, and aircraft structures. Many of these technicians aid engineers in preparing layouts of aircraft and missile structures 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, weight control, or propulsion problems. 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 pre-



Courtesy of U.S. Department of the Navy

Technician tests new heat-resistant coating for metals

pare or check drawings for technical accuracy, practicability, and economy.

Technicians sometimes help estimate the cost of the materials and labor needed to manufacture aircraft and missiles. They may also be responsible for liaison between the engineers who do the planning and development work and the workers who convert the engineers' ideas into finished products. As an airplane or missile is built, the liaison technician checks it for conformance with 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 used, or the method of fabrication, which would expedite production of parts or assemblies.

Other aeronautical technicians are employed as manufacturers' field service representatives, serving as the link between their employers and the military services, commercial airlines, and other customers. Technicians with a flair for writing and illustrative drafting often prepare instruction manuals, bulletins, catalogs, and other technical materials. (See statements on Aeronautical Engineers and Airplane Mechanics, and chapter

on Occupations in Aircraft, Missile, and Spacecraft Manufacturing.)

Air-Conditioning, Heating, and Refrigeration Technology. 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 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 in preparing 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 would be best suited for the job, and estimate costs. Technical sales work for equipment manufacturers is still another area of employment for technicians. In such work, they 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. They apply their knowledge of the physical sciences and of apparatus and equipment to laboratory research or such work as the control of complicated chemical processes. 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, assisting chemists, other scientists, or engineers. Those helping to conduct experiments may make the computations and tabulate and analyze the results. In testing work, technicians make chemi-

cal 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 testing laboratories often assemble and use such apparatus and instruments as dilatometers (which measure the dilation of expansion of a substance), analytical balances, and centrifuges.

Outside the laboratory, chemical technicians are sometimes employed to supervise various operations in the production of chemical products and as technical salesmen 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 in estimating costs, preparing 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 for conformance with blueprints and specifications.

Many persons trained in civil engineering technology become estimators, who prepare estimates of the costs, materials, and time necessary in the construction or repair of various structures. Some become highway inspectors, who may supervise the clearing of rights-of-way and the preparation of roads for surfacing, test the materials used, and inspect construction works at various stages. Others are draftsmen, surveyors, or specialists in other well-established technician jobs. (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, in-

dicating, and controlling devices; navigational equipment; missile and spacecraft guidance and control instruments; electronic computers; and many other types of equipment using vacuum tubes and semiconductor circuits. Because the field is so broad, technicians generally become specialists in one area—for example, communications—and often in a subdivision such as radio or telephony. They may also specialize in some aspect of industrial electronics—for example, induction or dielectric heating, servomechanisms, automation controls, or ultrasonics.

Technicians working with engineers and scientists in the field of electronics need a strong background in electronics theory and mathematics to enable them to handle complex technical work above the level involved in routine operating and repair jobs. (For additional information on service and repair jobs in the electronics field, see statement on Radio and Television Servicemen.) These electronics technicians may, for example, prepare or interpret layouts and other diagrams, develop and test experimental electronic units, or assist scientists and engineers in the design of electronic circuits. Their work often calls for use of engineering handbooks; oscilloscopes, signal generators, ohmmeters, multimeters, and other instruments; and computing devices, including slide rules.

Electronics technicians employed in research activities usually assist scientists or engineers in designing, testing, and modifying experimental electronic devices. They may devise practical solutions to problems of design, select suitable materials, determine the best method of building a piece of equipment, or test and evaluate the operating characteristics of the equipment after it is built. They may sometimes be assigned to make necessary modifications in experimental equipment.

Electronics technicians working with engineers in manufacturing operations may help in designing and setting up different types of testing equipment and devising quality control and other tests for manufactured products. (See also chapters on Occupations in Aircraft, Missile, and Spacecraft Manufacturing, and in Electronics Manufacturing.)

Electronics technicians may also be employed in special maintenance and repair jobs where a

high degree of technical knowledge is needed. Electronics maintenance technicians employed by the Federal Aviation Agency, for example, keep radar and other electronic equipment in perfect working order for effective air traffic control. Persons with training and experience in electronics may be employed also as broadcast technicians in the engineering departments of radio and television broadcasting stations to operate and maintain the electronic equipment in the studio and at the transmitters. (For additional information on broadcast technicians, see chapter on Occupations in Radio and Television Broadcasting.)

Industrial 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 layout of machinery and equipment, planning the flow of work, and making statistical studies and analyses of production costs to eliminate unnecessary expense. The industrial technician may also assist the engineer by conducting time-and-motion studies, which involve timing and analyzing the movements workers make.

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 analyses may become involved later 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 sometimes used to cover a large number of specialized fields, including automotive technology, diesel technology, tool design, machine design, and production technology.

Technicians trained in one of the above areas of 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 in determining whether a proposed product design change is practical and how much it will cost to produce.

They may also be called upon to solve particular design problems such as those involving tolerances, stress, strain, friction, and vibration.

Planning and carrying out tests on experimental machines and equipment for performance, durability, and efficiency is a large area of work for technicians. As part of the testing procedure, they record data, make computations, plot graphs, analyze results, and write reports. They sometimes make recommendations for changes in design to meet performance requirements. Their jobs often require the use of instruments, test equipment, and gages such as dynamometers, as well as the ability to prepare and interpret drawings.

Some workers with training in mechanical technology 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 may also make detailed drawings of these tools and fixtures, or supervise others in making them. Besides developing new tools, designers frequently redesign tools currently in use to improve their efficiency.

The tool designer must have a knowledge of machine shop practice and of drafting, and a good background in advanced algebra, geometry, and trigonometry. He must also be familiar with the characteristics of the materials of which tools and fixtures are made. In addition, he needs a knowledge of manufacturing procedures, and the advantages and disadvantages of various methods of production, so that he can design tools which will produce the article desired as efficiently and cheaply as possible.

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.

Other Areas of Technology. Many fields of work besides those described above offer opportunities for technicians with appropriate training. Those trained in *metallurgical technology*, for example, work with metallurgists and metallurgical engineers in processing metals, minerals, and ceramics and converting them into finished prod-



Courtesy of National Aeronautics and Space Administration

Technician checks out spacecraft payload

ucts. Their jobs may include testing of metals and alloys to determine their physical properties, or working in research laboratories on such projects as developing new ways of treating and using metals and alloys. Technicians in the field of *mathematics* assist mathematicians, engineers, and scientists by doing computations involving the use of algebra, logarithms, trigonometric functions, and higher mathematics. Those working in the field of *biology* assist biological scientists in conducting tests and experiments to gain knowledge about living organisms and to apply this knowledge to the solution of practical problems, such as the development of new drugs and vaccines or new varieties of plants. Those trained in

agricultural technology work with agricultural scientists in improving farm products, the quality of foods, and soil conditions. Still other fields of work for technicians include cartography (map-making), forestry technology, electrical technology (power), gas turbine technology, optical technology, and petroleum technology.

As industry becomes increasingly mechanized, new technical occupations continue to emerge. For example, *instrumentation technology*, a new and growing area of employment, has evolved from the introduction of more and more 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—who may have either specific training in instrumentation or training chiefly in electronics, mechanics, or hydraulics—work with the engineers and scientists who develop these highly complex devices, and 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.)

Where Employed

An estimated 535,000 engineering and science technicians, not including draftsmen and surveyors, were employed in 1962—about 12 percent were women. Nearly 400,000 of these technicians (about three-fourths of the total) were employed by private industry. The industries employing the largest numbers of engineering and science technicians are electrical equipment, machinery, chemicals, and aircraft, missiles, and spacecraft.

The Federal Government also employs sizable numbers of engineering and science technicians. In 1962, Federal agencies had approximately 70,000 employees in technician occupational cate-

gories; chiefly as engineering aids and technicians, electronic technicians, equipment specialists, cartographic aids, meteorological technicians, physical science technicians, soil conservation aids, forestry technicians, and mathematics aids. Of these engineering and science technicians, the largest number—nearly 30,000—worked for the Department of Defense. Together, the Departments of Agriculture, Commerce, and the Interior employed about 24,000 technicians, and the remainder were scattered among a number of other Government agencies.

State government agencies employed about 40,000 engineering and science technicians in 1962, and local governments about 15,000. The remainder are 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 and science technicians can obtain formal education for their work from a number of sources including technical institutes, junior colleges and community colleges, extension divisions of universities, colleges offering 2-year technical programs, some large comprehensive high schools, technical high schools, and vocational-technical high schools. Many engineering and science students who have not completed all requirements for a bachelor's degree, as well as some other persons with post-high school education in mathematics and science, are also able to qualify for technician jobs, providing they obtain some additional technical training and experience. Persons often become qualified for engineering and science technician jobs through on-the-job training and experience, plus formal course work taken on a part-time basis either through classroom or correspondence courses. In general, post-secondary school technical training is required for high-level engineering and science technician jobs.

Engineering and science technicians usually begin work as trainees or in the more routine positions under the direct and constant supervision of an experienced technician, scientist, or engineer. As they gain experience they are given more responsibility, often carrying out a particular as-

signment under only general supervision. Technicians may move into supervisory positions. Those with exceptional ability sometimes obtain additional formal training and are promoted to professional engineering positions.

The entrance requirements of schools specializing in preparing students for technical jobs are usually less rigid and standardized than those of 4-year colleges. For admittance to institutions offering post-high school technical training, high school graduation is usually required. Some schools will admit students without a high school diploma, however, if they are able to pass special examinations and otherwise demonstrate their ability to perform work above the high school level. Since all the occupations considered in this chapter require basic training in mathematics and science, students interested in technical careers should obtain as good a background as possible in these subjects while in high school. A few technical institutes have arrangements for helping students make up deficiencies in these subjects.

Courses offered by schools specializing in post-high school technical training are often of college level. Included is instruction on laboratory techniques as well as courses in science, mathematics, and engineering, with subject matter related to the practical problems students will meet on the job. Students are taught the use of instruments and are also given instructions in the use of machinery and tools, more to give them a familiarity with the equipment than to develop skills.

Because of the variety of educational institutions where training may be obtained and the differences in the kind and level of training offered, persons seeking a technical education should use more than ordinary care in selecting a school. Information should be secured about accreditation, professional recognition, the length of time the school has been in operation, instructional facilities, faculty qualifications, acceptability of credits, and the kinds of jobs obtained by the school's graduates.

Some of the types of educational institutions and other sources where young people can obtain training as technicians are:

Technical Institutes. Technical institutes offer 1, 2, or 3 years of education above the high school level. Two years is the usual training period. Technical institute programs are usually specially

designed to place the graduate into some specific job or cluster of jobs immediately upon graduation, and with a minimum of on-the-job training. Their scope is more limited than that required to prepare a person for a career as a professional scientist or engineer. In general, the student receives intensive technical training but less theoretical and general education than is provided by 4-year engineering and liberal arts colleges. Much emphasis is placed on laboratory and practical work in order to familiarize students with instruments, equipment, and techniques used in industry.

Some schools offer cooperative programs under which a student spends part of his time in school and part in employment related to the occupation for which he is preparing himself. It may take more than 2 years to complete the curriculum at a technical institute with a cooperative plan, but this type of program gives students valuable work experience, which often outweighs the disadvantages of a longer training period. In addition, students participating in cooperative programs frequently earn enough to pay for at least a part of their educational expenses, and are often able to obtain higher starting salaries on their first jobs.

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.

Evening as well as day sessions are generally available in most technical institutes. Almost half of the students attending technical institutes in 1960 were enrolled part time in evening and special classes. By attending evening classes, employed workers often become qualified for technician jobs.

Some technical institutes give associate degrees which signify that the student has completed at least 2 years of college-level work. If the prospective student desires eventually to obtain a bachelor's degree from a 4-year college, he should investigate in advance whether his technical institute credits are transferable to the college of his choice.

Junior Colleges and Community Colleges. Many junior and community colleges also prepare students for technician occupations in industry and

government. Two years of post-high school education is usually offered by such schools and it is common practice for them to award the degree of associate in arts or science upon completion of the 2-year program.

Not all junior colleges are equipped to give technical training of the type described in this report. Some junior colleges offer courses equivalent to those given in the freshman and sophomore years of 4-year colleges, in order that their graduates can go on into the junior year in a 4-year college; others offer 2-year terminal programs of the technical institute type. Many junior colleges award associate degrees at the completion of 2 years' college level work.

Junior college courses in technical fields are often planned around the employment needs of the industries in their locality. The training programs for prospective technicians therefore vary and may include highly specialized preparation in addition to general courses. Sometimes, the courses are designed to meet the specifications of one or two industries or even of a single plant.

Many junior colleges are important adult education centers with extensive night school programs. Through appropriate part-time study at selected junior colleges, as at technical institutes, workers may prepare themselves for engineering and science technician jobs.

Training in Industry. 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. Instruction is given both through formal classes and through training on the job. Workers who are trained wholly on the job generally get less theoretical background than those who receive formal instruction.

Other employers, aware of the need for technically trained workers but without training programs, often encourage their employees to attend classes in local schools or to enroll in correspondence courses. Some large corporations reimburse their employees for tuition after they have completed courses satisfactorily. The workers are usually expected to take courses directly related to their work assignment, and are sometimes allowed to attend classes on the employer's time.

Training for some occupations in the technician category—tool designer and electronic technician,

for example—may be obtained through a formal apprenticeship. In addition to on-the-job training, supplementary education in mathematics and science is provided. Persons interested in apprentice training may obtain further information from the local office of their State employment service, their State apprenticeship agency, the U.S. Bureau of Apprenticeship and Training, or directly from employers, or the local labor union concerned with the occupation they wish to learn.

Other Training. Although most engineering and science technician jobs require post-high school education or the equivalent in experience, a few advanced technical and technical-vocational high schools, principally in large cities, offer programs which qualify their graduates for some technician entry jobs. Graduates of this type of school, however, often need supplementary training before they can progress to higher level positions. In recent years, as a result of the stimulus provided by title VIII of the National Defense Education Act of 1958, public schools of this type have been putting a great deal of emphasis on developing curriculums to qualify young people for entry jobs in technician occupations. Many technical high schools have high admission requirements and offer more thorough and advanced courses in mathematics, science, drafting, and laboratory work than are usually available in academic high schools. They sometimes offer a year of schooling beyond the 12th grade. Some have evening courses. These courses may be organized as formal technical programs to prepare technicians or may cover only a few subjects related to a particular area of work.

Correspondence schools are an additional source of preparation for technicians. Success in such courses depends greatly on the ability of the student to study by himself. The persons deriving the most benefit from such courses are those who wish to learn more about their jobs or who wish to advance to a better job in the same field by increasing their theoretical and mathematical knowledge. Some correspondence school programs also offer residence work in which the student receives laboratory and other practical training.

In addition to the sources of training already discussed, many thousands of technicians are trained each year by the Armed Forces. The Army, Navy, Air Force, Marine Corps, and Coast

Guard all train their own specialists. Some trainees are given intensive short courses; others receive extensive training of a year or more. Much of the training is transferable from military to civilian jobs and many of the technicians trained by the military establishments utilize their training in civilian employment after they leave the Armed Forces.

Employment Outlook

Employment opportunities for well-qualified engineering and science technicians are expected to be very good throughout the remainder of the 1960's, and continued expansion of the field is anticipated over the long run. In recent decades, technicians have been one of the fastest growing occupational groups, and there is every indication of continued rapid growth. As the employment of scientists and engineers continues to grow, increasing numbers of technicians will be needed to assist them. In addition, more than 10,000 technicians will be needed each year to replace those who retire, die, or transfer to other occupations.

The demand for engineering and science technicians will be greatest in research, development, design, and other work preceding the manufacturing process. As products and the methods by which they are manufactured become more complex, increasing numbers of technicians will probably also be required to assist engineers in such activities as production planning, maintaining liaison between production and engineering departments, and technical sales work.

Underlying the increase in demand for technicians are the general expansion of American industry and the increasing complexity of modern technology. The demands of the defense and space programs will also result in a growing need for workers in the technician category. In addition, the trend toward automation of industrial processes and the growth of new areas of work, such as that related to atomic energy, will probably add to the demand for technical personnel.

Also of great importance to the expected growth in the employment of engineering and science technicians is the prospect of a continued high level of government and private expenditures for research and development in the years ahead. Expenditures for research for defense and space programs in particular are expected to continue at a

high level. Furthermore, many companies are establishing new research programs and strengthening existing ones to meet the strong competition in developing new consumer-oriented products and processes.

Well qualified women technicians should continue to have favorable opportunities, chiefly in drafting jobs, in chemical and other laboratory work, and in computation and other work requiring application of mathematics. Over the long run, it is likely that more women will be trained and find employment in these and other technician occupations.

Earnings

In general, a technician's earnings depend upon his education, his technical specialty, and his work experience. Other important factors which influence his earnings are the type of firm for which he works, the kind of work he does, and the geographic location of his job.

Annual starting salaries for graduates of post-high school technical schools were typically between \$3,700 and \$5,700 a year in industry in 1962. Young persons entering engineering and science technician jobs with less formal training generally earned somewhat less.

In Federal Government agencies in early 1963, beginning engineering and science technicians were offered \$3,820, \$4,110, or \$4,565, depending on the type of job vacancy and the applicant's schooling and other qualifications. Some Federal Government agencies hire high school graduates and train them for technician jobs. Beginning salaries for these jobs ranged from \$3,560 to \$3,820 a year, depending on the individual's high school courses and experience.

Most technicians can look forward to an increase in earnings as they gain experience. Studies of their graduates conducted by a number of technical schools in 1961 and 1962 showed most earned over \$6,500 a year after about 5 years of experience.

Where To Go for More Information

General information on careers for engineering and science technicians may be obtained from:

American Society for Engineering Education,
Technical Institute Division,
University of Illinois, Urbana, Ill., 61801.

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

National Council of Technical Schools,
1507 M St. NW., Washington, D.C., 20005.

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:

The American Association of Junior Colleges,
1777 Massachusetts Ave. NW., Washington, D.C.,
20036.

National Home Study Council,
1601 18th St. NW., Washington, D.C., 20009.

Draftsmen

(D.O.T. 0-48.)

Nature of Work

In making a space capsule or an electric iron, a nuclear submarine or a television set, a bridge or a typewriter, manufacturing and construction companies need detailed plans giving dimensions and specifications for 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 complete and accurate working plans which are used by skilled crafts-

men in making a product. Draftsmen may make calculations concerning the strength, reliability, and cost of materials, and check dimensions of parts and their relationship to each other. Through their drawings and specifications, they describe exactly what materials and processes skilled craftsmen are to use on a particular job. In developing their drawings, draftsmen use such instruments as compasses, dividers, protractors, and triangles, as well as machines that combine the functions of several devices. They may also 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. *Tracers* make corrections and prepare drawings for reproduction by tracing them on transparent cloth, paper, or plastic film.

Draftsmen may also specialize in a particular field such as mechanical, electrical, electronic, aeronautical, structural, and architectural drafting.



Courtesy of U.S. Department of the Interior

Draftsman completes a detailed drawing

Where Employed

An estimated 260,000 draftsmen were employed in 1962; about 6 percent were women. The large majority of draftsmen (approximately 230,000 in 1962) are employed in private industry, chiefly in manufacturing. The manufacturing industries employing the largest numbers are machinery; electrical equipment; fabricated metal products; ordnance; and aircraft, missile, and spacecraft. Substantial numbers are also employed by engineering and architectural consulting firms, construction and transportation companies, and public utilities.

A number of draftsmen (more than 25,000 in 1962) work for Federal, State, and local governments. 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. A few thousand draftsmen are employed by colleges and universities and by non-profit organizations.

Training, Other Qualifications, and Advancement

Young persons interested in becoming draftsmen can acquire the necessary training from technical institutes, junior and community colleges, extension divisions of universities, colleges offering special 2-year programs, vocational and technical high schools, and correspondence schools. Training may also be obtained through 3- or 4-year apprenticeship programs or through on-the-job programs combined with part-time schooling.

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 are also helpful, since many higher level drafting jobs require a knowledge of manufacturing or construction methods. Many technical schools offer courses in structural design, strength of materials, and physical metallurgy.

Young people with only high school drafting training usually start out as tracers; those with some formal post-high school technical training can often qualify as junior draftsmen. As drafts-

men gain skill and experience, they may advance to higher level positions as checkers, detailers, senior draftsmen, or design draftsmen, or supervisors of other draftsmen. Some may become independent designers. Furthermore, some draftsmen who take additional technical training are able to transfer to engineering positions.

Qualifications for success as a draftsman include the ability to visualize objects of two or three dimensions and to do freehand drawing. Draftsmen should also have good eyesight and steady hands. Although artistic ability is not generally required, it may be very helpful in some specialized fields.

Employment Outlook

Employment opportunities for well-trained draftsmen are expected to be favorable throughout the remainder of the 1960's, and the longer run outlook is for continued growth in the occupation. Prospects will be best for those with post-high school drafting training. Well-qualified high school graduates who receive only high school drafting training, however, will also be in demand for some types of jobs.

Employment of draftsmen is expected to rise as a result of the increasingly complex design problems of modern products and processes. As the engineering and scientific occupations grow, more draftsmen will be needed as supporting personnel. Moreover, the industries employing large numbers of draftsmen—in particular, the electrical equipment and aerospace industries—are expected to expand in the years ahead. On the other hand, photoreproduction of drawings and expanding use of newly developed electronic drafting equipment are eliminating some routine tasks done by draftsmen and will probably bring about a reduction in the need for tracers.

In addition to draftsmen needed to fill new positions, many will be required each year to replace those who retire, die, or move into other fields of work. Losses to the occupation from retirements and deaths alone were estimated to be approximately 4,000 during 1962.

Earnings

In private industry, the usual beginning salary for draftsmen was between \$300 and \$350 a month

in 1962, according to the fragmentary data available. As they gain experience, draftsmen may move up to higher level positions with a substantial increase in earnings. For example, the earnings of experienced senior draftsmen averaged about \$550 a month in early 1962.

In the Federal Civil Service in early 1963, the entrance salary for high school graduates without work experience who were employed in trainee-draftsman positions was \$300 a month. For those with post-high school education or with some experience in drafting, entrance salaries were

higher. The majority of experienced draftsmen working for the Federal Government earned between \$385 and \$560 in early 1963.

Where To Go for More Information

American Institute for Design and Drafting,
18465 James Couzens, Detroit, Mich., 48235.

American Federation of Technical Engineers,
900 F St. NW., Washington, D.C., 20004.

See also section on Where To Go for More Information in the statement on Technicians.

Surveyors

(D.O.T. 0-64.)

Nature of Work

Surveyors have an important part in the planning and construction of highways, airfields, bridges, dams, and other structures. They provide necessary information on the measurements and physical characteristics of the construction site. They also locate land boundaries, assist in setting land valuations, and collect information for maps, charts, and plats.

The primary task of the surveyor is to determine the precise measurements and locations of elevations, points, lines, and contours on or near the earth's surface, and the distances between points. As a rule, the surveyor is directly responsible for the performance and accuracy of the survey. He plans the fieldwork, selects survey reference points, and determines the precise location of the natural and manmade features of the survey region. He keeps records of the distances, directions, elevations, and other information disclosed by the survey; makes mathematical calculations based on such information; verifies the accuracy of the survey data; and prepares sketches, maps, and reports.

In making his detailed measurements, the surveyor is assisted by a field party which he supervises and directs. A typical field party is usually made up of from three to six members in addition to the surveyor (sometimes called the party chief). Included in the typical field party are *instrumentmen*, who set up, adjust, and operate a number of surveying instruments, including the



Courtesy of Bureau of Reclamation

Surveyors use plane table and transit to survey land surface features

theodolite, transit, level, altimeter, and tellurometer, at the points designated by the surveyor; *chainmen*, who measure the distances between the points, using a metal tape or surveyor's chain; and *rodmen*, who use a level rod, stadia board, or range pole to assist in measuring elevations, distances, and directions between selected points.

Surveyors often specialize in one particular type of survey. Those doing *highway surveys* are concerned with establishing the points, grades, and lines needed for highway locations. Those carry-

ing out *land surveys* locate boundaries of a particular tract of land, prepare maps, record plats of the land, and formulate legal descriptions of it for deeds, leases, and other documents. Surveyors engaged in *geodetic surveys* measure immense areas of land, sea, or space, taking into account the earth's curvature and its geophysical characteristics. Surveyors doing *topographic surveys* determine the elevations, depressions, and contours of an area, and indicate the location of distinguishing surface features such as farms, buildings, forests, roads, and rivers. Surveyors working on *photogrammetric surveys* apply special stereoscopic plotting techniques to photographs taken from airplanes or ground stations in order to make topographic maps, and to locate and make precise measurements of the natural and manmade features of an area. Surveyors also specialize in other types of surveys, such as *gravity, magnetic, hydrographic, mine, oil-well directional, pipeline, construction, or railroad*. Many surveyors have job titles which identify their specialties, for example, highway surveyor or topographic surveyor.

Where Employed

An estimated 40,000 surveyors, of whom fewer than 4 percent were women, were employed in the United States in 1962. They were located in all parts of the country—in small towns as well as in large cities.

About one-half of all surveyors work for Federal, State, and local government agencies. Among the Federal Government agencies utilizing these workers are the U.S. Geological Survey and Bureau of Land Management of the Department of the Interior, U.S. Coast and Geodetic Survey and Bureau of Public Roads of the Department of Commerce, Corps of Engineers of the Department of the Army, and Forest Service of the Department of Agriculture. Surveyors in State and local government agencies are employed mainly by highway and sanitary engineering departments and by urban planning and redevelopment agencies.

A large number of surveyors work for construction companies and for engineering and architectural consulting firms. A sizable number either work for or head surveying firms which conduct surveys on a fee or contract basis. The

remainder work in a variety of industries, including crude petroleum and natural gas extraction, transportation, and electric light, power, and gas utilities.

Training, Other Qualifications, and Advancement

The most common method of preparing for work as a surveyor is through a combination of courses in surveying and extensive on-the-job training in survey techniques and in the use of survey instruments. Colleges and universities having civil engineering curriculums provide surveying and related subjects as part of these curriculums. A few other 4-year colleges, and some junior colleges, technical institutes, and vocational schools offer 1, 2, and 3-year programs in surveying. In addition, extension courses in surveying are offered by many of these institutions. In most cases, the entrance requirement for surveying courses is high school graduation, preferably including courses in algebra, geometry, trigonometry, calculus, drafting, and mechanical drawing.

For the person seeking a professional career in the more specialized and highly technical surveying areas such as geodesy, topography, or photogrammetry, a bachelor's degree in engineering or the physical sciences, with emphasis on courses in the specific branch of surveying, is required. For advancement in the highly technical areas, graduate study is desirable.

Young persons with some formal training in surveying usually start as instrumentmen. As they gain experience, they are usually given more responsibility and, after several years, may advance to surveyor. Persons with a high school diploma but without formal training or courses in surveying may also enter the field, usually starting as rodmen. Prior employment, during the summer or at other times, with a construction firm or other employer engaged in surveying work is usually considered by employers in selecting young people for advancement. After several years of on-the-job experience and some formal courses in surveying, young persons may advance successively through the positions of chainman and instrumentman to that of surveyor or party chief. In many instances, promotion to these higher level positions is made on the basis of a written examination, as well as on experience.

More than 40 States require licensure or registration of land surveyors responsible for locating and describing land boundaries. In some States, applicants for licenses are expected to know other types of surveying in addition to land surveying. Requirements for licensing vary among the States, but in general include one of the following: College graduation with 2 to 4 years' experience, 6 years' experience and passing of an examination, or completion of 10 years' experience. In mid-1962, approximately 14,000 land surveyors were registered. In addition, approximately 13,000 engineers were registered to do land surveying, primarily as part of their civil engineering duties; however, these workers are considered engineers rather than surveyors.

In addition to the necessary training and experience, qualifications for success as a surveyor also include a strong liking for outdoor work. Sound health and good eyesight are also essential for most types of work. Since most surveyors must supervise and direct the work of other technical personnel, leadership qualities and the ability to get along with others are important.

Employment Outlook

Employment opportunities for surveyors are expected to be favorable throughout the 1960's, both in government and private industry. Prospects will be best for people with college-level training in surveying. Qualified high school and college students will also continue to be sought for summer employment as rodmen and chainmen.

Among the factors expected to contribute to the favorable employment outlook in both the short- and long-run is the increasing demand for surveying services created by a growing population and an expanding economy. The rapid growth of urban areas and the enactment of new or revised city zoning laws will require additional surveyors to locate boundary lines, and to lay out streets, shopping centers, schools, and recreation areas, as well as sites for electric, gas, water, and sewage facilities. Construction or improvement of the Nation's roads and highways will require many new surveyors. Additional surveying personnel will also be needed in the preparation of topographic and other types of maps and charts, primarily for Federal and State Government

agencies. Furthermore, surveyors with college degrees in geodesy will be needed to help track missiles and spacecraft, and to assist in other space activities.

Although new devices which reduce the time spent on surveys involving large stretches of land and surveys requiring extreme accuracy will continue to be introduced, they are not likely to affect employment opportunities significantly. These devices will make it possible to carry out certain types of surveys—such as those of rugged mountain areas, swamps, and deserts—much more accurately and economically than in the past. However, the introduction of new instruments may make it necessary for many surveyors to obtain additional training.

Employment opportunities for women will continue to be limited, primarily because much of the surveyor's work is strenuous. A few openings will be available for women with college degrees to make survey-related computations, analyze data, and prepare reports in offices.

Earnings and Working Conditions

In the Federal Government service, surveyors employed as field party chiefs received a starting salary of about \$380 a month in early 1963. New college graduates with bachelor's degrees qualifying for Federal Government positions as geodesists could begin at approximately \$460 or \$555, depending on their college records. Graduates with bachelor's degrees qualified for positions in topography and photogrammetry started at about \$380 or \$460 a month. In private industry, according to the fragmentary data available, the usual beginning salary for surveyors was approximately \$400 a month. Beginning salaries for instrumentmen in government (other than Federal) and industry were about \$350 a month. Chainmen and rodmen started at about \$250 to \$300.

Surveyors usually work an 8-hour day and 5-day week. However, they sometimes work longer hours during the summer months, when weather conditions are most suitable for surveying activities.

The work of surveyors is active and sometimes strenuous. They may stand for long periods, and may walk long distances or climb mountains with heavy packs of instruments and equipment. Be-

cause most of their work is done out of doors, surveyors may be exposed to all types of weather conditions. Some duties, such as planning surveys, making photogrammetric measurements, preparing reports and computations, and drawing maps, are usually performed in an office.

Where To Go for More Information

General information on careers in surveying may be obtained from:

American Congress on Surveying and Mapping,
Woodward Bldg., Washington, D.C., 20005.

Information on the specialty of photogrammetry may be obtained from:

American Society of Photogrammetry,
44 Leesburg Pike, Falls Church, Va., 22040.

Further information on positions in the Federal Government is given in the chapter on Occupations in Government. (See index for page reference.)

SOCIAL SCIENCES

The social sciences are concerned with the whole range of human society and its activities, from the origin of man to the latest election returns. Social scientists, however, generally specialize in one of several major fields, in each of which human behavior is studied from a different point of view. Anthropologists study primitive tribes, reconstruct civilizations of the past and their history, and are concerned with the cultures and languages of all peoples. Economists analyze the factors which help or hinder man in satisfying his material needs. Historians describe and interpret the events of the past. Political scientists are concerned with the problems of government. Sociologists deal with the behavior and relationship of groups such as the family, the community, and minorities.

Besides these basic social science fields, there are a number of closely related fields, some of which are covered in separate statements in this *Handbook*. (See statements on Geographers, Statisticians, Psychologists, and Social Workers.)

Between 50,000 and 60,000 people were professionally employed in the basic social sciences in 1962, according to rough estimates based on information from a variety of sources. About 10 percent of the total were women. Because of overlapping among the basic social science fields and also with such related fields as business administration, foreign service work, and high school teaching, it is extremely difficult to determine exactly the size of each social science profession. Economists, however, make up the largest group and anthropologists, the smallest.

The majority of all social scientists are employed by colleges and universities. The Federal Government is the second largest employer, especially of political scientists and economists. Except for economists, private industry employs comparatively few persons in professional social science positions, but there is a trend in a variety of 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 non-profit organizations provide an important source of employment for economists, political scientists, and sociologists.

Employment Outlook

Employment in the social sciences has been increasing and is expected to grow rapidly during the remainder of the 1960'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. (See index for page number.) A moderate rise in employment is also expected in government as a result of the growing reliance on social scientists for administrative as well as research assistance. Employment in government agencies is most affected by changes in public policy. For example, more economists will be needed to handle research and administrative functions in connection with new programs established by Congress aimed at relieving unemployment. A moderate rise in employment in private industry and nonprofit organizations is also expected. In addition to personnel required for new positions, many hundreds of social scientists will be needed each year to replace those who leave the field because of retirement or death, or for other reasons.

Social scientists with doctor's degrees are likely to have excellent employment opportunities during the 1960's, in both teaching and nonteaching positions, barring a sharp rise in the proportion of college graduates majoring in the social sciences. For those with less formal training, the employment situation will differ considerably among the several social science fields. These differences are discussed in the sections which follow.

Earnings

Average salaries for social scientists employed as instructors generally ranged from about \$5,000

to \$6,500 a year in a majority of colleges and universities in 1962, according to data from a variety of sources. Generally, the positions paying salaries near the top of this range required the Ph. D. degree or some experience and completion of all requirements for the Ph. D. degree except the doctoral dissertation. Average salaries of professors were 60 to 75 percent higher than those of instructors; in some very large universities, the difference was very much greater. Economists earned more, on the average, than other social scientists. Early in 1962, average salaries of economists in 30 large colleges and universities ranged from medians of \$7,600 a year for assistant professors to \$13,000 for full professors.

In the Federal Government, the beginning salary early in 1963 for social scientists with a bachelor's degree was \$4,565 a year. Those with a superior academic record or with a year of graduate training were eligible for positions at an annual salary of \$5,540. Starting salaries were higher for candidates with additional graduate training. The majority of experienced social scientists in the Federal Government earned from about \$9,500 to \$14,000 a year; many with administrative responsibilities earned considerably more.

In general, social scientists with the Ph. D. degree earn substantially higher salaries than those with the master's degree. Women social scientists usually earn substantially less than men of comparable age, experience, and level of education.

Many social scientists have some income in addition to their regular salaries. Summer teaching is the principal source of such income in all fields, but consulting work is an important source of

income for economists, political scientists, and sociologists. Income from royalties is a more common source of supplementary earnings for historians. Social scientists regularly employed by colleges and universities are the group most likely to have additional earnings.

Where To Go for More Information

Additional information on employment opportunities in the social sciences and related fields is given in the following publications:

Anthropology As A Career, Smithsonian Institution, Washington, D.C., 20560. Price 20 cents.

The Foreign Service Office, U.S. Department of State Publication 7533, Washington, D.C., 20520. Free.

Overseas Assignments, Agency for International Development, Washington, D.C., 20523. Free.

Information on the respective branches of social science and on public administration may be obtained from the following professional organizations:

American Anthropological Association, 1530 P St. NW., Washington, D.C., 20005.

American Economic Association, Northwestern University, Evanston, Ill., 60201.

American Historical Association, 400 A St. SE., Washington, D.C., 20003.

American Political Science Association, 1726 Massachusetts Ave. NW., Washington, D.C., 20036.

American Sociological Association, 1755 Massachusetts Ave. NW., Washington, D.C., 20036.

American Society for Public Administration, 6042 South Kimbark Ave., Chicago, Ill., 60637.

Anthropologists

(D.O.T. 0-36.01)

Nature of Work

Anthropologists study primitive and civilized man—his origin, physical characteristics, customs, languages, traditions, material possessions, and social and religious beliefs and practices. Although the smallest group of the social scientists, anthropologists cover the widest range of subject matter.

Most anthropologists specialize in cultural anthropology—usually archeology or ethnology.

Archeologists excavate the places where earlier civilizations are buried in order 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 river valley along the Rio Grande 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 their ways of life at first hand. The ethnologist takes detailed and comprehensive notes describing the



Courtesy of Smithsonian Institution

Anthropologists conduct research among Wai Wai Indians in British Guiana

social customs, beliefs, and material possessions of the people, usually learning their language in the process. He may also make comparative studies of the cultures and societies of various groups. Some cultural anthropologists specialize in *linguistics*, the scientific study of the sounds and structures of languages and of the historical relationships among languages.

A few hundred people specialize as *physical anthropologists*. These 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 are occasionally employed as consultants on such projects as the design of more comfortable space suits and cockpits for astronauts.

The principal function of anthropologists is college teaching, which in some schools may include the teaching of sociology or, less often, geography, as well as anthropology. Research and

report writing are the major activities of a substantial number of anthropologists, including a large proportion of those employed in government and nonprofit organizations, as well as a good many in the teaching field. Others specialize in museum work, which generally combines management and administrative duties with field work and research on anthropological collections. A few are engaged primarily in consulting, nontechnical writing, or other activities.

Where Employed

About 1,500 people were employed as anthropologists in 1962. About a fifth of them were women—a higher proportion than in any other social science field. The great majority are employed in colleges and universities. The Federal Government employed a considerable number, mainly in museums, in Government-supervised areas such as parks, and in technical aid programs. The Government agencies which employed the largest number of anthropologists were the Smithsonian Institution and the National Park Service. Many other Government agencies, including the Departments of Defense and of Health, Education, and Welfare, employed some members of the profession mainly as consultants. State and local government agencies also employed some anthropologists, usually for museum work on health research. A few were employed in private industry and nonprofit organizations.

Training and Other Qualifications

Young people who are interested in careers in anthropology should obtain Ph. D. degrees. College graduates with bachelor's degrees can obtain only 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 those with the Ph. D. degree. In many colleges, and most universities, only anthropologists holding the Ph. D. degree can obtain a permanent teaching appointment.

Some training in physical anthropology, archeology, and ethnology is necessary for all anthro-

polo­gists. Courses in linguistics (the scientific study of language) are also valuable and are required for certain areas of work. A knowledge of mathematics is increasingly important since statistical methods and high speed computer technology are becoming more widely used 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 supervisory positions in charge of the digging or collection of material and may finally take charge of a portion of the work of the expedition. Beginning ethnologists and linguists (as well as experienced ones) 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.

The choice of a graduate school is very important, since the beginning anthropologist usually gets his first job through the university from which he receives his advanced degree. Students interested in museum work should select a school which can provide experience in an associated museum having anthropological collections. Similarly, those interested in archeology should choose a university which offers opportunities for summer experience in archeological field work or should plan to attend an archeological field school elsewhere during their summer vacations.

Employment Outlook

Expanding employment opportunities for anthropologists are anticipated during the remainder of the 1960 decade. The number employed in colleges and universities will probably rise substantially. Employment outside the teaching field will also increase but at a much slower rate. Some of the additional opportunities will be in museums and archeological research programs. Others will be in the field of mental and public health, in other community survey work and in foreign affairs. Hiring in other fields is likely to be limited largely to the replacement of personnel retiring or vacating their positions for other reasons.

Anthropologists holding the doctorate will have very good employment opportunities throughout the 1960's. Since the number of new Ph. D.'s is expected to remain below the demand during this period, employment opportunities will also 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 qualify for 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. (Information on Earnings and Where To Go for More Information is given at the beginning of this chapter.)

Economists

(D.O.T. 0-36.11)

Nature of Work

Economists study man's activities devoted to satisfying human wants. They are concerned with the problems which arise in utilizing limited resources of land, raw materials, manpower, and manufactured products so as to meet, as well as possible, people's many unsatisfied wants. 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 exchanged, produced, distributed, and consumed. Some econo-

mists are concerned with such practical problems 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 are employed principally as teachers in colleges and universities, as research workers in government agencies and, to a lesser extent,

in private industry and nonprofit research organizations. Those employed as college teachers guide students in learning the basic principles and methods of economics and also frequently engage in writing, lecturing, or consulting activities. They do much of the research on basic problems in economic theory and formulate many of the new theories and ideas which directly or indirectly influence economic thought in industry and government.

Most economists in the Federal Government are specialists in agricultural, business, labor, or fiscal economics, or in international trade and development. They may plan and carry out studies involving the collection of basic data in these fields, use these and other data to analyze the need for changes in government policy, assess the economic position of the Nation, write reports on their findings, and sometimes present these reports before policymaking bodies. In addition, many people with training as economists are employed by the Federal Government as statisticians, foreign affairs specialists, intelligence specialists, and in administrative and other positions where a background in economics is important.

Economists employed by large business firms, including banks and other financial institutions do research and, in many cases, also have some administrative and consultative duties. They may concentrate on problems relating to domestic business conditions, markets and prices of company products, government policies affecting business, or international trade. Their main purpose is to provide management with information to be used in making decisions on problems such as the timing of new financing or the advisability of expanding the company's business by adding new lines of merchandise or by opening branch plants in new areas.

Where Employed

Economics is the largest of the basic social science fields. About 20,000 people were employed primarily as economists in 1962. Of this number, about half were employed by colleges and universities; approximately a third worked for government agencies—chiefly Federal. A small but growing number are employed by private industry and some serve in private research agencies

and community organizations. A few are self-employed, acting as consultants, mainly to business firms.



Economist uses charts in explaining employment projections

Economists are to be found in nearly all cities and university towns. The largest group, however, are in the Washington, D.C., area where most of those in the Federal Government are located. A good many American economists are employed in foreign countries, mainly by the U.S. Department of State and the Agency for International Development.

Most economists in private industry are employed in the home offices of large corporations which are located chiefly in big cities—above all, New York City and Chicago. These two cities also have the largest concentrations of economists in nonprofit research organizations.

Training and Other Qualifications

All economists must have a thorough grounding in economic theory, economic history, and methods of economic analysis, including statistics. An increasing number of universities emphasize the value of mathematical methods of economic analysis and require candidates for graduate courses in such methods to be well trained in mathematics, including calculus.

A bachelor's degree with a major in economics is sufficient for many beginning research jobs in government and private industry, although persons employed in such jobs are not always re-

garded as professional economists. In the Federal Government, candidates must have a minimum of 21 semester hours of economics and 3 hours of statistics, accounting, or calculus for entrance positions.

Since beginning jobs are ordinarily concerned mainly with the collection and compilation of data, a thorough knowledge of statistical procedures as well as economics is usually required. Industrial and business firms often hire young people with the bachelor's degree in economics as management trainees and rotate them through various departments to acquaint them with company activities. Whether or not the employee is finally assigned a job which makes specific use of his training in economics depends largely on the needs of the company.

The master's degree is generally required for appointment as a college instructor, though graduate assistantships may be awarded to outstanding 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 to the position of instructor. In government or private industry, economists with the master's degree can usually qualify for more responsible research positions than are open to those with 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.

Economists interested in overseas assignments will find broad training in other social sciences, as well as advanced training in economics, very helpful. For most positions with the U.S. Department of State and the Agency for International Development, considerable experience is also required.

The choice of a graduate school is very important for people planning to become economists. Students interested in research should select schools which emphasize training in research methods and statistics and provide good research facilities, including opportunities for practical experience. Those who wish to work in the field of agricultural economics will find exceptional opportunities for part-time research work at State universities having agricultural experiment stations. Professors and chairmen of economics

departments do much of the placement of beginning economists in teaching positions and in positions in industry and nonprofit research organizations.

Employment Outlook

Employment opportunities for well-qualified economists will continue to increase rapidly during the remainder of the 1960's, especially in the college teaching field. Colleges and universities will need hundreds of new instructors annually to handle rapidly increasing college enrollments and to fill positions vacated because of retirements, deaths, or transfers to other fields of work. In other fields of employment, opportunities are likely to increase more slowly. However, many economists are likely to be required annually to meet expansion and replacement needs in industry, government, and nonprofit organizations. Private industry is expected to employ a growing number of economists, as businessmen become more accustomed to relying on scientific methods of analyzing business trends, forecasting sales, and planning purchasing and production operations. The growing interest in improving the quality of "economics" instruction in the Nation's high schools may also contribute to the overall demand for economists. Employment of economists in State and Federal Government is likely to increase somewhat to meet the needs of government and industry for more extensive data collection and analysis as a guide to policy planning.

Economists with the doctorate are expected to have excellent opportunities for employment. The number of new Ph. D.'s is likely to be considerably less than the number of new college instructors needed during the 1960's. As a result, employment opportunities for economists with a master's degree will also be very favorable, especially if they have good training in statistics and mathematics. Those with only a bachelor's degree will probably continue to find good opportunities for employment in government agencies, provided they have completed a substantial number of courses in economics and statistics. In other areas of employment, holders of the bachelor's degree will continue to face considerable competition for employment as economists. (Information on Earnings and Where To Go for More Information is given at the beginning of this chapter.)

Historians

(D.O.T. 0-36.91)

Nature of Work

Historians study the records of the past and write books and articles describing and analyzing past 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. Some are experts in such areas as the development of various types of transportation (trains, cars, aircraft); others in art, architecture, or other objects 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, usually 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 and 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.

Where Employed

An estimated 9,000 to 10,000 persons were employed as historians in 1962. This estimate does not include high school history teachers, who are usually classified as teachers rather than as historians although some have had considerable training in history.

Approximately 80 percent of the historians were employed in colleges and universities. Slightly less than 10 percent were employed in Federal Government agencies, principally the Na-

tional 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 and Other Qualifications

Graduate education is usually necessary for qualification as a historian. The master's degree in history is the minimum requirement for appointment to the position of college instructor, but in many colleges and universities, the Ph. D. degree is necessary for appointment. The doctorate 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 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 of 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 of historians is expected to continue to increase substantially during the 1960 decade, chiefly in college teaching. Hundreds of new instructors will probably be needed annually

to teach new classes made necessary by expanding enrollments, and to replace those who retire, die, or leave for other types of work. The number of positions for historians in archival work is also expected to rise, though 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 with doctorates are expected to have very good employment opportunities throughout the 1960 decade. Historians who have completed all the requirements for the Ph. D. except the dissertation are also expected to have favorable opportunities. However, those with no work beyond

the master's degree will probably encounter considerable competition for professional positions. College graduates with 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 a good many openings in high school teaching. Some will also be able to qualify as trainees in administrative and management positions in government agencies, nonprofit foundations, civic organizations and, more rarely, in private industry. (Information on Earnings and Where To Go for More Information is given at the beginning of this chapter.)

Political Scientists

(D.O.T. 0-36.96)

Nature of 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 political scientists specialize in public administration, in American Government, or in international relations. Smaller numbers specialize in such fields as public law, history of political ideas, political parties, public opinion, and area studies.

Political scientists are most frequently employed as college teachers, sometimes teaching other social sciences as well as political science. They may combine research, consultation, or administrative duties with their 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. A good many political scientists are engaged mainly in research. They may make surveys of public opinion on political questions for private research organizations. They may make studies of proposed legislation for State or municipal legislative reference bureaus or congressional committees to determine whether the legislation is well drafted and constitutional. They 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 in all fields of work. For example, they may be employed as budget analysts, as personnel directors or assistants, as city planners or managers, as legislative aids to congressmen, and as staff members of congressional committees.

Where Employed

Probably between 10,000 and 15,000 people were employed as political scientists in 1962, largely in colleges and universities or in government agencies. Fewer than 10 percent work for other types of employers such as municipal and other 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 widely taught. Most other political scientists are located in Washington, D.C., and in other large cities, or in State capitals. A good many are employed in overseas jobs, mainly by the U.S. Department of State, the Agency for International Development, and the U.S. Information Agency.

Training and Other Qualifications

Graduate training is generally required for professional employment in political science. College graduates with a master's degree in public administration can qualify for various administrative and research positions in government and in

nonprofit research and civic organizations. Over 80 colleges and universities offer graduate degrees in public administration. The college programs cover a wide range of subjects—for example, international administration, city planning, municipal administration, criminal investigation, and social security administration. A majority of these schools provide field training, and many offer internships which enable the student to obtain experience in government work. A good 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. However, for some Government jobs, such as those with the Agency for International Development, only persons with substantial experience (preferably in public administration) are hired.

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 is generally required for advancement to the position of professor.

Some young people with only a bachelor's degree in political science qualify as trainees in public relations or research work or in jobs, such as budget analyst, personnel assistant, or investigator in government or industry. However, they must compete for these jobs with college graduates majoring in many other fields, particularly those with majors in business administration, accounting, economics, and other social science specialties. A great many students with the bachelor's degree in political science go on to study law; many others obtain graduate training in public administration, international relations, or other specialized branches of political science.

Employment Outlook

Employment of political scientists is expected to continue to increase rapidly during the 1960 dec-

ade. The largest increase will be in colleges and universities. However, the number of political scientists in administrative jobs in government agencies will probably rise also because of a growing recognition of the value of specialized training. Government agencies concerned with foreign affairs will continue to employ a good many political scientists. A slow growth is anticipated in employment of political scientists in private industry. No substantial change is foreseen in the number of political scientists in other types of work.

Many more political scientists will be needed to fill positions vacated because of retirements, deaths, or transfers to other fields of work. Altogether, colleges and universities may need 400 to 500 new political scientists annually during the 1960's, both to fill new positions and to meet replacement needs. Government agencies will need several hundred more each year.

Political scientists with the doctorate 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 others with the master's degree will be more limited, but many 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 with only the bachelor's degree, opportunities for professional employment in the political science field will probably 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 enter high school teaching. (Information on Earnings and Where To Go for More Information is given at the beginning of this chapter.)

Sociologists

(D.O.T. 0-36.31)

Nature of Work

Sociologists study the many groups which man forms—families, tribes, communities, villages, and States, and a great variety of social, religious, professional, 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 particular kinds of social groups and institutions; others are more interested in the ways in which individuals are affected by groups to which they belong. Many sociologists specialize in the study of 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 sociologists concentrate on research methodology or the conduct of surveys. Growing numbers are concerned with the application of sociological knowledge and methods in the areas of penology and correction, education, public relations in industry, and regional and community planning. Some specialize in medical sociology—studying the social factors which affect the fields of mental or public health or the problems of hospital administration. The topics in which sociologists specialize are too many and varied to be fully listed here.

Most sociologists are college teachers, but, as a rule, these teachers also do research work. In addition, many sociologists are employed full time in research by government agencies, research bureaus connected with universities, welfare agencies, other nonprofit organizations, and large companies.

Sociological research may involve the collection of data (often through personal interviews), the preparation of case studies, testing, 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, alcoholism, poverty, and de-

pendency—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 show the trends in population, 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. Some sociologists specialize in conducting surveys, either those which add to basic sociological knowledge or those in such applied fields as public opinion research, marketing, and advertising research. Still others are specialists in the use of mass communication facilities, including radio, television, newspapers, magazines, and circulars.

Sociologists are frequently administrators—supervising research projects or the operation of social agencies, including marriage and family clinics. Some people with sociological training are recreation workers, case workers, prison inmate classification officers, or probation and parole officers. Other sociologists act as 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.

Where Employed

It is roughly estimated that about 7,000 or 8,000 persons were professionally employed as sociologists in 1962. Numerous other persons were employed in positions requiring some training in this field, including many in social, recreation, and public health work.

Approximately three-fourths of the sociologists—people in research and administrative positions, as well as teachers—are employed in colleges and universities. About one-tenth are in Federal, State, local, or international government agencies; the remainder work 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 staff of medical colleges and 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, because they are likely to have exceptional 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.

Training and Other Qualifications

At least a master's degree with a major in sociology is usually required for employment as a sociologist. The Ph. D. degree is frequently required for employment in the better positions and virtually always for the most responsible positions.

Young people with only a bachelor's degree in sociology are not considered qualified for professional employment 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. A good many are employed as case workers, counselors, recreation workers, or administrative assistants in public and private welfare agencies. As a rule, however, welfare agencies prefer persons with specific training in social work. Sociology majors with sufficient training in statistics may obtain positions as beginning statisticians. Those who meet local certification requirements may enter high school teaching.

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 also qualify for some college instructorships. Most colleges, however, will 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 can often get teaching or research assistantships which will provide both financial aid and valuable experience.

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.

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 provides 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 continue to increase substantially during the remainder of the 1960's. The majority of new positions will be in college teaching. Expanding college enrollments will account for most of these new positions; however, some will result from the growing trend toward including sociology courses in the curriculums of other professions, such as medicine, law, and education. Perhaps as many as 300 new sociology teachers will be needed each year, on the average, to fill new positions and to replace college faculty members who leave the profession. A moderate rise in the number of sociologists in nonteaching fields is also anticipated.

Sociologists well trained in research methods and advanced statistics will have the widest choice of jobs. Employment opportunities are expected to be better than average for research workers in rural sociology, community development, population analysis, public opinion research, and in various branches of medical sociology. Employment opportunities will also increase markedly in

other applied fields, such as the study of juvenile delinquency and education. A few openings are anticipated in the new area of the sociology of law.

The number of sociologists with the doctor's degree is expected to rise less rapidly than demand during the remainder of the 1960'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. (Information on Earnings and Where To Go for More Information is given at the beginning of this chapter.)

THE CLERGY

The choice of the ministry, priesthood, or rabbinic 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 should understand also that the civic, social, and recreational activities of clergymen are often 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 inhabitants and their 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. A sharp rise in church and synagogue membership has occurred since 1940. About 116 million people were members of organized religious groups in 1961—representing 63 percent of the total population, whereas in 1940, slightly less than half the population belonged to religious groups. In addition to those who serve congregations, many clergymen teach in seminaries and other educational institutions, serve as missionaries, and perform various other duties in meeting their religious responsibilities.

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 will 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 most 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 often 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 are frequently 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 which 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. 0-08.)

Nature of 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 other talks, instruct people who are to be received into membership of the church, perform marriages, and conduct funerals. They counsel individuals who seek guidance, visit the sick and shut-in, comfort those who are bereaved, and serve their church members in many other ways. Protestant ministers may also write articles for publication and engage in interfaith, community, civic, educational, and recreational activities sponsored by or related to the interests of the church. A few clergymen teach in seminaries, colleges, and universities.

The types of worship services which ministers conduct differ among Protestant denominations and also among congregations within a denomination; in some denominations, ministers follow a traditional order of worship, whereas in others they adapt the services to different occasions. Most of these 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 close 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.

Where Employed

In 1961, about 225,000 people were serving as ministers of churches, composing over 225 Protestant denominations or other groups. In addition, thousands of ordained clergymen were in other occupations—many closely related to the ministry.

The greatest number of clergymen are affiliated with the four largest groups of churches—Baptist, Methodist, Lutheran, and Presbyterian—to which about 7 out of every 10 of the 64 million Protestant church members belong. 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 addition, 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 the religious needs of two or more congregations in different communities. 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 ministry has a wider range than that for most professions. Some religious groups have no formal educational requirements, and others ordain persons who have received varying amounts 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 theology following college graduation. After completion of such a course in a theological school, the degree of bachelor of divinity or sacred theology is awarded.

Eighty-one of the many theological institutions in the Nation in early 1963 were accredited by the American Association of Theological Schools. Accredited institutions admit only students who have received the bachelor's degree, or its equivalent.

lent, 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 should take courses also in the natural and social sciences, religion, and foreign languages. The standard curriculum recommended for accredited theological schools divides the course of studies into four major fields: Biblical, historical, theological, and practical. There is a trend toward adding 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 or more years of additional study.

In general, each large denomination has its own school or schools of theology which 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 personal qualifications which most denominations seek in a candidate for the ministry are a deep religious conviction, a sense of dedication to Christian service, a genuine concern for and love of people, a wholesome personality and high moral and ethical standards, and a vigorous and creative mind. Because of the demands of the ministry, good health is a valuable asset.

Persons who have met denominational qualifications for the ministry are usually ordained following graduation from a seminary. In denominations which do not require seminary training, clergymen are ordained at various 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 which have a well-defined church

organization—often are requested to serve in positions of great administrative and denominational responsibility.

Outlook

Shortages of Protestant ministers have persisted for many years and are likely to continue throughout the middle and late 1960's. However, not all Protestant denominations will have equal difficulty in filling vacant pulpits. Some denominations will probably have a sufficient number of people who are qualified to serve as ministers. Generally, those denominations which require many years of formal training to qualify for the ministry are having the greatest difficulty in filling the needs of all their churches, and this situation is likely to persist. The number of students graduated annually from Protestant theological schools probably will not be sufficient to replace the thousands of ministers who retire or die each year, to meet the needs of newly established congregations, and to supply assistant ministers where needed.

Many congregations—mainly those in rural areas—did not have a full-time ordained minister in 1963. Some had to rely on the services of theological students or lay persons or shared the services of a pastor with another congregation. Many large congregations were unable to fill openings for assistant ministers. In addition, ordained ministers were being sought for teaching positions; to serve in foreign missions, in relief work, and in religious educational activities; as chaplains in the Armed Forces; and in universities, hospitals, penitentiaries, and other institutions.

Over the long run, the total number of ministers needed by Protestant churches will probably become larger as a result of the expected increase in population and in the number of congregations. The greatest expansion is anticipated in the suburbs of large cities. The increasing opportunities for ministers in fields such as television and radio, youth and family relations work, the campus ministry, and religious activities including chaplaincies in institutions and industry, also point toward a need for additional clergymen. Replacement of those removed from the ranks by death, retirement, or other causes will also require

an ever-increasing number of newly trained ministers.

Where To Go for More Information

Young people who wish to enter the Protestant ministry should seek the counsel of a minister or

church guidance worker. Additional information on both the ministry and other church-related occupations are also available from many denominational offices. Information on admission requirements may be obtained directly from each theological school.

Roman Catholic Priests

(D.O.T. 0-08.)

Nature of Work

Roman Catholic priests attend the spiritual, moral, and educational needs of the members of their Church. Their duties include offering the Sacrifice of the Mass; hearing confessions; administering the Sacraments; visiting and comforting the sick; conducting funeral services and consoling survivors; counseling those in need of guidance; and assisting the poor. Priests give religious instruction at Mass in the form of a sermon. They have numerous other responsibilities to assure that all laws of the Church are fulfilled.

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 an evening visit to the local hospital or the hearing of confessions. In addition, each day priests spend several hours in prayer and reading their breviaries. 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 and the type of work to which they are assigned. 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 are members of religious orders—for example Jesuits, Dominicans, or Franciscans—and generally work as members of a community in specialized activities, such as teaching or mis-

sionary work, assigned to them by the superiors of the orders to which they belong.

Both religious and secular priests hold teaching and administrative posts in the 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 secular priests are primarily 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 in the foreign field.

Where Employed

About 56,000 priests served 43 million Catholics in the United States in 1962. There are priests in nearly every city and town and in many rural communities; however, the majority are in heavily populated metropolitan areas, where most of the Catholic population is located. 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. Many are stationed throughout the world as missionaries. 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.

Training and Other Qualifications

The course of study for the priesthood takes at least 8 years after graduation from high school. Most students take this training in theological

seminaries—first, in a minor seminary (usually for 2 years), then in a major seminary which offers 6 years of advanced training. In 1962, about 46,000 students, known as seminarians were enrolled in 545 seminaries in the United States. High school graduates with the desired scholastic background—an academic course, including Latin—can complete the minor seminary in 2 years and then advance to the major seminary. Elementary school graduates may enter the minor seminary where they complete their high school work before taking the 2 years of college level work. Courses include Christian doctrine, Latin, Greek, English, at least one other modern language, rhetoric and elocution, history, geography, bookkeeping, mathematics, natural sciences, and Gregorian chant.

At the major seminary, the first 2 years are devoted to the study of philosophy, scripture, church history, and the natural sciences as related to religion. During the remaining 4 years, the course of study 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 taken either at Catholic University of America (Washington, D.C.) or at the ecclesiastical 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, 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 loans to the students. Those in religious seminaries are often 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.

Outlook

A growing number of priests will be needed in the years ahead to provide for the spiritual and educational needs of the rising number of Catholics in the Nation. Although the number of seminarians has increased steadily in recent years, the number of ordained priests is not sufficient to fill the needs of newly established parishes and expanding colleges and other Catholic institutions, and to replace priests who die. Priests usually continue at their work longer than persons in other professions, but 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 with a shortage of priests. Continued expansion of such activities, in addition to the expected further growth in Catholic population, will require a steady increase in the number of priests, both in the next few years and over the long run.

Where To Go for More 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.

Rabbis

(D.O.T. 0-08.)

Nature of Work

Rabbis are the spiritual leaders of their congregations and teachers and interpreters of Jewish law and tradition. They conduct daily services and hold special services on the Sabbath and on holidays. Rabbis are customarily 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, supervising religious education programs, engaging in interfaith activities, assuming community responsibilities, and counseling individuals—are similar to those performed by clergymen of other faiths. Rabbis may also write for religious and lay publications, and teach in theological seminaries, colleges, and universities.

Rabbis serve congregations affiliated with 1 of the 3 branches of American Judaism—Orthodox (traditional), Conservative, or Reform (liberal). 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. Because of these differences, the format of the worship service and therefore the ritual that the rabbis use may vary even among congregations belonging to the same branch of Judaism.

Where Employed

About 4,600 rabbis served the 5½ million followers of the Jewish faith in this country in 1962. Most are Orthodox rabbis; the rest are about equally divided between the Conservative and Reform branches of Judaism. Most rabbis act as the spiritual leaders of individual congregations; some serve as chaplains in the Armed Forces, in hospitals, and in other institutions; others teach either full or part time in educational institutions; and others are employed in social welfare agencies

and in religious education work for such organizations as the Hillel Foundation.

Although rabbis serve Jewish communities throughout the Nation, they are concentrated in those States which have sizable Jewish populations, particularly, New York, California, Pennsylvania, New Jersey, Illinois, and Massachusetts.

Training and Other Qualifications

To become eligible for ordination as a rabbi, a student must complete the prescribed course of study at a Jewish theological seminary.

Entrance and training requirements depend upon the branch of Judaism with which the seminary is associated. The Hebrew Union College—Jewish Institute of Religion (Reform) and The Jewish Theological Seminary of America (Conservative) are the only seminaries that train rabbis for their respective branches of Judaism. Both schools 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 are normally 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 if the student has a strong background in Jewish studies; otherwise, the course may take as long as 6 years.

About 15 seminaries train Orthodox rabbis. These schools have programs of various lengths, all leading to ordination. At one of the larger Orthodox seminaries, well-qualified students who are college graduates may complete the rabbinic program in 3 years; however, students who are not college graduates may spend a longer period at this seminary and complete the requirements for the bachelor's degree at the same time they are pursuing the rabbinic course. Most Orthodox seminaries, however, do not require a college degree to qualify for ordination.

In general, the curriculums of Jewish theological seminaries provide students with a comprehensive grasp of all aspects of Jewish knowledge, in-

cluding the Bible and Talmud. Other courses include Jewish history, theology, pastoral psychology, and public speaking. The Reform seminary places less emphasis on the study of Talmud and offers a broad course of study that includes such subjects as human relations and Jewish religious education. Some seminaries grant advanced academic degrees in such fields 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, as assistants to experienced rabbis, or as chaplains in the Armed Forces. As a rule, the pulpits of large and well-established synagogues and temples are filled by experienced rabbis.

The choice of a career as a rabbi should, of course, be made on the basis of a fervent belief in the religious teachings and practices of Judaism and of 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 intelligent and able to write and speak effectively.

Outlook

The number of rabbis in this country will probably not be sufficient to meet the needs of all congregations and other organizations desiring their services in the middle and late 1960's. In the early years of the decade, many congregations—especially those located in States where there

are relatively few persons of the Jewish faith—were unable to secure the spiritual leadership of a full-time ordained rabbi and had to rely on the services of senior theological students and lay readers. Rabbis were also being sought to lead the many new congregations which had been organized in and around New York, Chicago, Los Angeles, Philadelphia, and Boston—where the majority of the Jewish population is concentrated.

The recent increases in Jewish religious affiliation and in the number of synagogues and temples seem likely to continue. Furthermore, an increasing demand for rabbis to work with social welfare and other organizations connected with the Jewish faith is anticipated.

Although the number of students graduating annually from the Jewish theological seminaries is expected to increase also, there will probably not be enough new graduates to replace the rabbis who retire or die, and to fill the openings which will be created by the formation of new congregations. Immigration, once an important source of supply of rabbis, is no longer significant. In fact, graduates of American seminaries are now in demand for Jewish congregations in other countries.

Where To Go for More Information

Young people who are interested in entering the rabbinate should seek the guidance of a rabbi. Additional information on how to prepare for service in the rabbinate of a particular branch of Judaism, including school admission requirements, may be obtained from each theological school.

BUSINESS ADMINISTRATION AND RELATED PROFESSIONS

People employed in the field of business administration are a large group and an extremely important one. The success or failure of a business enterprise probably depends more on how well its managers do their job than it does on anything else. Business managers are also one of the fastest growing groups in the country. Between 1958 and 1962, the number of salaried management workers increased more than three times as fast as the number of workers in all nonagricultural occupations combined.

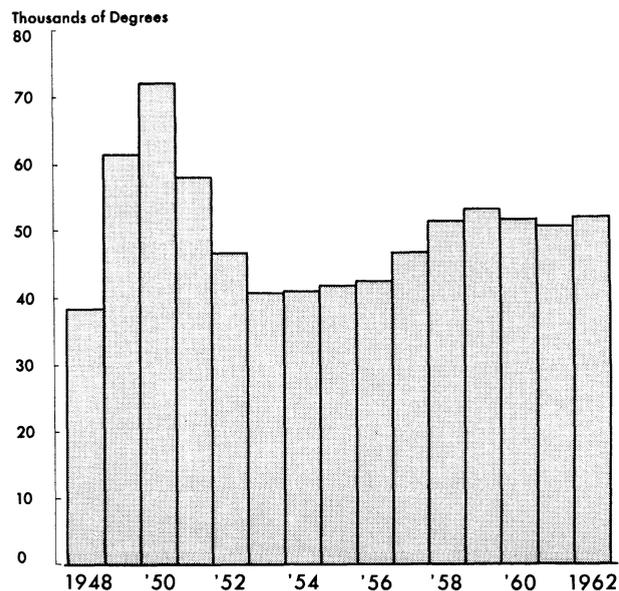
In 1962, there were about 3½ million people in salaried management positions with private firms. In addition, many more thousands were employed as supervisors, and as engineers and other professional specialists whose work involved managerial responsibilities.

Many management workers are college graduates who have taken their major courses in the field of business and commerce. In recent years the graduates in this field have exceeded 50,000 annually and have accounted for close to 15 percent of all bachelor's degrees awarded. This major field is second only to teacher training in numbers of degrees awarded, and exceeds those granted in such large fields as engineering, law, and medicine. Chart 19 shows the number of bachelor's degrees awarded in business and commerce since 1920.

Management workers do the same kinds of things that the owner of a small business does for himself to keep his business running, but on a much bigger scale. The man who runs a small television repair service, for example, may attempt to attract new customers through advertisements in local papers. The workers in charge of advertising household appliances produced by a large manufacturing company may use newspaper advertisements also, but their firm's advertisements are likely to be bigger and more elaborate and pub-

CHART 19

BACHELORS' DEGREES GRANTED IN BUSINESS AND COMMERCE



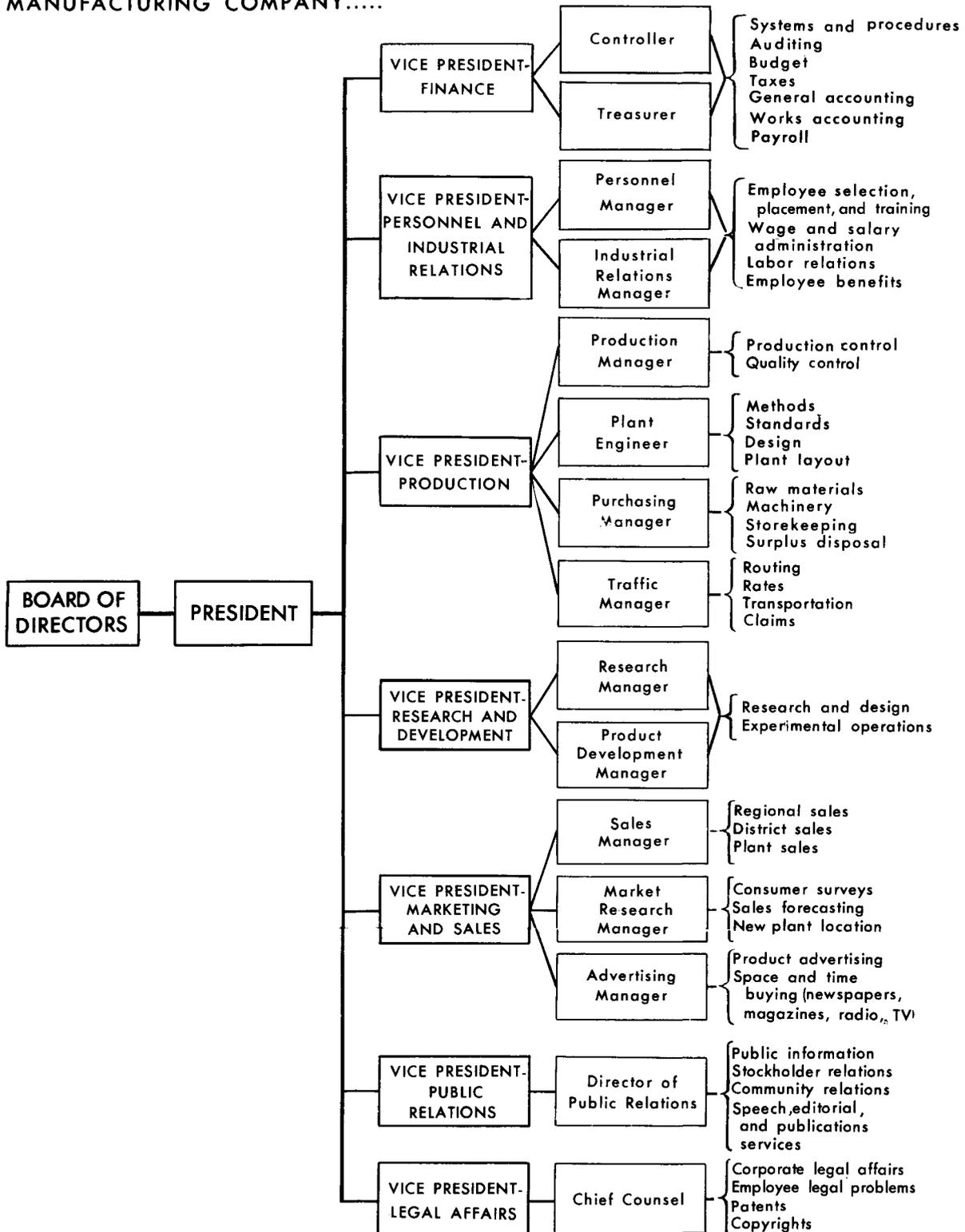
Source: U.S. Department of Health, Education, and Welfare, Office of Education.

lished in newspapers throughout the country. Their company's products will probably be advertised also through radio, television, and other channels. Similarly, the small businessman has, at most, only a few employees to direct, whereas the personnel workers in a large corporation must consider the welfare and productiveness of thousands of employees.

At the top of the management ladder are the corporation presidents, vice presidents, and other company officials. These people set company goals, coordinate company activities, and make the major decisions which establish companywide policies. In small companies, they may also carry through with the plans which they develop, tak-

CHART 20

SAMPLE ORGANIZATION CHART OF A LARGE MANUFACTURING COMPANY.....



ing direct charge of the work done in connection with store displays, financial reports, employee recreational activities, or other projects. In large corporations, however, the plans and policies developed by officials at the top are more likely to be carried out with the assistance of management workers in subordinate positions—the middle-level managers who direct the work of sales, accounting, personnel, engineering, and other departments. (See chart 20 illustrating how management functions might be organized within a large company.) Companies with branch plants and chain stores, have middle-level managers in charge of these operations as well. Some companies also have many supervisory positions which involve management responsibilities. Middle-level managers, as well as supervisors in positions of this kind, are responsible for keeping the units under their direction operating at peak efficiency and in accordance with the broad policies established for the company as a whole.

At the bottom of the management ladder are the beginners who are gaining experience which may later qualify them for management positions. Many are college graduates who have been recruited because their ability, personality traits, and training make them promising candidates for managerial work. Such trainees are placed usually in jobs where they have particularly good opportunities to become acquainted with the firm's business activities and policies. Some work as assistants to people in management positions, while others are given job assignments which are changed periodically so that they may have an opportunity to learn all phases of their employer's business operations. A limited number go through formal executive trainee programs.

The number of companies with formal management-trainee programs is still relatively small. Most people enter administrative jobs only after

several years of work experience, often with the same employer but in work unrelated to management. This kind of experience gives the manager-to-be an opportunity to acquire the knowledge of business practices and problems he will need. It also enables his employer to observe whether he possesses the maturity, judgment, and leadership qualities which are essential if he is to be effective in planning and directing company activities. Today, more and more employers are seeking to develop the qualities which make for successful management through company-sponsored training programs open to carefully selected groups of employees.

Increasing dependence on trained management specialists plus the economic growth which is anticipated point towards the likelihood that employment in this field of work will expand very considerably during the middle and late 1960's. In addition, new management-related occupations, such as hospital administrator and urban planner, are developing which will absorb certain management and planning functions formerly handled by others. Openings for newcomers will arise also because of the need to fill positions which become vacant as management workers retire or leave their jobs for other reasons. Altogether, the number of management positions in private industry which will have to be filled can be expected to reach 150,000 or more per year during the period 1963-70. Most of them will be filled by people who have already acquired a substantial amount of experience in other phases of their employer's operations or by outsiders with work experience related to the positions to be filled. Opportunities for many young people to start on the road to a career in business management will be provided, however, as the entry jobs farther down on the ladder are vacated by people who move up to better positions.

Accountants

(D.O.T. 0-01.)

Nature of Work

Accounting is the second largest field of professional employment for men. In 1962, approximately 450,000 accountants and auditors were engaged in professional accounting work, includ-

ing more than 75,000 certified public accountants (CPA's) who had passed rigorous examinations and met educational and experience requirements prescribed by law in their State. Fewer than 10 percent of all accountants, and 2 percent of the CPA's, were women.

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, private, and government accounting. Public accountants are independent practitioners who work on a fee basis for any business enterprise or individual wishing to use their services. Private accountants, often referred to as industrial or management accountants, handle the financial records of particular business firms for which they work on a salary basis. Government accountants work on the financial records of government agencies or audit the records of private business organizations and individuals whose dealings are subject to government regulation.

Accountants in any field of employment may specialize in such areas as auditing, tax work, cost accounting, budgeting and control, or systems and procedures. 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 private accountants do cost or other management accounting. Sometimes they specialize in tax work or in internal auditing—that is, examining and appraising financial systems and management control procedures in their companies. Many accountants in the Federal Government are employed as Internal Revenue agents, investigators, and bank examiners, as well as in regular accounting positions.

Where Employed

More than half of all accountants do private accounting work for the business and industrial firms where they are employed. Perhaps a third are engaged in public accounting as proprietors, partners, or employees of independent accounting firms. About 10 percent work for Federal, State, and local government agencies.

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 always an asset; for the better positions, especially in public accounting, it may be required. Candidates with a master's degree in accounting, as well as college training in other business and liberal arts subjects, are preferred by some large public accounting 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. Some previous work experience can be of great value also in qualifying for private 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.

All States require that anyone practicing in the State as a "certified public accountant" hold a certificate issued by the State board of accountancy. Well over half the States also restrict the title "public accountant" to those who are licensed or registered. Requirements for licensing and registration vary considerably from one State to another, and information on these requirements should be obtained directly from the board of accountancy in the State where the student plans to practice. Before the CPA certificate is issued, at least 2 years of public accounting experience, or its equivalent, is required in nearly all States. The States of New York, New Jersey, Florida, South Dakota, Connecticut, and Hawaii also require CPA candidates to be college graduates. Similar requirements will become effective in six more States during 1965, and in a number of additional States before the end of the decade. All States use the CPA examination provided by the American Institute of Certified Public Accountants. In recent years, more than 9 out of 10 successful CPA candidates have been college graduates.

Inexperienced accountants usually begin with fairly routine work. Junior public accountants

may be assigned to counting cash, verifying additions, or performing other detailed work. They usually advance to semi-senior positions in 2 or 3 years and to senior positions within another 2 or 3 years. In the larger firms, those successful in dealing with top executives in industry may eventually become supervisors, managers, or partners or transfer to executive positions in private accounting. Many become independent practitioners. Beginners in private accounting may start as ledger or cost clerks, timekeepers, junior internal auditors, or, occasionally, as trainees for technical and executive positions. They may rise to chief plant accountant, chief cost accountant, senior internal auditor, or manager of internal auditing, depending on their specialty, and some become controllers, treasurers, and even corporation presidents. In the Federal Government, beginners are hired as trainees and are usually promoted in a year or so. Although advancement may be rapid for able accountants, those with inadequate academic preparation are likely to be assigned to routine jobs and find themselves handicapped in obtaining promotion.

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 may have already 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 which affect their work. For example, more and more accountants are studying computer operation and programing methods so as to adapt accounting procedures to new methods of processing business data.

Employment Outlook

Employment opportunities for accountants, which were excellent at the beginning of 1963, are expected to continue to be very good for the remainder of the 1960's. As many as 10,000 accountants may be needed annually during this period to replace those who retire, die, or transfer to other occupations. Provided there is no major drop in the general level of business activity, at least as many more will be needed each year to fill new positions. Demand for college-trained accountants will rise faster than demand for people

without this broad background of training, because of the increasing complexity of business and its accounting requirements. Graduates of private business and accounting schools, however, should also have good job prospects during this period.

Over the long run, accounting employment is expected to expand rapidly because of several factors, including the greater use of accounting information in business management; complex and changing tax systems; the growth in size and number of business corporations which are required to provide financial reports to stockholders; and the increasing use of accounting services by small business organizations. Highly trained accountants will be in even greater demand as consultants to business managers in projects such as planning new recordkeeping systems and accounting procedures for use with electronic data-processing equipment.

Increasing numbers of women will be engaged in professional accounting, though most public accounting firms will probably remain reluctant to employ them—because of tradition and preferences expressed by individual clients, and because some types of travel and factory assignments are considered better suited to men than to women. However, those women who rank high among college graduates with accounting majors and who secure the CPA certificate will, in time, undoubtedly break down these barriers.

Earnings and Working Conditions

Starting salaries for new college graduates averaged about \$6,000 a year late in 1962, according to a private survey of over 100 large business organizations actively recruiting college seniors for accounting positions. Smaller firms, especially the small CPA firms, generally pay somewhat lower rates. Salaries of senior accountants with about 5 years' experience are generally about 50 percent higher than starting salaries; salaries of those with 10 years' experience are likely to be about twice as high as the beginning rate. Many certified public accountants who were in supervisory positions or were self-employed earned between \$10,000 and \$25,000 a year, according to the American Institute of Certified Public Accountants. A few who are partners in very large public accounting firms may earn as much as

\$100,000 a year. Chief accountants in other than public accounting firms averaged between \$10,000 and \$15,000 a year. In major industrial corporations, chief internal auditors earned from \$18,000 to \$28,000 a year, according to the limited data available. Those in managerial accounting positions, such as controllers and financial vice presidents, earned much more.

In the Federal Civil Service, the entrance salary for junior accountants and auditors was \$4,565 in early 1963. Some candidates with superior academic records could qualify for a starting salary of \$5,540. Many experienced accountants in the Federal Government made between \$9,000 and \$10,000 a year, and some, with administrative responsibilities, earned \$13,000 or more in 1963.

Public accountants are likely to work especially long hours under heavy pressure during the tax season. They do most of their work in their clients' offices, and sometimes do a considerable amount of traveling in order to serve distant clients. A few private and government accountants also do a great deal of traveling and work irregular hours, but the majority remain in one office and work be-

tween 35 and 40 hours a week, under the same general conditions as their fellow office workers.

Where To Go for More 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.

Financial Executives Institute,
2 Park Ave., New York, N.Y., 10016.

The Institute of Internal Auditors, Inc.,
120 Wall St., New York, N.Y., 10005.

A leaflet describing accounting as a career may be obtained free from:

The American Accounting Association, School of
Commerce,
University of Wisconsin, Madison, Wis., 53700.

Advertising Workers

(D.O.T. 0-81. and 0-06.94)

Nature of 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. Advertising workers, who plan and prepare these advertisements and get them before the public, are employed by many kinds of organizations. The largest groups are employed by advertising agencies, which prepare and handle advertising for other firms on a commission or service fee basis. The remainder work for manufacturing companies, stores, and other organizations having products and services to sell; for firms in the advertising media business, such as publishers, broadcasters, and outdoor advertising and direct mail organizations; and for printers, engravers, art studios, product and package designers, or

other firms which provide services to advertisers and advertising agencies.

In 1962, about 125,000 men and women were employed in professional or other positions requiring considerable knowledge of advertising, according to an estimate by the Advertising Federation of America. This total includes 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 see to the satisfactory reproduction of the "ads"; and salesmen who sell advertising space in publications or time on radio or 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, and sometimes have staff members who specialize in writing copy for

particular kinds of products or for one type of media such as radio, popular magazines, or direct mail. The specialized occupations most commonly found in advertising work are described next.

Advertising managers head the advertising departments of manufacturing companies and other advertisers and of newspapers and other media. Since most businesses use the services of advertising agencies to handle all or part of their advertising programs, the company's advertising manager works mostly on policy questions—for example, the type of advertising, the size of the advertising budget, and the agency to be employed. He then works with the agency in planning and carrying through the program. He may also 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 chiefly concerned with selling advertising time or space; his functions are similar to those of the sales manager in other businesses.

Account executives are employed in advertising agencies to 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 gets 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 they usually call on copywriters and artists to 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 directly responsible to agency heads.

Advertising copywriters create the headlines, slogans, and text that attract buyers. They collect information about the products and the people who might use them. They use their knowledge of 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 housewives, businessmen, scientists, or engineers—or even in copy which deals with specific products such as lipsticks or washing machines. In advertising agencies, copywriters work closely



Account executive and copywriter discuss advertising copy with client

with account executives, though they may be under the supervision of a copy chief.

Media directors (or space buyers and time buyers) are employed by advertisers or advertising agencies to determine where and when advertising should be carried in order 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 type of the reading or listening audience which can be reached in various parts of the country by specific publications, broadcasting stations, and other media.

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. (See index for page number.)

Production managers and their assistants arrange to have the final copy and art work converted into printed form. They deal with print-

ing, engraving, 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.

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 advertisements. More information about this group appears in the separate statements on Commercial Artists and on Photographers. (See index for page numbers.)

Where Employed

Perhaps a third of all advertising workers are employed in advertising agencies; more than half of these 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.

Large numbers of advertising workers employed by other types of employers—especially by advertising service and media firms—are also located in the New York and Chicago metropolitan areas. However, many are found in smaller cities throughout the country.

Training, Other Qualifications, and Advancement

Most employers, in hiring advertising trainees, prefer college graduates with liberal arts training or majors in marketing, journalism, or business administration. However, there is no typical educational background for success in advertising. Some successful advertising people have had no college training; others 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 is also 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 experience in copywriting or other work for their school publications and, if possible, through summer jobs in selling, interviewing, or other work 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 salesmen. A few begin as junior copywriters. In most advertising organizations, women begin as secretaries or, if they have the required education, as research assistants. The best avenue of entrance to advertising work for women is through advertising departments in retail stores.

Employees with initiative, drive, and talent may progress from beginning jobs to creative, research, or managerial work. For management positions, they should have 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 on satisfied advertisers. Many of these workers prefer to remain in their own specialties and for them advancement can be to more responsible work at increased pay. Some topflight copywriters and account executives set up their own agencies.

Employment Outlook

Young people who are very well qualified by experience and aptitude for advertising work will find good employment opportunities for the remainder of the 1960's. Those who are only moderately well qualified may find the advertising field a hard one to enter and an even harder one in which to advance.

Employment in advertising is expected to increase moderately during the remainder of the 1960 decade and over the long run because of anticipated increases in the volume of advertising. Among the factors that will contribute to the de-

mand for advertising workers are the overall growth of industry, the development of new products and services, and the increase in competition among producers of industrial and consumer goods. The growth in self-service in retail stores will also necessitate more advertising since, in the absence of salespeople, firms will find it increasingly important to advertise to attract customers to their products. In addition to those needed to fill new positions, several thousand advertising workers will be needed each year to replace those who transfer to other types of work, or who retire, die, or leave the field for other reasons. The greatest demand is likely to occur in advertising agencies, since the present trend is for advertisers to turn over more and more of their advertising work to agencies. The increase in employment of advertising workers in firms outside the agency field will probably be at a slower rate. As in the past, openings will occur in many cities and towns throughout the country, but are likely to be most numerous in New York City.

Earnings and Working Conditions

Starting salaries for beginning advertising workers ranged from \$60 to \$115 a week in 1962, according to limited information available. The higher salaries were most frequently paid in very large firms recruiting outstanding college graduates, and the lower salaries in stores and small advertising agencies.

Salaries of workers above the trainee level are also likely to be highest in the very large firms, according to a private survey. In advertising agencies doing a yearly business of \$2 million or

less, the annual salaries of copywriters ranged from \$3,200 to \$12,800 in early 1962; account executives' salaries ranged from \$4,500 to \$16,500 a year. In agencies doing an annual business of \$10 million or more, salaries ranged from \$4,500 to \$24,000 for copywriters and from \$12,500 to \$25,000 for account executives. Salaries reported for copy chiefs, account supervisors, and other top executive personnel were usually, but not always, substantially higher. According to another private survey, earnings of advertising managers in firms other than advertising agencies generally ranged from \$7,000 to \$21,000 annually. The wide spread in salaries reflects the great difference in experience, function, talent, and degree of responsibility among workers with the same job title.

Advertising workers frequently work under great pressure. Working hours are extremely irregular, because publication 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. The copywriter and the artist have the satisfaction of seeing their work in print or hearing it over the radio, even though they remain unknown to the public at large.

Where To Go for More Information

Advertising Federation of America,
655 Madison Ave., New York, N.Y., 10021.

American Association of Advertising Agencies,
420 Lexington Ave., New York, N.Y., 10017.

Industrial Traffic Managers

(D.O.T. 0-97.66)

Nature of Work

Traffic managers and their assistants arrange for transportation of raw materials, equipment, and finished products to and from industrial and business firms. It is their job to see that raw materials purchased and finished products sold are shipped in a way that will insure prompt and safe delivery and at the same time keep costs as low as

possible. 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—water, highway, rail, air, or pipeline—the route, and finally the particular carrier, or transportation company, which would be best to use for each shipment. (Traffic managers employed by railroads, airlines, truck-

ing firms, and other transportation companies, who are chiefly concerned with attracting business to their firms, are not covered by this statement.)

The duties of industrial traffic managers and their assistants 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 which 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, arrangements for transporting incoming goods may be made by the purchasing department—those for outgoing shipments, by personnel in the sales department. Employees 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 and their assistants must know about these and any other legal matters which apply to their companies' shipping operations. Some traffic managers represent their companies before ratemaking and regulatory bodies—such as the Interstate Commerce Commission, State Commissions, and local traffic bureaus—to request or oppose changes in rates, commodity classifications, or types of service provided by carriers.

Where Employed

Altogether, about 15,000 persons held jobs as industrial traffic managers in 1962. The majority were employed by manufacturing firms, although



Industrial traffic managers often must arrange a combination of transportation facilities to ship goods

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 it is still possible for persons with a high school education to qualify for traffic manager positions on the basis of previous experience, a college education is becoming increasingly important for those who want 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 persons with 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 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 status and recognition in traffic management work is "certified" membership in the American Society of Traffic and Transportation, Inc., which can be acquired by successfully completing the Society's examinations and meeting certain experience requirements.

Employment Outlook

A steady increase in employment in this occupation can be expected during the 1960's. Some large companies will probably 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 will probably be located in purchasing or sales departments and thus have different job titles.

Among the factors expected to contribute to the longrun 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 and more remote 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 with economies in shipping. Undoubtedly, there will be strong demand for specialists who know how to classify products so as to obtain the lowest possible freight rates, choose the carriers which are best able to handle

each shipment, and otherwise protect their companies from excessive shipping expenses.

Although college training will probably be emphasized increasingly for entry jobs, experience and demonstrated ability in the fields just indicated will remain the most important factors in qualifying for promotion, especially to high-level traffic management positions.

Earnings and Working Conditions

Young men with college degrees who started as business trainees in the traffic departments of large industrial firms often received annual salaries of about \$5,500 in 1962, according to the limited data available. Beginners with 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 \$500,000 annually was about \$8,500 in 1960, according to the limited information available. In companies where transportation costs ranged between \$4 million and \$10 million, the average was approximately \$15,000. In firms where these costs are still higher, some traffic executives earned considerably more than \$20,000.

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.

Where To Go for More Information

Young people interested in careers in industrial traffic management may consult with members of local traffic and transportation associations or they may write to:

The Associated Traffic Clubs of America,
4914 Bethesda Ave., Washington, D.C., 20014.

For information on the requirements for certification by the American Society of Traffic and Transportation, Inc., write to:

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

Marketing Research Workers

(D.O.T. 0-36.11)

Nature of Work

Marketing research workers are factfinders for businessmen. They seek out, analyze, and interpret the many different kinds of information which business executives need in order to make effective plans, such as those concerned with expanding operations, enlarging sales, improving methods of distributing goods and services, and increasing profits. Marketing researchers prepare reports and recommendations to help management make decisions on such widely differing problems as forecasting sales; estimating the potential demand for a new product; selecting a brand name, package, or design; choosing a new plant location; price setting, revising salaries and commissions of salesmen; deciding whether to move goods by rail, truck, or other methods of transportation; 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 pertinent to marketing policies.

Practically all 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. Research workers analyzing the fluctuations in a company's sales, for example, may first study sales records in a number of different cities, to determine periodical 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 take inventories of products stocked in warehouses, or make door-to-door surveys to learn how many company products are already used in households.

Marketing research is often concerned with the personal opinions of the people who are using company products or who might be likely to use them in the future. For example, a survey intended to help management decide on the design



Marketing research workers plan a survey

and pricing of a new line of cooking utensils may involve the use of a questionnaire to learn from a limited number of housewives the price they would be willing to pay and their preferences in such things as the color and size of the utensil and type of handle.

A survey of this kind is usually carried on 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 certain that the opinions obtained from them will be representative of the opinions held by the many other 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 housewives to obtain answers to the questions. He may also direct the work of the office employees who tabulate and analyze the information collected. His report summarizing the survey findings may also 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 marketing research worker not only tries to get opinions 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.

Where Employed

An estimated 10,000 to 15,000 people were employed full time as marketing research workers in 1962. This number included research assistants and others in junior positions, who helped experienced analysts collect information and prepare reports, as well as research supervisors and directors. The majority of these workers were men; positions held by women were, for the most part, 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 workers (clerks who coded and tabulated survey returns, typists, and others) were employed full time in this field. Thousands of other workers, many of them women, were employed on a part-time or temporary basis as survey interviewers. The great majority of the interviewers and a large proportion of the professional and clerical workers were employed on large-scale research projects dealing with consumer goods.

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 are also employed by very large stores, radio and television firms, and newspapers, and some work for university research centers, government agencies, and other organizations which provide information for businessmen. Marketing re-

search organizations range in size from one-man enterprises to large firms with hundreds of employees.

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 as well—wherever there are central offices of large manufacturing and sales organizations.

Training, Other Qualifications, and Advancement

Many people go into marketing research after having worked in other kinds of research jobs or having been employed in work related to the field of marketing. University teachers with experience in teaching marketing research or statistics are often chosen by employers to head new marketing research departments.

A college degree is usually required of people hired as trainees in marketing research. Marketing, statistics, English composition, speech, psychology, and economics are among the courses considered most valuable as preparation for this field of work. 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 assistants or junior analysts. At first, they are likely to do a great deal of 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 to write reports on survey findings.

After a few years of experience, assistants and junior analysts may advance to higher level posi-

tions, with responsibility 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 who are well trained in marketing research methods and statistics are likely to find very good job opportunities throughout the rest of the 1960's. Most of the openings expected to occur each year in this relatively small field of work will result from the need to replace people who retire, die, or leave the field for other reasons. Competition for top jobs is expected to be keen because of the growing supply of experienced people in the field.

Over the long run, the demand for marketing research services is expected to increase as the constant stream of new products sharpens competition for customers. Business managers will find it increasingly important to obtain the best information possible for appraising marketing situations and planning marketing policies. 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. It is anticipated, therefore, that existing marketing research organizations will expand and that many new marketing research departments and new independent research firms will be set up.

Earnings and Working Conditions

Starting salaries for marketing research trainees ranged from about \$375 to \$450 a month in 1962, according to the limited data available. People with master's degrees in related fields usually started at higher salaries.

Earnings are substantially higher for experienced marketing research workers who attain positions with considerable responsibility. For example, in 1959, earnings of marketing research directors averaged about \$10,000 yearly in firms with fewer than 1,000 employees and about \$14,000 in firms with more than 1,000 employees. In a few very large firms, their average earnings exceeded \$25,000 a year. Women in marketing research positions tend to earn less than men in comparable positions, and relatively few women advance to the top jobs.

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 connection with their work. They frequently work under pressure and for long hours to meet deadlines. Nevertheless, marketing research offers an opportunity for interesting and varied work to the individual who enjoys a challenging job.

Where To Go for More 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,
27 East Monroe St., Chicago, Ill., 60603.

Personnel Workers

(D.O.T. 0-39.81 through .88 and 0-68.70 through .78)

Nature of Work

Personnel workers are responsible for helping their employers hire good workers and assign them to work they can do effectively. Personnel workers may develop recruiting and hiring pro-

cedures, interview job applicants, and select and recommend the ones they consider best qualified for the openings to be filled. Some of these workers keep personnel records and prepare reports based on these records. In addition, they may

counsel employees, deal with disciplinary problems, classify jobs, plan wage and salary scales for different positions, develop safety programs, and conduct research in personnel methods. Employee training, the administration of retirement and other employee benefit plans, and labor relations—including negotiating agreements with unions—are also important aspects of their work. (Personnel workers in schools are discussed in the statement on School Counselors elsewhere in this *Handbook*.)

Many personnel jobs require only limited contact with people, whereas others involve frequent contact with employees, union representatives, job applicants, and other people in and outside the company.

Business organizations with large personnel departments employ personnel workers with many different levels of responsibility. Usually, the department is headed by an executive with the title of Personnel Director; other titles sometimes used are Industrial Relations Director, Labor Relations Director, or Employee Relations Director. The director formulates policy, advises other company officials on personnel matters, and administers his department. Within the department, supervisors and various personnel specialists—in labor relations, 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 and may have other duties as well.

Personnel workers do much the same kind of work in Federal, State, and local government agencies as in large business firms, and the personnel departments in government agencies are organized in much the same way as in private firms. Government personnel workers, however, spend considerably more time in activities related to classifying jobs than do personnel workers in private industry. Also, it is more common in government for personnel staffs to include people who devise, administer, and score the competitive examinations which are given to job applicants.

Where Employed

Personnel workers are employed in nearly all kinds of business enterprises and government agencies. The total number employed in early 1963 was estimated to be nearly 100,000. Well over half of all personnel workers are employed by private firms. The second largest number are employed by Federal, State, and local government agencies. A third and considerably smaller group of personnel workers are in business for themselves, often as management consultants or labor relations experts. In addition, a number of professionally trained personnel workers are employed in colleges and universities as teachers of personnel administration, labor relations, and similar subjects.

Most personnel workers are employed in large cities and in the highly industrialized sections of the country. About two-thirds of all personnel workers are men. Many women, however, are employed in personnel positions in organizations which employ large numbers of workers—for example, in department stores, telephone companies, very large companies, and government agencies.



Personnel director explains organization chart to his staff members

Training, Other Qualifications, and Advancement

A college education is becoming increasingly important for entrance into personnel work. In many companies and government agencies, new graduates are hired for junior personnel positions and then provided in-service training through programs to acquaint them with their employers' operations, policies, and problems. Other companies prefer to fill their personnel positions by

transferring people who already have firsthand knowledge of company operations—employees in administrative, sales, and other types of positions. A large number of the people now in personnel work who are not college graduates entered the field in this way.

College courses which provide good preparation for personnel work include personnel management, business administration, applied psychology, statistics, labor economics, political science, sociology, English, and public speaking. Many employers in private industry prefer college graduates with the specialized training provided by a major in personnel administration, while some prefer graduates with a general business administration background. Other employers consider a well-rounded liberal arts education the most desirable preparation for personnel work. Young people interested in personnel work in government are often advised to major in public administration, political science, or personnel administration; however, those with other college majors are also 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 labor relations. A background in accounting or law may be useful for positions concerned with wages, or pension and other employee benefit plans.

Some college graduates, when starting out in personnel work, learn what they need to know about their employer's operations and specific personnel procedures by taking part in formal training programs. Others begin as assistants to experienced personnel workers and learn on the job. After such initial training, they may be advanced to higher level work with responsibility for interviewing applicants, classifying jobs, and for other aspects of the personnel program. Eventually, after they have gained experience, those with exceptional ability may perhaps be promoted to executive positions such as that of personnel director. Personnel workers sometimes advance also

by transferring to other organizations with larger personnel programs or from a middle-rank position in a big corporation to the top job in the personnel department of a smaller one.

Personal qualities regarded as important for success in personnel work include the ability to speak and write effectively and more than average skill in 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 be able to give advice which is in the best interest of both. A liking for detail, a high degree of persuasiveness, and a pleasing personality are also important in this field of work.

Employment Outlook

A moderate number of opportunities for college graduates to enter personnel work is expected during the rest of the 1960's. However, competition for entry into professional positions is likely to be keen in many parts of the country. In general, employment prospects will probably be best for college graduates with specialized training in the field. 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 gradually over the long run. As employment rises in many fields of work, there will be a need for more personnel workers to carry on recruiting, recordkeeping, and related activities. Moreover, many employers are coming to recognize the importance of the "human factor" and to depend more heavily on the services of trained personnel workers to handle their employee relations. Employment in some specialized areas of personnel work is particularly likely to rise. Wider use will probably be made of psychological tests; employee training programs are likely to be expanded and adapted to new problems; the need for labor relations experts to handle relationships with unions will probably continue to increase. The growth of employee services, safety programs, pension and other benefit plans, and personnel research is also likely to continue. The expected increase in demand for trained workers should extend throughout the personnel field, al-

though it is likely to be most rapid in some specialized areas.

Earnings and Working Conditions

Beginning salaries averaged about \$5,500 in 1962 for men college graduates employed by large companies, according to reports from college placement directors. According to a national survey covering more than 1,800 job analysts, average annual salaries of job-analyst trainees employed in private industry were about \$6,100 in early 1962. Experienced job analysts who were responsible for very difficult kinds of work earned \$9,700 a year, on the average. According to the same survey which covered nearly 3,800 directors of personnel, the average annual salary reported for directors who worked in companies employing between 250 and 750 workers was \$8,800; those who worked in very large companies averaged over \$15,000 a year. Some top personnel and industrial relations executives in very large corporations earned considerably more.

In the Federal Government, inexperienced graduates with bachelor's degrees started at \$4,565 a year in early 1963; those with exceptionally good academic records, began at \$5,540. The entrance salary for graduates with master's degrees was

usually \$5,540 also, although for a few especially well-qualified people in this group it was \$6,675. The salaries paid many Federal Government personnel workers with administrative responsibilities and several years of experience in the field were around \$11,000 a year; some of these personnel workers, in charge of personnel for major departments of the Federal Government, earned \$16,000 or more a year.

Employees in personnel offices generally work 35 to 40 hours a week. During a period of intensive recruitment, or at the time of a strike or other 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 as do all professional employees in the organizations where they work.

Where To Go for More Information

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

The American Society for Personnel Administration,
Kellogg Center, East Lansing, Mich., 48823.

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. 0-06.97)

Nature of Work

Public relations workers are responsible for developing and maintaining public opinion favorable to the organizations which use their services. It is their job to be informed about the attitudes and opinions of customers, employees, and other groups which are important to the interests of their employers. They use the results of their investigations to help management build favorable public opinion.

Public relations workers often provide information about their employers' business for publication in newspapers and magazines, for broadcasting over radio and television, and for use by other channels of communication. They plan the kind of publicity which they believe will be most effective, contact the people who may be interested

in using it, and prepare and assemble the needed material. Many news items in the daily papers, human interest stories in popular magazines, and pamphlets giving information about the company, its services or industrial processes, and job opportunities have their start at public relations workers' desks. These workers may also play an important part in arranging speaking engagements for company officials, and sometimes write speeches for them to deliver. Often they participate actively in community affairs, serving as their employers' representatives during safety campaigns and other community projects; or they may arrange plant tours for visiting businessmen, school pupils, and other groups. Showing a film at a school assembly, staging a beauty contest, calling a press conference, and planning a conven-

tion may all be a part of a public relations worker's job.

All public relations workers tailor their programs to their employers' particular needs. In a business firm, the public relations worker is usually concerned with his employer's relationships with employees, civic organizations, and other community groups, as well as with such matters as promoting sales and with legislation.

Some public relations workers—for example, the press agent who handles publicity for an individual and the man who is in charge of a limited 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 their own planning and research, prepare their own material for publication, and otherwise carry out plans which have been decided on. Such public relations workers may be top-level officials or they may occupy positions farther down the management ladder. They may combine their public relations duties with responsibility for advertising or other managerial work.

In large firms with extensive public relations programs, staffs assigned to this work sometimes number 100 or more, and several levels of managerial responsibility may be involved. Responsibility for developing plans and policies may be shared between a vice president or other top executive who is responsible for the final decisions and the director (or manager) of a public relations department. In addition to the public relations department's writers, research workers, and other professional and clerical employees, there may be specialists in different kinds of public relations work—in preparing material for publication in the daily press, for example, or in writing reports sent to stockholders.

Where Employed

In 1962, there were an estimated 50,000 public relations workers in managerial and supervisory positions and probably an equal number in non-supervisory jobs. The number in jobs at the top (directors) was probably no more than a few thousand. Most public relations workers are men. An increasing number of women are entering public relations work, however, particularly in

department stores, hospitals, hotels, and restaurants.

The majority of public relations workers are employed by manufacturing firms, stores, public utilities, trade and professional associations, and labor unions. Others are in consulting firms which provide counsel and other kinds of public relations services to clients on a fee basis. In 1962, there were about 1,500 public relations consulting firms, as well as a number of advertising agencies which offered public relations services; and there were about 5,000 corporations which either used the services of consulting firms or had public relations staffs of their own.

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 consulting firms are either in New York City or in Los Angeles, Chicago, and Washington, D.C.

Training, Other Qualifications, and Advancement

A college education is generally regarded as the best preparation for public relations work, although employers differ in the specific type of college background they require of applicants. Some prefer graduates with 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.

Among the college subjects considered desirable as preparation 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 related fields of work.

Among the personal qualifications usually considered important for work in this field are initiative, drive, the ability to express thoughts clearly and simply—both in writing and orally—and creativity. 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 some related field.

Some companies—particularly those with large public relations programs for which they recruit and hire young men with outstanding college records as public relations trainees—have formal training programs for new employees. In other companies, new workers learn by working on the job under the guidance of experienced staff members. Beginners often start out maintaining files of material about the company and its activities, scanning newspapers and magazines for appropriate articles to clip, and doing the research needed in order 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—initiating and developing plans and maintaining the outside contacts which are so important in a successful program—is usually in the hands of the director of the department and his most experienced staff members. Some experienced public relations workers eventually open their own consulting firms, while others move on to better positions with other employers.

Employment Outlook

Employment opportunities are expected to expand moderately in this field during the rest of the 1960's. In addition to the new jobs created, as expanding business firms require the services of more public relations specialists, other openings will occur because of the need to replace workers who retire or leave their positions for other reasons.

Many of the positions which will have to be filled during the coming years will call for experienced public relations workers. They are likely to be filled mainly by people who have already done research, prepared material for publication, or handled other public relations assignments. As workers with this kind of experience are moved up to fill the public relations jobs that

become available, however, they will leave job vacancies farther down the line which will afford newcomers a chance to start and gain experience in the field. Jobs at the top are limited in number, however, and competition for them is keen.

Earnings and Working Conditions

Most trainees in public relations work in 1962 received starting salaries of about \$5,000 to \$7,000 a year, according to the limited data available. The highest starting salaries were paid chiefly to beginners who were employed by consulting firms in major cities and who were exceptionally well-qualified from the standpoint of educational background and previous work experience.

The salaries of experienced public relations workers are generally highest in large companies, where public relations programs are likely to be more extensive than elsewhere. According to the most recent information available (1959), the average (median) salary for privately employed public relations directors or managers was about \$19,000 a year in firms with an annual sales volume of more than \$200 million and about \$12,000 in those with a sales volume of less than \$100 million. Top officials such as vice presidents in charge of public relations earned from \$25,000 to \$50,000 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 the salaries paid public relations workers in other business organizations. In social welfare agencies and universities, salary levels tend to be somewhat lower.

The workweek for public relations workers is usually the same as for other officials in their organizations—35 to 40 hours. Irregular hours and overtime may often be necessary, however, to meet deadlines, prepare or deliver speeches, attend meetings and community functions, and make trips out of town. Sometimes, because of the nature of their regular assignments or because of special events, they may be on call on a round-the-clock basis with the workweek stretching to 6 or 7 days instead of the usual 5.

Where To Go for More Information

Public Relations Society of America, Inc.,
375 Park Ave., New York, N.Y., 10022.

Purchasing Agents

(D.O.T. 0-91.60)

Nature of Work

Purchasing agents and their assistants buy the raw materials, machinery, supplies, and services required by companies and organizations to carry on their operations. They are responsible for obtaining items and services at the lowest cost consistent with good quality and for seeing that supplies are on hand when needed.

The head of the purchasing department is usually called a purchasing agent, but he may have the title of vice president—purchasing, procurement or purchasing officer, director or manager of purchasing, or buyer. (“Buyers” in retail stores—people who select and purchase merchandise for resale to individual customers—are not included in this report.) In a large firm, the head of the purchasing department directs the work of a staff including assistant purchasing agents and various types of 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.



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

The purchasing agent receives order forms or requisitions from the various departments of the company. These requisitions list and describe needed items and include such information as required quantities and delivery dates. Since the agent can usually purchase from many sources, his main job is to select the seller who offers the best value. To do this, the agent or his staff members 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 requirements with respect to the specifications set up for the goods and date of delivery.

It is important for purchasing agents to develop good working relations with their suppliers, in order to get “rush” orders accepted, arrange for favorable terms of payment, and receive other considerations such as special packaging and prompt adjustment service. They must 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.

Where Employed

Well over half of the approximately 100,000 purchasing agents and closely related types of buyers employed in 1960 were in manufacturing industries. Large numbers were employed in government agencies—Federal, State, and local—and in wholesale and retail trade. Public utilities, transportation companies, and institutions (schools, colleges, universities, and hospitals), each 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 or more specialized buyers. Probably fewer than 10 percent of all purchasing agents and closely related types of buyers are women. Government agencies, hospitals, restaurants, and textile firms are the principal employers of women purchasing agents.

Training, Other Qualifications, and Advancement

Although employers differ greatly in the qualifications required for purchasing personnel, it is evident that a college degree is becoming increasingly important for promotion to a high-level purchasing position. Many employers prefer graduates of schools of business administration or engineering who have had courses in accounting, economics, and purchasing. A few require graduate training in business administration. On the other hand, many firms give great weight to experience with the company and select purchasing workers from among their own personnel.

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-type 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 stock, or providing proper storage facilities. He may then 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 buyer or assistant purchasing agent, and then to full-fledged 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 good during the rest of the 1960's for well-qualified young people to enter and advance in purchasing occupations. Demand is expected to be strong for graduates of schools of business administration, who have had courses in purchasing. Demand is also expected to be above average for graduates with a good background in engineering and science to fill jobs in purchasing departments of firms that manufacture complex machinery, chemicals, and other technical products. Graduates with degrees from liberal arts colleges will 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 tend to decrease. They will also be at a competitive disadvantage for jobs which involve the development of scientific methods for materials management or purchasing-related activities such as inventory control, including the use of electronic data-processing equipment.

Some of the major factors which point toward a rising demand for purchasing agents and their assistants over the long run, 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 function. Many job opportunities will result from 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 for men college graduates hired as trainees in purchasing departments of large firms averaged about \$5,500 in early 1962.

According to the most recent information available (1959), average (median) annual salaries of experienced purchasing agents ranged

from \$8,400 in firms with an annual volume of purchases under \$3 million to \$15,300 in firms with purchases amounting to more than \$30 million. Some top purchasing executives earned \$25,000 to \$50,000.

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 outside the regular hours to attend meetings, prepare reports, visit suppliers' plants, or travel. Purchasing

department employees usually receive the same holidays, vacations, and various benefits as other workers in the company.

Where To Go for More Information

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

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

THE PERFORMING ARTS

The performing arts include music, acting, and the dance. The interest in and attraction of careers in this field are so great that the number of first-rate artists seeking employment is generally much larger than the number of full-time employment opportunities available. As a result, many performers supplement their incomes by teaching, and others have to 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, therefore, consider the possible advantages of making their art a hobby rather than a field of work. Aspiring young artists must usually spend many years in intensive training and practice before they are ready for public performances. A person needs not only great natural talent but also determination, a willingness to work long and hard, and an overwhelming interest in his chosen field—a love for it so great that,

despite all obstacles he would rather work in it than in any other occupation.

The statements which follow this introduction give detailed information on the instrumental musician, singer, actor, and dancer as performing artists and in related work. Many men and women with an interest and talent in music are also employed as directors of church choirs or school choruses or as orchestra or band conductors. A few with great creative talent work chiefly as composers of music. Other musicians arrange or adapt melodies for orchestras or bands; still others (copyists) copy parts for individual instruments from the musical scores written by arrangers. Similarly, a few people with ballet training and originality work as choreographers, who design new ballets or other types of dance performances, and some are dance directors. Another small field of employment, to which people with executive ability and a knowledge of acting and of production problems can sometimes progress, is that of directing or producing stage, television, or motion picture productions.

Musicians and Music Teachers

(D.O.T. 0-24.12 and 0-24.31)

Nature of Work

Professional musicians—whether they play the piano, violin, or trumpet in a symphony orchestra, dance band, or “jazz combo”—have behind them many years of study and intensive practice. Although most musicians play only one instrument, many are qualified to play two or more—for example, the saxophone and clarinet, oboe and English horn, or piano and organ. As a rule, musicians also specialize in either classical or popular music; only a few play both types professionally.

In a symphony orchestra, 85 to 100 or more musicians play together under the direction of a conductor. About half the musicians in the orchestra play the strings—violins, violas, cellos,

and double basses. Smaller numbers play the brass—trombones, trumpets, French horns, and tubas; and the woodwinds—oboes, flutes, piccolos, clarinets, English horns, and bassoons; and a few play the drums, cymbals, and other percussion instruments. Usually the orchestra also has among its members a pianist and one or two harpists. Each orchestra player has attained great technical skill in playing his particular instrument, and they play together with great precision. The musicians in the “first chairs”—the leading players of each kind of instrument—are especially fine artists and can play any solos called for by the parts for their instruments.

Musicians trained in classical music also play in opera and theater orchestras and for other

kinds of performances needing orchestral accompaniments. Some form small groups—a string quartet or a trio (made up of a violinist, a cellist, and a pianist, for example)—which give concerts of chamber music. Many pianists serve as accompanists for 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 as well as playing the organ. A very few exceptionally brilliant and well known musicians—chiefly pianists and violinists—become concert artists, giving their own concerts and appearing as soloists with symphony orchestras. Orchestras, chamber music groups, and individual artists often make recordings.

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 using these instruments play in nightclubs, restaurants, and at special parties. The best known bands and solo performers sometimes give concerts and perform on television. They also make recordings.

Many musicians, in addition to their work as performers, give private lessons in their own studios or in pupils' homes. More than half of the people primarily employed as instrumental musicians (estimated at about 100,000 in 1962) 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 music. Some are music teachers in elementary or secondary schools where they direct vocal and instrumental music pro-



Musicians in dance bands must usually work nights and weekends

grams, teach music appreciation, and may also give group instruction on an instrument.

In addition to the people primarily employed as musicians or music teachers, thousands of qualified instrumentalists have other full-time jobs and only occasionally are paid for work in the field of music. Most of these part-time musicians belong to dance bands which are hired to play at private parties or for other special occasions. Many of those with a background in classical music play occasionally in an orchestra or for other performances, or do some part-time teaching.

Where Employed

Most professional musicians work in large cities, principally in New York, Chicago, and Los Angeles, where most of the Nation's entertainment activities are concentrated. In addition, sizable numbers work in Baltimore, Boston, Cincinnati, Cleveland, Minneapolis, Philadelphia, Rochester, San Francisco, and other cities which have major symphony orchestras or music schools and conservatories. Music teachers in elementary and secondary schools, as well as in colleges and universities, are employed all over the country. Moreover, just about every town and city has at least one private music teacher, usually a pianist. Dance bands and civic orchestras are also located in many communities, although in the smaller towns, their members are usually only part-time musicians with other regular jobs.

A few musicians were employed in hospitals, to work in the field of music therapy, and some worked in music libraries and other places.

Training and Other Qualifications

Most people who become professional musicians begin studying an instrument at an early age. Boys and girls often get their first introduction to instrumental music through group instruction in piano, violin, trombone, and other instruments offered in many elementary schools and high schools. They can also take music lessons from private teachers or in the preparatory department of a music conservatory.

To achieve a career as a performer of classical music or as a music teacher, young people need intensive training—either through private study with an accomplished artist, or in a college or

university with 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, it is frequently necessary to have an audition. Many of the teachers in these schools are accomplished artists who will undertake the training only of promising young musicians. An audition is sometimes required also for admission to the department or school of music of a college or university. However, the emphasis on talent as a performer is less for young people preparing to be music teachers than for those preparing only for careers as performers.

Many 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 frequently award also the degree of bachelor of music to students who major in instrumental or vocal music. The 4-year program leading to this degree 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 are usually required for college teaching positions, but exceptions may be made for especially well-qualified artists.

Musicians who play jazz and other popular music also must be skilled in their instrument and have an understanding of and feeling for that style of music. As a rule, when young, they take lessons with private teachers and then seize all opportunities, beginning while they are still in high school, 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, instrumental music has been overcrowded for many years, and it is expected to remain so throughout the 1960'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. Though many opportunities for single and short-term engagements playing popular music in night clubs, 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 and choir masters may persist in many communities during the next few years; first-class, experienced accompanists and well trained, outstanding players of stringed instruments, including violin, viola, cello, and double bass, 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 not expected to increase 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 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 well-qualified as both musicians and as teachers, is considerably brighter than for performers. A great increase in the numbers of young people of high school and college age will take place during the 1960'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, a

fairly rapid 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

Musicians who were members of the 26 major symphony orchestras in the United States in 1962, had a very wide range of earnings—from a low of \$1,600 for the season, to \$10,000 and higher. According to the American Symphony Orchestras League, Inc., the average of the salaries paid to musicians by these orchestras was about \$4,500 for the season. Those who played in dance bands were paid from \$60 to \$300 per week in 1962, according to the limited information available. Symphony orchestras had relatively short seasons, generally ranging from 22 to 32 weeks a year. Instrumentalists who were members of small ensembles reportedly received as much as \$200 per concert. Concert soloists have the highest earnings of all musicians, but they have to deduct the cost of expensive clothes, travel, and management and coaching fees from their earnings. The amount they receive for a performance depends to a large extent on their professional reputations.

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 teaching are very uncertain and vary according to the musician's reputation, the number of teachers in the locality, the number of students desiring lessons, the economic status of the community, and other factors.

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. Most private teaching is

done in the late afternoon, on Saturdays, and sometimes in the evening.

Performers may have relatively long periods of unemployment between jobs and, thus, the overall level of their earnings is generally lower than that in many other occupations. Moreover, performers do not usually work steadily for one employer. Consequently, few performers can qualify for unemployment compensation, and they seldom 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).

Where To Go for More Information

Information about wages, hours of work, and working conditions for professional musicians is available from:

American Federation of Musicians (AFL-CIO),
425 Park Ave., New York, N.Y., 10022.

Information about employment opportunities for church musicians, as well as 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,
Knox College, Galesburg, Ill., 61401.

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 about employment opportunities with symphony orchestras may be obtained from:

The American Symphony Orchestra League, Inc.,
Symphony Hill, P.O. Box 66, Vienna, Va., 22180.

Singers and Singing Teachers

(D.O.T. 0-24.00 through 0-24.05)

Nature of Work

Professional singing is an art which requires not only a fine voice, but also a highly developed

technique and a broad knowledge of music. The pinnacle of a singing career is to become an opera and concert star. The tiny group of famous artists

who have reached this height sing leading roles with the major opera companies, go on concert tours in the United States and other countries, and often make recordings. Somewhat larger numbers of singers obtain secondary roles in operas and engagements as soloists in oratorios and other types of performances. A much larger group—probably the majority of all 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.

Singers who specialize in popular music have a style of singing so different from that of singers of classical music that the two groups have little in common technically. Although most popular music singers have some vocal training, many of them rely on their personalities to a much greater extent than do singers of classical music to help them “put a song across.” 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. They may be employed as featured singers with a dance band; or they may sing with other vocalists in small groups such as trios or quartets. The best known popular music singers make 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—chiefly singers of serious music—give private voice lessons. A sizable number of singers with the necessary qualifications are employed in elementary and secondary schools, where they teach music appreciation courses and lead choruses. Others give voice training or direct choral or opera theater groups in music conservatories or in colleges and universities with schools or departments of music.

Where Employed

Probably not more than 75,000 to 80,000 people were earning the major part of their incomes from singing engagements or vocal teaching in 1962. Opportunities for singing engagements are mainly in New York City, Los Angeles, and Chicago—the Nation’s chief entertainment centers. Nashville, Tenn., is a major place of employment for

singers, including those who specialize in folk and country music, for both “live” performances and recordings. Persons trained as singers who teach music in elementary and secondary schools and in colleges, universities, and conservatories of music are employed throughout the country. Opportunities for part-time employment, chiefly as church singers, are to be found in small towns as well as in big cities.

Training and Other Qualifications

Young people who want to perform professionally as singers of serious, or classical, music should acquire a broad background in music, including its theory and history. The ability to dance is also very helpful since singers who perform in musical comedies and other shows are frequently required to dance as well as to sing. In addition, boys and girls 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 serious voice training—which often continues for years after the singer’s professional career has started—it is important that a prospective singer audition before a competent voice teacher to determine 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 con-



Professional singers may also be required to dance

nected with a college or university, or by taking private voice lessons. Before students are admitted to music conservatories or to college- or university-connected schools or departments of music, they may have to audition before a faculty member who may be a well-known artist. 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 or Bachelor of Science (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 their State certification requirements for teachers. Such training is available in over 500 colleges and universities throughout the country. College teachers are usually 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 is required for classical music, and the lack of a powerful voice 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 well-known ones.

In addition to musical ability, it often takes an outstanding personality, an attractive appearance, good contacts, and good luck to achieve a singing career. Furthermore, a career in this art is often 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 during the remainder of the 1960's. Competition among popular

singers will continue to be especially keen. A great number of single-job openings are likely to occur in the entertainment field—the opera and concert stage, the movies, the theater, nightclubs, radio and television, dance bands, and other places—but not enough to provide steady employment for all qualified singers. The great majority of professional singers, therefore, will probably have to supplement their incomes by working part time as singing teachers or in other jobs. 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 performers 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, and will probably continue to be, limited. However, there is a growing demand for singers to record 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 brighter than for performers. As school enrollments increase, 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 also, since enrollments in schools and departments of music in these institutions are likely to rise along with the increase expected in college enrollments generally. 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

Most professional singers have relatively modest earnings. For example, soloists with church choirs received about \$25 per service, or its equivalent each month, in 1962, according to the limited information available. Singers employed by dance bands and in motion pictures earned as much as \$200 per week. In contrast, the relatively few well-known singers in the field earn considerably more

than these amounts. A concert soloist, opera star, or a top recording artist of popular music may command more than \$1,000 for a single performance.

The salaries of public school music teachers are determined by the salary schedule adopted for all teachers in their school system. Private music teachers charge fees which vary greatly, depending 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, and private voice teachers can usually give lessons at their own convenience. 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 Artistes of America (AFL-CIO).

Where To Go for More Information

Information about wages, hours of work, and working conditions for performers is available from the unions which organize singers in the various entertainment media.

Information about accredited schools and departments of music may be obtained from:

National Association of Schools of Music,
Knox College, Galesburg, Ill., 61401.

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.

Actors and Actresses

(D.O.T. 0-02.11, .15, and .41)

Nature of Work

Making a character come to life before an audience is a job which has great glamour and fascination for many people. It is also hard and demanding work, requiring special talent and involving many difficulties and uncertainties.

Only a very few of the nearly 20,000 actors and actresses in the United States 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 are frequently cast in supporting roles. The great majority, however, are struggling for a toehold in the profession, glad to pick up small parts whenever and wherever they can.

New actors generally start in "bit" parts, where they have only a few lines to speak. If successful, they may progress to larger supporting roles, of which there are several in most plays. The actors who have minor parts in stage productions may

also serve as understudies for the principals. If a leading player must miss a performance, the understudy has a chance to demonstrate his acting ability and attract attention to his qualifications for important roles.

When a play is being prepared for production, the cast spends many hours in rehearsal. Actors who prepare for roles either on the stage or in the movies must memorize their lines and know the cues—the last words or action, by another actor which are the signal to come on stage, make an exit, or begin speaking. 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.

Besides the actors with speaking parts, "extras" who have no lines to deliver are used in almost every motion picture. In spectacular productions, the number of extras who take part in crowd scenes is often very large.

Some actors find jobs as dramatic coaches or become directors of stage, television, radio, or motion picture productions. A few are engaged in teaching in schools of acting or in the drama departments of colleges and universities.

Where Employed

The legitimate stage and motion pictures, including films made especially for television, are probably the largest fields of employment for actors, although "live" television and radio also employ actors intermittently.

In the winter, most employment opportunities on the stage are in New York. In the summer months, however, stock companies in suburban and resort areas are an equally large field of employment. There are also a small but growing number of winter stock companies in southern resort areas. In addition, many cities now have community or "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, and the casts are therefore selected from actors located there.

Although employment opportunities in motion pictures and film television are centered in Hollywood, a few studios are on Long Island, N.Y., and some in 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. Some local television and radio stations occasionally employ actors.

Training and Other Qualifications

Since an actor learns largely through practice, young people aspiring to acting careers should get as much amateur 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 may also be helpful. Such training can be obtained at special schools of the dramatic arts, chiefly in New York, or at the High School of Performing Arts which is part of that city's school system. The dramatic arts are also taught in over 400 colleges and universities. A college degree is becoming increasingly necessary for an acting career. Because college drama curriculums usually include courses in liberal arts subjects, speech, pantomime, play production, and the history of the drama, as well as practical courses in acting, the actor develops an appreciation of the great plays, old and new, 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 an asset, and is becoming increasingly important for an acting career.

In all media, whether the legitimate stage, motion pictures, radio, or television, the best way to start is to make use of local opportunities and to build on the basis of such experience. Many actors who are successful in local dramatic produc-



A successful actor must have outstanding talent, interest, and determination

tions eventually try to appear on the New York stage. Inexperienced actors usually find it extremely difficult to obtain employment in New York or Hollywood. Although motion picture producers do give some screen tests to inexperienced applicants, only an infinitesimal proportion of the many thousands of people taking these tests enter the movies in this way. The motion picture field is an especially difficult one to enter, and employment is often a result of previous successful experience on the Broadway stage.

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 go on almost indefinitely. Supporting players also may have opportunities to portray roles in which age is not a disadvantage. On the other hand, for many members of the profession, employment opportunities become increasingly limited during and past middle age. This is especially true of those who become typed in romantic, youthful roles.

Employment Outlook

The overcrowding which has existed in the acting field for many years is expected to persist. In the legitimate theater and also in motion pictures and radio and television, job applicants outnumber by many times the jobs available. Moreover, most actors have employment in their profession for only a small part of the year.

With the development first of motion pictures, then of radio, then of TV, employment opportunities for actors in the theater have been more and more reduced. The recent growth of summer stock companies has somewhat increased the employment of actors in the summer months, but the numbers of New York stage productions, of

motion pictures, and of radio shows requiring actors have been declining.

Although a motion picture production may use a very large number of actors, they are employed only while the picture is being filmed, 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 nearly enough to offset the decline in the 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 for a long time. Taped TV plays give employment to actors for only one performance, whereas live dramas may give employment for several performances.

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. Further increases are likely also in the employment of actors on television. In the acting field as a whole, however, employment opportunities are not expected to increase, and may well decrease somewhat, over the next decade. The number of new entrants to the profession is expected to outnumber employment opportunities that may generally become available. Even highly talented young people are likely to face great 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 "live" 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 large New York theaters was \$117.50 in mid-1963. Those appearing in small "off-Broadway" theaters had

considerably lower rates. For shows on the road, the minimum rate was \$150 a week. For rehearsal time, it was \$97.50 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 about \$100 in mid-1962. For extras, the minimum rate was about \$25 a day. Actors on network television received a minimum program fee of \$155 for a single half-hour program, and 10 hours of rehearsal time; actors on radio received \$49.60 for a half-hour performance, 1 rehearsal hour included. Those with contracts for longer programs or a series of programs received relatively lower rates.

In all fields, many well-known actors and actresses have salary rates above the minimums. The salaries of the few top stars are many times the figures cited. On the other hand, because of the frequent periods of unemployment characteristic of this profession, annual earnings are low for all but a very few of the best known performers.

Eight performances amount to a week's work on the legitimate stage and any additional performances are paid for as overtime. The basic

workweek after the opening of a show is 36 hours, including limited time for rehearsals. Prior to the opening, however, the workweek is usually 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 over weekends and holidays. Traveling over the weekend is often necessary when plays are on the road.

Some actors are covered by a pension fund and a growing number have hospitalization insurance to which their employers contribute, but very few have paid vacations or sick leave. Most 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 kind of casual work obtainable while they are waiting for another role.

Where To Go for More Information

American Federation of Television and Radio Artists,
724 Fifth Ave., New York, N.Y., 10019.

Screen Actors Guild, Inc.,
7750 Sunset Blvd., Hollywood, Calif., 90046.

Screen Extras Guild, Inc.,
723 North Western Ave., Hollywood, Calif., 90029.

Dancers

(D.O.T. 0-45, 11 through .51)

Nature of Work

Dancing is an ancient and worldwide art, having many different forms. 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 stylized "positions," and women dance "en pointe" (on the very tips of their toes). The effect sought is one of effortless grace. In modern dance, movements are much more varied but are nonetheless carefully planned and executed to follow a pattern.

In all types of dance productions, most of the performers dance together as a chorus. However, a group of selected dancers may do special numbers, and a very few do solo work. The number

of ballerinas and other top artists is, of course, much smaller still.

Many dancers combine teaching with their stage work or teach full time in schools of the ballet or in colleges and universities. A few dancers have become choreographers, who create new ballets or dance routines. Others are dance directors and train the dancers in new productions.

This statement does not include instructors of ballroom and other social dancing.

Where Employed

In 1962, there were about 20,000 dancers and dancing teachers in the United States. It is estimated that over half of them were teaching in private schools of the dance and in schools and colleges. Most of the other dancers were primarily performers on the stage, screen, and television. A few trained in dance therapy were em-

ployed by hospitals to work in this new field used in the treatment of mental disorders.

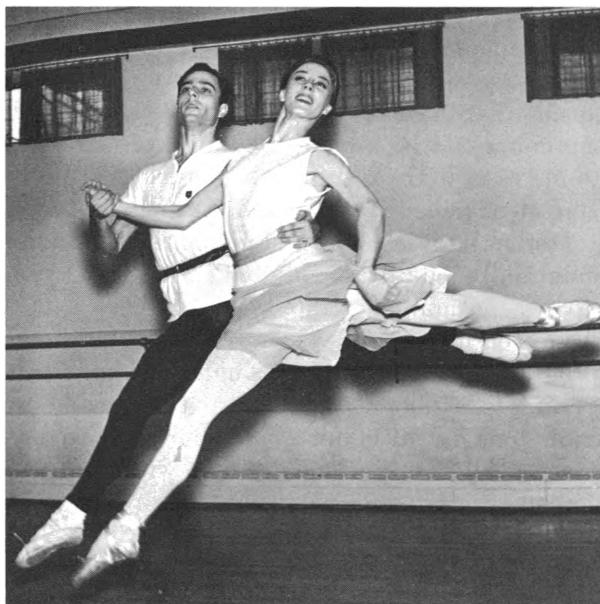
Dancing teachers are located chiefly in large cities, but almost every town and city has its school of the dance. The great majority of performing dancers are in New York City, Los Angeles, Las Vegas, and Chicago.

Training and Other Qualifications

The traditional way of preparing for a dancing career is to begin serious training in a professional school by age 12 or earlier. Girls wishing to become ballet dancers should begin taking lessons at the age of 8. In either case, 2 or 3 years of prior preparation is needed before the young girl should start dancing "en pointe." Professional ballet training typically takes from 10 to 12 lessons per 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 the 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 on the stage, screen or television.

Because of the strenuous training program in the professional schools, the general education received by students in these schools is not likely to exceed the legal minimum. However, really great performing artists have to be more than technicians. Many people competent to judge therefore believe that a dancer's education should include such subjects as music, literature, and history to aid him in his interpretations of dramatic episodes and of music. Approximately 70 colleges and universities confer bachelor's degrees on students who have majored in physical education and have concentrated on the dance, and some give graduate degrees, the M.A. and Ph. D. A few colleges and conservatories of music also award degrees (usually in the fine arts) to qualified students who major in the dance. Labanotation, which is the method of writing dance routines and is comparable to writing an orchestral score, is



Physical vitality is necessary for a dancing career

one of the advanced courses taught. Knowledge of this is especially important to choreographers.

A college education is an advantage in obtaining employment in teaching professional dancing or in choreography. However, the girls who postpone their first audition until graduation compete at a disadvantage with younger girls for openings in classical ballet. On the other hand, they can compete successfully for openings in modern dance performances which do not generally require a proficiency in toe dancing.

For teaching in the professional schools, experience as a performer is usually necessary; in colleges and conservatories, graduate degrees are generally required, but often experience as a performer 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 with normal arches are required. These physical qualifications must be accompanied by unusual talent for dancing.

For women dancers, employment in ballet companies is very difficult to obtain after the age of 30, except for a few 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, can usually continue somewhat longer. After the employable age as performers has passed, some dancers teach in schools of the ballet 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 do.

Employment Outlook

The keen competition and irregular employment experienced in this profession for many years are likely to persist. The supply of trained dancers has always exceeded the demand, which has been decreasing year after year. The number of stage productions has decreased because of the competition of the motion picture industry, which in turn has been adversely affected by television. Very few stage shows have a run of 26 weeks or more, and many "fold" after the first week. On the other hand, there is a growing trend toward using professional dancers at industrial exhibitions, such as auto shows. Also, a few new professional dance companies are being developed around the country. Nevertheless, employment opportunities for dance performers will remain limited. The number of musical shows produced for the stage and motion pictures, will probably continue to decline. Although television will offer some additional employment opportunities, technical problems must be solved before this medium can be fully satisfactory for large-scale dance productions. Civic and community dance groups are increasing in number and opportunities for dancers will expand as these develop into professional groups. Most of the openings for dance performers in the years ahead, however, will stem from the need to replace dancers 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 contributory 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 and nearly equal numbers are needed.

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). The American Guild of Musical Artists, Inc., is the union to which dancers belong who perform in opera ballets, classical ballet, and modern dance. Dancers may also belong to 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. In addition, the separate contract signed by each dancer with the producer of the show has to be at least as favorable in the matter of salary, hours of work, and working conditions as the basic agreement.

The minimum salary for dancers in ballet and other stage productions was \$110 a week, as of mid-1962. The minimum rate for rehearsal time was \$80 a week, except in small ballet companies which provided \$60 for a rehearsal week. When a show goes on tour, salaries are increased, 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—for instance, for 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 principals, choreographers, and stars, salaries in stage productions ranged from \$200 to over \$2,000 per week in 1962.

Because most dancers are employed as performers only a small part of the year, their annual earnings are much less than would be expected from these weekly rates. According to union records, about half of all dancers employed in 1962 earned less than \$3,000 from all professional performances on the stage, in motion pictures, and on television. Only about 3 percent earned more than \$10,000. Some dancers qualified to teach in the technical schools of the ballet are able to combine this work with engagements as performers.

A much greater number have to supplement their incomes by working in offices, waiting on tables, or babysitting, while waiting for a new contract.

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.)

During a rehearsal week, the normal workweek is 30 hours. During a performance week, the normal workweek consists of eight performances plus 12 hours for rehearsal. 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 to various health and welfare benefits provided by their unions and to which the employers contribute.

Where To Go for More Information

Information on colleges and universities and conservatories of music which provide for 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, 1963 edition, compiled by the American Association for Health, Physical Education and Recreation, a division of the National Education Association, 1201 16th St. NW., Washington, D.C., 20036.

Information on hours, earnings, and working conditions may be obtained directly from the unions which organize dancers in the various entertainment media.

OTHER PROFESSIONAL AND RELATED OCCUPATIONS

Architects

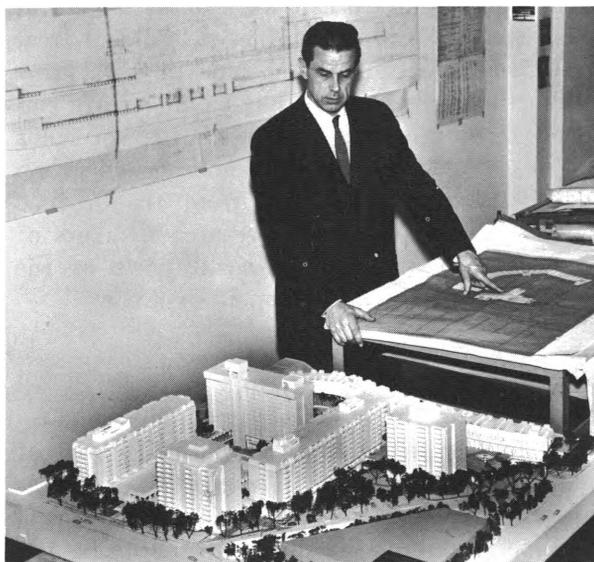
(D.O.T. 0-03.10)

Nature of Work

Architects plan buildings and other structures and supervise their construction. Their goal is to design structures which are safe, useful, and pleasing in appearance.

When an architect receives a commission for a building, he meets with the client to discuss the purpose, requirements, 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, taking into account 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 draws preliminary plans of the structure and submits them to the client for his approval. Alterations suggested by the client may be incorporated in the final design, which includes floor plans as well as details of the interior and exterior of the building. The final design is then 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 supplementary 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.



Architect compares drawings with model of new housing development

The architect then assists his client in selecting a building contractor and may also aid in drawing up the contract between client and contractor and act as the client's advisor and representative in dealings with the contractor. As construction proceeds, the architect makes periodic inspections to make certain that the design is not altered and that the materials specified in the contract are 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. A few specialize in one particular type of structure. When working on large-scale projects or for large architectural firms, architects frequently specialize in one phase of the work, such as design, specification writing, or construction supervision.

Where Employed

An estimated 27,000 registered (licensed) architects were employed in the United States in 1962. In addition, several thousand people were working in positions requiring a knowledge of architecture. Less than 3 percent of all architects are women.

Approximately half of all architects are self-employed, either practicing individually or as partners. Most of the others work for architectural firms. Some work for engineers, builders, real estate firms, and for other businesses with large construction programs. A small number are employed by government agencies, often in fields such as city and community planning and urban redevelopment. Another small group are full-time teachers in schools of architecture. Members of the profession are located in all parts of the country, primarily in metropolitan areas.

Training, Other Qualifications, and Advancement

A license for the practice of architecture is required by law in all States and the District of Columbia. In general, the purpose of these laws is to insure that work which may affect 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 1962, professional training in architecture was offered by 72 colleges and universities in the United States, 52 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 offer graduate education leading to the master's degree, and a few schools offer the Ph. D. degree. Although graduate training is not essential for the practice of architecture, it is often desirable for research and teaching positions.

Most schools of architecture admit qualified high school graduates who meet the entrance re-

quirements of the liberal arts college with which the school of architecture is associated. Some schools require 1 or 2 years of preprofessional education, followed by 3 or 4 years of architectural training. In general, architectural schools prefer that students' preparation include mathematics, science, social studies, language, and art. Training or ability in both freehand drawing and drafting are helpful, though not a requirement for entering a course in architecture.

A typical curriculum includes not only architectural courses but also other subjects—usually English, mathematics, physics, chemistry, sociology, and economics. Some examples of technical and professional courses in the curriculum are: Architectural design, structural theory, working drawings, specification writing, graphic presentation, freehand drawing, the history of architecture, professional ethics, and business practices.

Success in the profession requires an unusual combination of abilities—a capacity to master technical problems, a gift for artistic creation, and a flair for business and for human relations. To determine their interests and potentialities, young people should, if possible, spend some time in an architect's office before entering architectural school. Students are also encouraged to work for architects or for building contractors during summer vacations to gain some knowledge of practical problems.

The new graduate usually begins as a junior draftsman in an architectural firm, where he is assigned to making drawings and models of building projects or to the drafting of details in the working drawings. As he gains experience, he is given more complex work. After several years, he may progress to chief or senior draftsman, with responsibility for all the major details of a set of working drawings. Some architects become job captains with the responsibility for a full set of working drawings and for the supervision of other draftsmen. Others become designers or construction supervisors, or branch off into the field of specification writing. 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

Employment opportunities for architects are expected to be very good throughout the 1960's, and continued growth in their employment is anticipated over the long run.

Most architects work on nonresidential projects—office buildings, stores, schools, hospitals, and the like—and the volume of such construction is expected to expand considerably. Residential construction, a growing area of work for architects, will also increase. Moreover, the increasing size and complexity of modern nonresidential buildings, as well as homeowners' growing awareness of the value of architects' services, are likely to bring about a greater demand for architectural planning. Urban redevelopment and city and community planning projects, other growing areas of employment for architects, are also expected to increase considerably in the years ahead. (See statement on Urban Planners.) Expanding college enrollments will create a need for additional teachers.

In addition to new positions created by the rising demand for architectural services, more than 500 openings are likely to arise each year owing to retirement and death of experienced architects.

Along with the anticipated growth of employment, a rise in the number of architectural graduates is likely to occur. Assuming that graduations in this field follow the trend expected in college graduations as a whole, the number of architectural degrees awarded each year during the middle and late 1960's should be considerably greater than the 1,800 degrees awarded in 1961. However, many architectural graduates utilize their training in fields such as sales and administration and

do not enter the profession. Thus, those who choose to enter the field should have favorable employment opportunities through the 1960's, at least.

The outlook for women architects, although less favorable than for men, is nonetheless expected to be good. Women who are good draftsmen will probably be able to obtain employment readily. However, very few women are able to establish themselves in private practice.

Earnings and Working Conditions

Starting salaries for architectural school graduates were generally between \$80 and \$100 a week in mid-1962, according to available information. Draftsmen with 3 or more years' experience earned up to \$160 a week; job captains, specification writers, and other senior employees usually earned \$150 to \$200 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 with many years of experience and good reputations earn well over \$25,000 a year, while many who have not become well known have very low incomes. Young architects just starting their own practices may go through a period when their expenses are greater than their income.

Where To Go for More Information

The American Institute of Architects,
1735 New York Ave. NW., Washington, D.C., 20006.

Commercial Artists

(D.O.T. 0-44.)

Nature of Work

Artwork designed to attract the attention of readers and to stimulate their interest in particular products and ideas is found in most newspapers, magazines, and other publications. These illustrations used in advertisements and editorial features are prepared by commercial artists who also work on television commercials and movie

cartoons, industrial and other films, fashion illustrations, greeting card and book illustrations and design, packaging, wallpaper and textile designs, and do many other kinds of artwork. They may also design and illustrate displays, posters, and direct mail advertising. Commercial artists usually carry out artistic ideas that are created by others.

Some artists do routine but essential tasks such as “pasting-up”—cutting and pasting together the basic parts of an advertisement or other artwork. The majority are “general boardmen” who spend nearly all their time over the drawing board—sketching, lettering, retouching photographic prints, preparing charts and maps, cartooning, or performing other art assignments. Still other artists work as letterers, executing appropriate lettering either freehand or with the use of mechanical aids, or as illustrators who make sketches and drawings. Layout men plan the selection and arrangement of illustrations and lettering and determine color and other elements of design. Art directors and designers develop visual ideas for art programs, submitting ideas in rough form to layout men to be further developed. Directors and designers also buy the artwork of photographers, illustrators, letterers, and other artists for use in their programs and often supervise an art staff.

Where Employed

An estimated 50,000 commercial artists were employed in early 1963; about one-fourth 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.

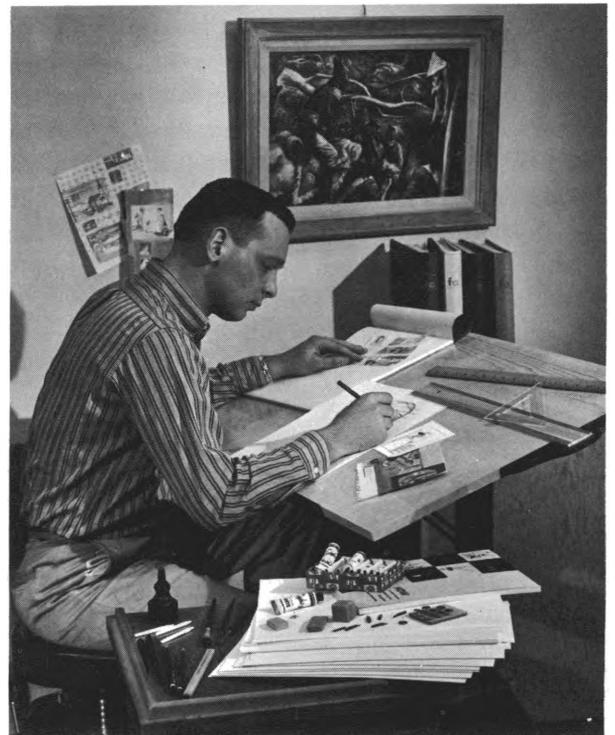
Most commercial artists are employed as staff artists on a regular salaried basis by advertising agencies, commercial art studios, advertising departments of large companies, printing and publishing firms, textile companies, television and motion picture studios, department stores, sign shops, mail-order 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.

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 supplemented by specialized training in the techniques of commercial and applied art. In addition, extensive educational training in the fine arts—painting, sculpture, or architecture—and in academic studies provides a good foundation not only for obtaining employment as a commercial artist but especially for qualifying for promotions 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 is usually, but not always, 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 or more years of study and confer a bachelor's degree—commonly the bachelor of fine arts (B.F.A.) degree. In these schools, commercial art instruction is supplemented by courses in such liberal arts



Artistic ability is a basic qualification for commercial art work

subjects as English and history. Some limited training in commercial art may also be obtained through courses offered by public vocational high schools, or through private home-study schools, and through practical experience on the job, but supplemental training is often needed for advancement.

The first year in art school may be devoted primarily to the study of fundamentals—perspective, design, color harmony, composition, and use of pencil, crayon, pen and ink, and other art media. Subsequent study generally includes drawing from life, advertising layout, lettering, typography, illustration, and highly specialized courses in the student's particular field of interest.

Accomplished draftsmanship, imagination, and artistic judgment concerning the harmony of color and line 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 jobs. For commercial artists engaged in freelance work, the ability to sell both ideas and finished work to employers or clients is very important. Art directors need a strong educational background not only in art and business practices, but also in general liberal arts subjects.

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.

Often commercial artists assemble their best artwork into a folder, or "portfolio," to use in displaying their work to others. A good up-to-date 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 throughout the rest of the 1960's. Young people with 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 varies with the kind of specialization: For example, opportunities for illustrators, except those who are well known and have a unique style, are declining, largely because of increasing use of photography in advertising and editorial features. Demand is steady for mechanical lettering and for paste-up artists, but jobs for designers, art directors, and layout men are few in number, much sought after, and open only to highly talented and creative artists.

A moderate increase in employment of commercial artists is expected over the long run. The upward trend in business expenditures for all kinds of visual advertising will be reflected in a growing demand for commercial artists. Television graphics (including animations) and packaging design are expected to continue to be sources of expanding employment opportunities. Demand for other forms of art such as poster and window displays, greeting cards, and movie cartoons will probably create employment for an increasing number of artists. In addition, the growing field of industrial design is expected to need more artists who are qualified to work with engineering concepts. (See statement on Industrial Designers.)

Generally, the effect of a serious economic downturn would be a reduction in advertising budgets and a decrease in employment of commercial artists. During minor business recessions, however, the policy of many companies is to advertise their products more vigorously, thus increasing the use of advertising art.

Women with 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

Beginning commercial artists typically earned between \$50 and \$85 a week, in late 1962, according to limited data available. Talented artists with strong educational backgrounds and a good port-

folio, however, sometimes started at higher salaries. After a few years of experience, qualified artists may expect to earn \$100—\$150 or more a week. Art directors, designers, executives, well-known freelance illustrators, and others in top positions generally have much higher earnings, many beyond \$15,000 a year.

The earnings of freelance artists have an especially wide range, since they are affected by such factors as the amount of artwork sold, the price that the individual artist receives for his work, and the nature of the work he performs. For example, a recent private survey indicates that a freelancer may receive 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 \$4,000 for a color cover for a national magazine; or from \$75 to \$250 for a book jacket. Sometimes

freelance artists are paid for their services by the hour; letterers may be paid from \$7 to \$10 a word.

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.

Where To Go for More Information

Information on art training and employment trends is available from:

National Society of Art Directors, Art Education
Chairman,
115 East 40th St., New York, N.Y., 10016.

A list of schools offering highly specialized education in art and design is available from:

National Association of Schools of Art,
50 Astor Pl., New York, N.Y., 10003.

Foresters

(D.O.T. 0-35.07)

Nature of Work

Forests are one of America's greatest natural resources, covering more than one-third of the land area of the country. Foresters manage, protect, and develop these valuable properties and their related resources. They estimate the amount and value of timber in a forest area, plan and supervise the harvesting and cutting of trees, purchase and sell trees and timber, and carry out reforestation activities (renewing the forest cover by seeding or planting). Foresters also safeguard forests from fire, destructive animals and insects, and diseases. Some foresters are responsible for wildlife protection, soil conservation, and watershed control as well as for the management of camps, parks, and grazing land.

Foresters may specialize in one of several areas, such as timber management, fire control, forest economics, recreation, wildlife management, range management, arboriculture, and soil conservation. Some of these areas of work are becoming recognized as distinct professions. Foresters may also specialize in a particular activity, such as research, writing and editing, extension work (providing information about forestry practice to farmers, logging companies, and the public), and college and university teaching.

Where Employed

An estimated 20,000 persons were employed as foresters or as specialists in closely related fields in the United States in 1962. The largest group, about 7,500, were employed by the Federal Government, mainly by the Forest Service of the Department of Agriculture. Some were employed by other Federal agencies, including the Department of the Interior, the Department of Defense, and the Tennessee Valley Authority. State governments employed nearly 3,000 foresters, and a few hundred were employed by local governments.

Almost 7,000 foresters were employed in private industry in 1962, mainly by pulp and paper, lumber, logging, and milling companies. Approximately 1,000 foresters were managers of their own land, were in business for themselves as consultants, or were employed by consulting firms. Colleges and universities employed about 1,000 foresters.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in forestry is the usual minimum educational requirement for young persons seeking careers in forestry. An ad-

vanced degree is generally required for teaching or research positions.

Education in forestry leading to a bachelor's or higher degree was offered in 1962 by 43 colleges or universities. 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 from 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 and marketing of the forest crop and other forest resources). The curriculums also include courses in mathematics, science, engineering, economics, and the humanities. In addition, the great majority of colleges require that students spend one summer in a camp operated by the college. Forestry students are also 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 performing routine duties under the supervision of higher level foresters. As they gain experience and are given more responsibility, foresters may advance to positions such as that of branch forester, district ranger, forest supervisor, and managing forester.

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 isolated areas.

Employment Outlook

Employment opportunities for forestry graduates are expected to be favorable throughout the remainder of the 1960's. There will be particular need for well-qualified personnel with advanced degrees for college teaching positions and for research in areas such as forestry genetics, fire behavior and control, and forest products utilization.

Private and industrial owners of timberland are expected to offer increasing numbers of employment opportunities to foresters, primarily because of anticipated growth in the demand for wood and wood products. The forest products industries

are becoming increasingly aware of the profitability of improved forestry and logging practices, and are applying new techniques for utilizing the entire forest crop and for cutting trees in forests once regarded as unprofitable for timber operations. 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 major factors expected to contribute to this expansion are the growing amount of timber cut on Federal lands, the trend toward more scientific management of these lands, and expanding programs in areas such as recreation, watershed management, range management, and wildlife protection.



Forester selects tree for removal to allow more sunlight for other trees

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

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

The longrun outlook is for continued growth in the profession. The country's growing population and rising living standards will tend to increase the demand for lumber, paper, and other major forest products. In addition, the application of scientific management practices to forest lands, both public and private, is expected to expand. Moreover, occupational fields closely related to forestry, such as wood utilization, wildlife management, watershed management, forest recreation, soil conservation, and range management, have grown rapidly in the recent past and should continue to grow, thus creating many new positions for foresters in both government and private industry.

Opportunities for women in forestry will probably continue to be 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 and education work, and future opportunities for women are also likely to be primarily in these fields.

Earnings and Working Conditions

In the Federal Government in early 1963, inexperienced foresters with the bachelor's degree

could start at either \$4,565 or \$5,540 a year, depending on their college record. Those with the bachelor's degree and 1 or 2 years of graduate work could begin at \$5,540, \$6,675, or \$8,045; those with the Ph. D. degree, at \$8,045 or \$9,475.

Annual salaries of beginning foresters with bachelor's degrees employed by private industry were typically between \$4,800 and \$6,000 in early 1963, according to the Society of American Foresters. Starting salaries of new graduates with master's degrees were usually between \$6,000 and \$7,000 a year. Those with doctor's degrees usually received starting salaries of more than \$7,000. Beginning salaries of foresters employed by State governments varied widely, but were roughly comparable with those paid by private industry and the Federal Government.

In colleges and universities, salaries of forestry teachers were generally the same as those paid other faculty members. (See statement on College and University Teachers.) Foresters in educational institutions sometimes supplement their salaries with income from consulting, lecturing, and writing books and articles.

As part of his regular duties, the forester must spend considerable time out of doors under all kinds of weather conditions. Many foresters put in extra hours in travel and in emergency duty such as firefighting. Foresters, particularly those in beginning jobs, are often required to travel for extended periods of time.

Where To Go for More Information

Society of American Foresters,
425 Mills Bldg., 17th and Pennsylvania Ave. NW.,
Washington, D.C., 20006.

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

American Forest Products Industries, Inc.,
1816 N St. NW., Washington, D.C., 20036.

Geographers

(D.O.T. 0-36.93)

Nature of Work

Geographers seek knowledge about the distribution throughout the world of people and natural resources. They study the activities of people—where they live, why they are located there, and

how they earn a living. They also study the physical characteristics of the earth, such as its terrain, minerals, soils, water, vegetation, and climate, and attempt to relate the earth's physical characteristics to the location and activities of people.

Most geographers are engaged in college and university teaching and/or research. Their research may include the study and analysis of the distribution of soils, vegetation, land forms, climate, and mineral and water resources, sometimes utilizing surveying and meteorological instruments. They also analyze political organizations, transportation systems, and a broad range of other activities. Some geographers spend much time in field study, in preparing and interpreting statistics, and in analyzing aerial photographs and other data collected in the field. Many construct and interpret maps, graphs, and diagrams.

Most geographers specialize in one of the several main branches of geography. Those working in *economic geography* deal with the geographic distribution of economic activities—including manufacturing, mining, farming, trade, and communications. *Regional geography* is concerned with 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. *Political geography* is the study of geographic factors affecting national and international policies and events. *Urban geography*, a relatively new and growing field for geographers, is concerned

with the study of cities, and with community planning. (See statement on Urban Planners.) Specialists in *physical geography* study the earth's physical characteristics. Geographers in the field of *cartography* are concerned with the design and construction of maps, as well as the compilation of data for them.

Relatively few professional workers in the field of geography have the title of geographer. Many have job titles which describe their specialization such as map cataloger, cartographer, or regional analyst. 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.

Where Employed

Geography is a relatively small field of employment. Only about 2,500 geographers were employed in the United States in mid-1962; about 10 percent were women.

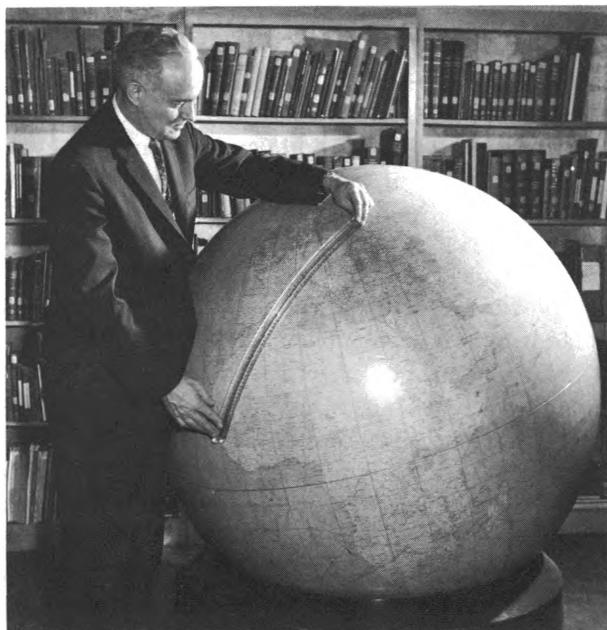
About two-thirds of all geographers are employed by colleges and universities. Those teaching in institutions which do not have separate departments of geography usually are assigned to departments of geology, economics, or other physical or social sciences.

The Federal Government employs about 400 geographers, mostly in the Washington, D.C., area. Among the major agencies employing these workers are the Departments of Defense, the Interior, Commerce, Agriculture, and State, and the Library of Congress. State and local governments also employ a number of geographers, mostly on city and State planning and development commissions.

Most of the small but growing number of geographers employed by private industry work for map companies, textbook publishers, travel agencies, manufacturing firms, chain stores, and marketing research organizations. A few geographers work for scientific foundations and other nonprofit organizations and research institutes.

Training, Other Qualifications, and Advancement

The minimum educational requirement for beginning positions in geography is a bachelor's



Geographer uses curved ruler on globe to measure distance

692-408 0-63-16

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.

Undergraduate training in geography is offered by many colleges and universities. In 1962, bachelor's degrees in geography were awarded by more than 150 institutions. Undergraduate study usually provides a general introduction to geographic knowledge and research methods and often includes some field studies. Typical courses offered are principles of geography, physical geography, weather and climate, economic geography, political geography, urban geography, and regional courses, such as geography of North America, Western Europe, the U.S.S.R., and Asia. Courses in cartography and map interpretation are also offered, since the drawing, analysis, and understanding of maps are an important part of the geographer's work.

Advanced degrees in geography are offered by a relatively small number of schools; in 1962, master's degrees were awarded by about 60 institutions and Ph. D. degrees by about 30. A bachelor's degree with a major in geography is the usual requirement for admittance to a graduate department of geography. However, most universities will admit otherwise well-qualified students with bachelor's degrees in such fields as economics, forestry, geology, or history. Requirements for advanced degrees include geographic field and laboratory work, as well as classroom studies, library research, and thesis preparation.

New graduates with only the bachelor's degree in geography find employment mainly in positions connected with mapmaking, either in government or private industry. Some obtain positions as research or teaching assistants in educational institutions while studying for advanced degrees. Others enter beginning positions in the planning field. Those with the master's degree can qualify for some teaching and research positions in colleges and universities and for many research positions in government and private industry. The Ph. D. degree is usually 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 outlook is for a moderate growth in employment of geographers throughout the remainder of the 1960's and over the longer run. There will be a particular need for geographers with graduate degrees to fill research and teaching positions in colleges and universities and research jobs in industry and government. Those with advanced training in fields such as economics or law, in addition to a degree in geography, will also be in demand.

Colleges and universities are expected to offer the greatest number of employment opportunities during the 1960's, primarily owing to anticipated increases in total college enrollments. Expanding interest in foreign countries, and growing awareness of the value of geography training in several other fields of work, such as in 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 is also anticipated.

Employment of geographers in government positions is also likely to increase. The Federal Government will need additional personnel in positions related to area development and regional and urban planning; resource management; planning, construction, and interpretation of maps; and in intelligence work. State government employment of geographers will probably expand also, particularly in such areas as conservation, highway planning, and city, community, and regional planning and development.

The number of geographers employed in private industry is also expected to rise. Market research work, in which many of these geographers are engaged, should continue its rapid growth. Opportunities should also increase in private area planning and development work.

Since geography is a relatively small field, job openings, resulting from growth in the profession and the need to replace workers who retire or otherwise leave the profession, 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, well-trained geographers, particularly those with advanced degrees, should have good employment opportunities through the 1960's.

Employment prospects for women geographers will be best in teaching, especially in junior colleges, women's colleges, and in the larger coeducational institutions. Government agencies should also offer some opportunities, mainly in mapping work. However, because of the field work required for most geographic positions, opportunities for women will be somewhat less favorable than for men.

Earnings and Working Conditions

In the Federal Government, in early 1963, geographers with the bachelor's degree and no experience could start at \$4,565 or \$5,540 a year, depending on their college record. Inexperienced geographers with 1 or 2 years of graduate training could start at \$5,540 or \$6,675; and those with the Ph. D. degree, at \$8,045.

In colleges and universities, annual starting salaries for well-trained geographers—those with the Ph. D. or with all the requirements for the

doctorate except the thesis—were usually between \$6,000 and \$8,000 in 1962, according to the limited information available. (For further information, see statement on College and University Teachers.) Geographers in educational institutions often have an opportunity to earn income from other sources, such as consulting work, special research projects, and publication of books and articles.

Working conditions of most geographers are similar to those of other teachers and office workers. Geographic research sometimes requires extensive travel, in foreign countries as well as in the United States. The geographers engaged in such projects are frequently away from home for long periods, at times living and working under somewhat primitive conditions.

Where To Go for More Information

Association of American Geographers,
1201 16th St. NW., Washington, D.C., 20036.

Home Economists

(D.O.T. 0-12.10 through .36)

Nature of Work

Improving products, services, and practices that affect the comfort and well-being of the family is the primary aim of home economists. These professional workers must have a broad knowledge of the field or be specialists in a particular area such as food, clothing and textiles, housing, home equipment, child care, household management, or family economics.

The largest single group of home economists are teachers, mainly in secondary schools. They conduct courses which include such areas of home economics content as food, nutrition, clothing, textiles, child development, family relations, home-furnishings and equipment, household economics and home management. The nature of much of the work done by home economists who are secondary school teachers is similar to that described in the statement on Secondary School Teachers, elsewhere in this *Handbook*. (See index for page number.) In addition, they may help students and their parents with homemaking problems, sponsor chapters of Future Homemakers of America, and

conduct many related activities. Teachers in adult education programs help homemakers to increase their understanding of family relations, and to improve their homemaking methods and skills. College teachers not only prepare students for professional careers in home economics, but also help prepare young people for homemaking. College teachers, who may combine research with teaching, often specialize in one particular area of home economics.

Home economists employed by private business firms and trade associations help to promote the development, use, and care of specific home products. They 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 workers, salesmen, and appliance servicemen. They may study consumer needs, help manufacturers translate these needs into desirable products, and provide miscellaneous consumer services. Home economists who

work for food manufacturers do an important part of their work in test kitchens—developing new recipes, improving present products, or helping to create new products. They may also publicize the nutritional value of specific foods. Home-service workers employed by utility companies often give advice on kitchen planning and laundry 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 and also devise plans for product uses. Those engaged in communications work for magazines, newspapers, radio and television stations, advertising and public relations agencies, trade associations and other organizations, usually plan, write and edit articles and advertisements and supervise the preparation of photographs designed to tell homemakers about home products and services. Their work may include product testing and analysis, work in research laboratories or test kitchens, and the study of consumer buying habits. Still other home economists in business organizations hold positions with

dress-pattern companies, department stores, interior design studios, and other firms involved in designing, manufacturing, and selling products for the home. A small number of home economists are employed in such businesses as financial institutions, giving customers advice on spending, saving, and budgeting. Others work for moving companies, as consultants on family moving problems and for chain food stores, providing food and household information to consumers. A few experienced home economists work as freelance consultants.

Home economists are engaged in research work in laboratories and offices of the Federal Government, State agricultural experiment stations, colleges, universities, and private organizations. The largest single group works for the U.S. Department of Agriculture conducting research on food and nutrition, textiles and clothing, housing, household equipment, or household economics. Some make surveys of farm families and their buying and spending habits and then develop budget guides. Others perform laboratory tests to determine the effect of different methods of cooking on nutritive value, flavor, tenderness, or volume of a food. A few in other Federal agencies are engaged in research on space travel; for example, working on problems of meeting food needs in outer space.

Home economists employed in the Cooperative Extension Services of the State land-grant colleges conduct adult education programs for women (both rural and urban) and 4-H Club programs for girls. Through these programs, extension workers help families to use home economics research findings 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 in the development of budget standards and also give homemaking advice. They may work as homemaking counselors and consultants, helping 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 engaged in homemaker serv-



Courtesy of U.S. Department of Agriculture

Home economist does research on food freezing methods

ices which provide temporary or part-time help to households disrupted by illness.

Where Employed

Altogether, about 85,000 persons were employed in home economics occupations in 1962. However, this figure includes 26,000 dietitians and approximately 5,000 extension workers whose work is discussed in separate statements on Dietitians and Agricultural Extension workers. (See index for page numbers.) Nearly 50,000 home economists were teachers. Approximately 35,000 were primarily secondary school teachers, and about 10,000 were primarily adult education instructors; however, a good many of these teachers taught both secondary school and adult education classes. In addition, there were nearly 3,500 college and university teachers. The remainder taught in elementary schools or were child development and family relations specialists teaching in kindergartens, nursery schools, recreation centers, and other institutions. About 5,000 or 6,000 home economists were in private business firms and associations. Several hundred were primarily research workers, and a smaller group participated in social welfare programs as advisers, consultants, and training supervisors. 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, in applied arts, and in other areas.

Training, Other Qualifications, and Advancement

Approximately 450 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 provides students with a strong background in science and liberal arts and also includes courses in each of the areas of home economics. Advanced courses in chemistry and nutrition are

important for those wishing to specialize 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. In order to teach home economics in a high school, it is necessary to complete the professional education courses and other requirements for a teacher's certificate in the State in which one wishes to teach.

A few scholarships especially designated for undergraduates in this field are available, as well as scholarships, fellowships, and assistantships for graduate study. Although colleges and universities offer most of these financial grants, some are provided by government agencies, research foundations, businesses, and the American Home Economics Association.

Home economists must be able to work with people of various living standards and backgrounds and should have a capacity for leadership, with ability to inspire cooperation. Good grooming, poise, and an interest in people are also essential, particularly when dealing with the public.

Employment Outlook

Home economists are expected to have very good employment opportunities throughout the remainder of the 1960's. In early 1963, experienced home economists with graduate training to fill administrative, college teaching, and extension specialist positions were in especially strong demand. Graduates with the bachelor's degree were also being sought to fill entry positions, mainly as teachers in secondary schools. In most States, not enough home economics graduates were entering and remaining in home economics occupations to satisfy the demand for these workers in teaching and other fields. Some young women who study home economics do not enter employment in the field but become full-time homemakers. Others work professionally for only a short time before marriage but often return to part-time or full-time employment after their children are in school.

The demand for home economists to fill teaching positions in secondary schools and in colleges and universities will be the principal factor in the longrun growth in employment in this field. In addition, the need for more home economists in research is expected to increase with the continued interest in using scientific methods for improving

various home products and services. Employers in many business establishments are also likely to become increasingly aware of the contributions that can be made by professionally trained home economists and will probably hire more of them to promote home products and to act as consultants to customers. Replacement needs will undoubtedly continue to be high in this field. There will be many opportunities for part-time teachers in adult education programs as more women utilize such programs to improve their homemaking skills for personal reasons and to obtain positions requiring such training.

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, graduated by education and experience. In school districts with 100,000 or more pupils, the average (median) salary of beginning teachers with a bachelor's degree was \$4,700 for the school year 1962-63, according to a National Education Association survey; in districts with 50,000 to 99,999 enrollment, starting salaries averaged \$4,600, and in districts with 25,000 to 49,999 enrollment, \$4,400.

Annual beginning salaries of home economists employed by business firms generally ranged from about \$4,000 to \$5,700, according to the limited data available in late 1962. Earnings of home economists with 5 years of experience usually ranged from \$5,000 to \$7,000 and top executives from \$7,200 to \$14,000 a year. According to a survey by the American Home Economics Associa-

tion, the average (median) salary of home economists engaged in college and university teaching was \$7,000 a year in 1962; 1 in 8 earned between \$10,000 and \$15,000 a year. In the cooperative extension service, salaries of county home demonstration agents averaged about \$6,800 per year and those of State specialists, \$8,400 per year in early 1963.

In the Federal Government, the entrance salary for inexperienced workers with a bachelor's degree in home economics was \$4,565 in early 1963. For those with additional education and experience, salaries ranged from \$5,540 to over \$16,000 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 work, 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 such fringe benefits as paid vacation, sick leave, retirement pay, and insurance benefits.

Where To Go for More Information

A list of schools granting degrees in home economics is available from the Home Economics Education Branch, Office of Education, U.S. Department of Health, Education, and Welfare, Washington, D.C., 20202.

Additional information about home economists and graduate scholarships may be obtained from:

American Home Economics Association,
1600 20th St. NW., Washington, D.C., 20009.

Industrial Designers

(D.O.T. 0-46.88)

Nature of 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 selection of styles in products, particularly radios, television sets, automobiles, refrigerators, and furniture, a primary objective of the industrial

designer is to design or redesign his employer's product to compete favorably with similar goods.

As a first step in designing, the industrial designer spends time on historical research on the product or related products. He examines the nature of the competition in today's market and the ways in which the product may be used. Then, he sketches a variety of alternative solutions, which are examined from many points of view.

For example, the designer may consult engineers, production supervisors, and the sales and market research staff for their opinions as to the practicability of producing a newly designed product, or changing the design of an old product, and as to the sales potential of the proposed designs. After the most suitable design is selected by company officials, a model 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 in design. The final or working model, which may be produced by machinists, patternmakers, or other highly skilled craftsmen, is usually made of the material to be used in the finished product. If the model is finally approved, it is adopted and put into production.

Industrial designers may also be called upon to do related types of work of an artistic nature. 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 layout of the interior 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 which may lead to the development of a new product. 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.



Industrial designer sketches changes in auto body design

Where Employed

Fewer than 10,000 industrial designers were employed in early 1963. The great majority worked for large manufacturing companies and in design consulting firms; of the remainder, the greatest number did freelance work or combined salaried employment with freelance work. 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. Those employed by industrial firms are most often found 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. People from other areas, however, notably engineering and architecture, often 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, though a few schools require 5 years of study. These schools award the bachelor's degree in industrial design or fine arts; some 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.

Entrance to the course of study in industrial design is limited, with rare exceptions, to qualified high school graduates; in addition, art schools and colleges may require students to present sketches and other examples of their artistic ability. Some schools require students to complete their freshman year or sophomore year 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, whereas others give students a strong cultural background in art. Nevertheless, all 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, principally those with a technical emphasis, 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, and science, in their curriculums.

Creative ability, skill in drawing, and the ability to predict consumer needs are among the most important personal qualifications needed by young people aspiring to work in this field. A mechanical interest is also important. 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 frequently required to work cooperatively with engineers and other staff members, ability to work and communicate well with others is important. Young people who plan to do industrial design on a consulting basis should, in addition, have a knowledge of business practices, as well as 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 the necessary funds, as well as established reputations in the field, may open their own consulting firms.

Employment Outlook

Employment in this relatively small occupation is expected to expand moderately during the rest of the 1960's. Employers will be actively seeking applicants with a college degree and outstanding talent. Some employment opportunities will also

arise each year from the need to replace designers who retire or leave the field for other reasons. Although these vacated positions are likely to be filled by promoting designers' assistants, such promotions result in openings at the entry level.

Over the long run, employment in the field of industrial designing will continue to expand. Rapid obsolescence of military and commercial equipment and the rising population will increase the demand for newly designed products. As in the past, manufacturers will strive to capture their share of this market through creating new products, by improving the design of existing ones, and by changing package designs and otherwise modernizing the appearance and use of their products. Small companies will probably make increasing use of services offered by industrial design consulting firms in order to compete more effectively with larger firms. All of these factors, combined with rising per capita income, will contribute to 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 and who have artistic and creative talent as well. Also, since personnel needs in this profession are closely related to general business conditions, any downturn in the economy would tend to affect adversely the employment outlook for industrial designers.

Earnings

Starting salaries of inexperienced industrial designers employed by manufacturing firms ranged from \$90 to \$125 a week in early 1963, according to the limited information available. Beginning salaries of those employed by consulting firms were usually lower. Salaries of experienced industrial designers vary greatly, depending on individual ability, size and type of firm in which employed, and other factors. According to scattered reports, those with several years of experience earned salaries ranging from \$6,000 to \$12,000 on the average, in early 1963. Some large manufacturing firms paid \$25,000 or more to experienced and talented 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 ranged between \$12,000 and \$20,000 a year, with a few outstanding industrial designers making as much as \$200,000 a year.

Where To Go for More Information

American Society of Industrial Designers,
15 East 48th St., New York, N.Y., 10017.

Industrial Designers' Institute,
441 Madison Ave., New York, N.Y., 10022.

National Association of Schools of Art,
50 Astor Pl., New York, N.Y., 10003.

Interior Designers and Decorators

(D.O.T. 0-43.40)

Nature of Work

Interior designers and decorators plan the selection and arrangement of furniture, draperies, floor coverings, and decorations for homes and other structures, such as offices, stores, hotels, theaters, clubs, schools, and even ships and aircraft. They may work on the interior settings used for motion pictures and television. Their plans are intended to achieve both an artistic and functional effect. Interior designers who plan the space and other interior design for their clients most often work on large projects—an entire office building, for example—and plan the complete layout of the rooms within the space allowed by the exterior walls and other framework. When their plans have been completed, the architect for the structure usually checks them against his blueprints to assure compliance with building requirements and to solve any structural problems. Some interior designers also design the furniture and accessories to be used in interiors and then arrange for their manufacture.

Many designers and decorators have their own establishments, where they sell some or all of the merchandise with which they work. Some work alone, or with one assistant; others have a large staff, sometimes including salespeople.

Many of the larger department and furniture stores have special departments with interior decorators in charge to advise customers on decorating plans. One of the main functions of such departments is to help sell the stores' merchandise, although the decorators are usually permitted to use materials not carried by the stores when this is essential to their decorating plans. In addition to customers, department store decorators may ad-



Interior decorator checks to determine client's preference in furnishings

vice the stores' buyers and executives concerning style and color trends in interior furnishings.

As a rule, designers and decorators work directly with clients to determine their preferences and needs in furnishings; on large assignments, they may submit sketches or water color renderings in perspective of their plans, along with 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, cabinet makers, carpet layers, and other craftsmen; and for the installation and arrangement of furnishings.

Where Employed

About 10,000 men and women were engaged in interior design and decoration in 1962. The majority were located in large cities and their suburbs—areas in which decorating services are widely used. In recent years, large department and furniture stores have become increasingly important sources of employment for professional decorators. Some designers and decorators have regular jobs with hotel and restaurant chains. Others are employed by architects, antique dealers, office furniture stores, industrial designers, furniture and textile manufacturers or other manufacturers in the interior furnishings field, or by periodicals that feature articles on home-furnishings.

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 such training. Most department stores, well-established design and decorating firms, and other major employers will accept only well-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 of fine arts 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 and fabrics. In addition, courses in salesmanship, business arithmetic, and other business subjects are of great value.

Membership in either the American Institute of Interior Designers or the National Society of Interior Designers is a recognized mark of achievement in this profession. For such membership a decorator must usually have completed 4 years of education or more beyond high school, with major emphasis on training in design, and also have had

several years of experience, including responsibility for supervision of all aspects of decorating contracts.

New graduates with art training 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 both 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 may also lead to a career in merchandising.

Decorators with ability and considerable experience may be advanced to head of the decorating department or to other supervisory positions in department stores or large decorating firms. Experienced decorators may open their own decorating establishments or move into positions as interior furnishings coordinators in department stores.

Artistic talent, imagination, and good business judgment are probably the personal qualities most important for success in this field.

Employment Outlook

Talented art school or college graduates with a major in interior design and decoration will probably have good opportunities for employment during the remainder of the 1960 decade. Young people without formal training or real aptitude for the work will, however, find it increasingly difficult to gain a foothold in the field.

A slow but steady increase in employment of interior designers and decorators is anticipated over the long run. Factors that will contribute to this expansion are population growth, larger expenditures for home and office furnishings, the increasing availability of well-designed furnishings at moderate prices, and a growing recognition among middle-income families of the value

of decorators' services. In addition to newly created jobs, some openings will arise each year as workers retire, die, or leave the occupation for other reasons.

Department and furniture stores will continue to employ an increasing number of trained decorators. These stores are also expected to share in the growing volume of decorating work for commercial establishments and public buildings, formerly handled almost entirely by independent decorators. This development will result in increased opportunities for salaried employment of decorators. As in the past, however, a sharp downturn in general economic conditions would adversely affect employment opportunities in this field.

Many women will continue to find employment opportunities in this field. Mature women with suitable educational and personal qualifications should be able to compete successfully, since some clients do not have confidence in youthful appearing decorators.

Earnings and Working Conditions

Beginning salaries ranged from \$65 to \$85 a week in 1962 for art school or college graduates with formal training in interior design and decoration, according to limited data available.

Many interior decorators with experience in this field earn only moderate incomes—from \$4,000 to

\$5,000 a year. Other decorators who are well known in their localities may earn up to \$12,000 or more. Designers and decorators whose talents are nationally recognized may earn more than \$25,000 yearly.

Decorators in business for themselves 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, and their own business competence. Decorators in the employ of others also have variable earnings, since few of them 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.

Hours of work for decorators and designers 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.

Where To Go for More Information

American Institute of Interior Designers,
673 Fifth Ave., New York, N.Y., 10022.

National Society of Interior Designers, Inc.,
Suite 700, 157 West 57th St.,
New York, N.Y., 10019.

Landscape Architects

(D.O.T. 0-03.20)

Nature of Work

Landscape architects plan the arrangement of outdoor areas for people to use and enjoy. Parks, gardens, scenic roads, housing projects, campuses, and country clubs reflect the skill of these architects in designing landscapes that are both useful and pleasing. Because of their knowledge of site planning, landscape architects may serve many types of clients, such as a school board planning a new high school, a manufacturer wishing to fit a factory into a suburban area attractively, a homeowner wishing to improve his grounds, a Government agency desiring a master plan for a military site, a city preparing to build an airport,

or a real estate firm embarking on a new suburban development.

The landscape architect may plan the entire arrangement of a site and supervise the grading, construction, and planting required to carry out the plan. Whether he performs all or only part of these services on a particular project, however, depends on the client's wishes and the available funds.

A landscape architect begins to plan a site by studying the nature and purpose of the client's project and the various types of structures needed. Next, he studies the site itself, observing and mapping such features as the slope of the land and



Landscape architects may plan the entire site for an area redevelopment project

the position of existing buildings and trees. He also considers the views, the parts of the site that will be sunny or shaded at different times of day, the structure of the soil, existing utilities, and many other factors. Then, after consultation with the architect and engineer working on the project, he draws 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. The landscape architect outlines in detail the methods of constructing such features as walks and terraces and draws up lists of materials to be used. Landscape contractors are then invited to submit bids for the work.

Firms of landscape architects usually handle a wide variety of assignments. Some, however, specialize in such projects as parks and playgrounds, campuses, hotels and resorts, shopping centers, roads, or public housing.

Where Employed

About 4,000 landscape architects were employed in early 1963. The majority were in business for themselves or worked for other landscape architects in private firms. Most of the remainder—about a third of all landscape architects—were employed by government agencies concerned with public housing, city planning, or parks and recreational areas. Some were on the staffs of archi-

tectural or engineering firms; others were employed by landscape contractors or nurseries, and a few taught in colleges and universities.

Landscape architects are found in every State and in many small towns as well as big cities. The largest numbers are in the most highly populated States. California, with a large population, a high per capita income, and a mild climate, has more landscape architects than any other State.

Training, Other Qualifications, and Advancement

A bachelor's degree from a college or university which offers professional training in landscape architecture is usually the minimum requirement for entering the profession. Such training is offered in at least 20 colleges and universities, of which 16 have been accredited by the American Society of Landscape Architects. The curriculum for the bachelor's degree requires 4 to 5 years of study, depending on the institution. A few 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 are usually 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 what phases of landscape architecture interest him most and may enable him to get a better than average job and salary upon graduation.

New graduates usually begin as junior draftsmen assigned to tracing drawings and other simple drafting work. As their skill increases, they progress to more responsible work. After 2 or 3 years, they can usually advance to positions as senior draftsmen, qualified to carry a design through all its 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 six States—California, New York, Virginia, Georgia, Oregon, and Louisiana. Candidates for the licensing examination are 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 with professional training in landscape architecture are expected to be good for the remainder of the 1960's. In the long run, the profession will probably continue to expand, 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. Opportunities for landscape architects may increase sharply if developers of new residential and commercial areas continue to offer planned recreational facilities and landscaping to compete with existing areas.

In some parts of the country, the expected increase in homeownership, coupled with rising per

capita incomes and living standards, will also spur the demand for landscape architects. These factors are likely to have much less effect in some other areas (especially the northern and eastern parts of the country) where homeowners generally choose the services of landscape gardeners and nurserymen instead of landscape architects.

Women can enter training for landscape architecture. They represent about 10 to 15 percent of all landscape architects (but only about 1 percent of the Nation's registered architects). Well-trained and competent women landscape architects can look forward to interesting and worthwhile careers in the profession, chiefly as specialists in garden and planting design.

Earnings and Working Conditions

In early 1963, starting salaries in private industry for new graduates in landscape architecture ranged from about \$90 to \$130 a week, according to the limited information available. The relatively higher salaries generally were paid to graduates who had gained experience in summer jobs in landscape architecture firms. Some firms started inexperienced landscape architects at about \$75 a week and advanced them to higher salaries after a few months' experience. Experienced persons employed by private firms typically earned from \$7,000 to \$8,000 a year, though it was not unusual for especially well-qualified people to receive annual salaries of \$10,000 or more.

Landscape architects in independent practice often earn more than salaried employees with considerable experience, but their earnings vary widely and may fluctuate from year to year. In recent years, earnings for this segment of the profession have tended to range from \$6,000 to \$15,000 a year, with some people of exceptional ability and established reputation making \$25,000 or more a year.

The annual entrance salary for newly graduated landscape architects in the Federal Civil Service was either \$5,365 or \$6,465 in early 1963, depending on their qualifications. The salary schedule also provides for periodic increases above this amount. A large majority of experienced landscape architects in the Federal Government earn \$8,045 or more a year; a few earn \$15,000 or more.

Salaried employees in both the government and in landscape architectural firms usually work regular hours. Self-employed persons often work long hours, especially in the planting season. Salaried employees in private firms may also work overtime in the seasonal rush periods.

Where To Go for More 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.,
2000 K St. NW., Washington, D.C., 20006.

Lawyers

(D.O.T. 0-22.)

Nature of Work

Lawyers (attorneys) advise clients on their legal rights and obligations and, when necessary, represent them in courts of law. In addition, they negotiate settlements out of court and represent clients before quasi-judicial or administrative agencies of the government. 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. Some lawyers serve as judges in Federal, State, and local courts. Others are primarily engaged in teaching, research, writing, or administrative activities.

The great majority of practicing lawyers are engaged in general practice, handling all kinds of legal work for clients. However, a significant number practice in a particular branch of the law—for example, 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 in such activities as 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.

Many people with 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 FBI agents, insurance adjusters, tax collectors, probation officers, credit investigators, or claims examiners. A legal background is also a valuable asset to people seeking public office.

Where Employed

Of the approximately 250,000 lawyers employed in 1961, three-fourths were in private practice. Approximately 60 percent of the private practitioners were in practice by themselves, about 30 percent were in partnerships, and the remainder—less than 10 percent—worked for other lawyers or law firms.

The greatest number of salaried attorneys are employed by government agencies. In 1961, the Federal Government employed approximately 13,000 attorneys, chiefly in the Department of Justice, the Department of Defense, and the Veterans Administration. About 8,300 attorneys held positions with city or county governments, and 4,300 were employed by State governments. Nearly 8,200 held judicial positions.

The second largest number of 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 while primarily employed in another occupation.

Although lawyers practice in all parts of the country, most of them are in cities and in the States with the greatest population. In 1961, for example, nearly one-third of all lawyers were in New York City, Chicago, Washington, D.C., Los Angeles, Boston, Detroit, Philadelphia, and Cleveland.

Training, Other Qualifications, and Advancement

Before a lawyer can practice in the courts of any State he must be admitted to the bar of that

State. In all States applicants must pass a written examination; a few States waive this requirement, however, 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 right to practice before Federal courts and agencies is controlled by special rules of each court or agency.

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—though this method of training is now rare. A few States will accept study of the law wholly in a law office; 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 examination.

As a rule, it takes 6 years of full-time study after high school to complete the required college and law school work. The most usual preparation for becoming a lawyer is 3 years of college study followed by 3 years in law school. Some law schools, particularly if they have a 4-year, full-time curriculum, 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, courses in 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 159 law schools in existence in 1962, 134 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 is usually required to complete the night-school curriculum. In 1962, about one-quarter of all law students 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 graduation, the degree of bachelor of laws (LL.B.) is awarded by most schools, although a few confer the degree of juris doctor (J.D.). 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. 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 salaried employment, during which time they can obtain experience and funds and become well known, many lawyers go into practice for themselves.

Employment Outlook

Graduates from widely recognized law schools and those in the top 10 percent of their classes will have favorable employment prospects throughout the 1960's. They are expected to have good opportunities for obtaining salaried positions with well-known law firms, on 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 are likely to 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. Law graduates will also be in demand as commissioned officers in the Armed Forces for legal assignments. 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 build up 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 continue to arise from the need to replace those who retire, die, or otherwise leave the field, a gradual increase in the legal profession is expected over the long run. 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. The growing complexity of business and government activities is expected to create a steadily expanding demand for lawyers who have extensive experience in fields such as corporation, patent, administrative, labor, and international law.

Opportunities for women lawyers, who comprised less than 3 percent of the profession in 1961, will probably continue to be limited for some time to come. More than half of all women

lawyers are employed in salaried positions, a few are in practice for themselves. Many women lawyers hold positions, not as attorneys, but in occupations requiring a knowledge of law.

Earnings and Working Conditions

In the Federal Government, the annual starting salary for attorneys who had passed the bar was either \$5,540 or \$6,675 in early 1963, depending on the applicant's qualifications. Attorneys employed in beginning salaried positions with manufacturing and other business firms had an average salary of approximately \$6,550 a year in early 1962.

Beginning salaries for young lawyers are generally highest in large law firms and Federal agencies. Those working for small law offices or engaged in legal aid work usually receive the lowest salaries. The beginning lawyer in practice for himself may make little more than his expenses during the first few years and may add to his total income by engaging in other part-time employment.

Lawyers' earnings usually rise with increased experience. Those employed on a salaried basis receive increases as they demonstrate their ability to assume greater responsibilities. 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.

Where To Go for More 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 the State capital. Information on law schools and on law as a career is available from:

The American Bar Association,
1155 East 60th St., Chicago, Ill., 60637.

Librarians

(D.O.T. 0-23.)

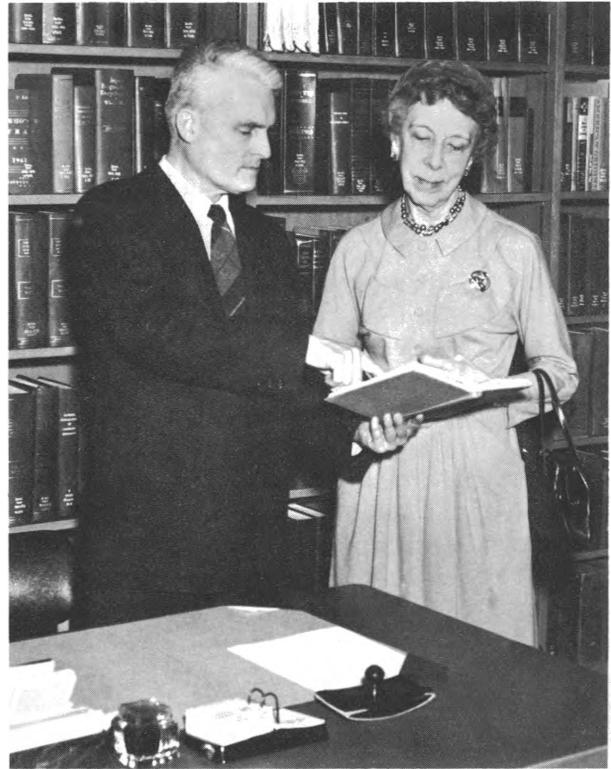
Nature of Work

Librarians select, acquire, and organize collections of books, pamphlets, manuscripts, periodicals, clippings, and reports and assist readers in their use. In many libraries, they also make available organized collections of phonograph records, maps, slides, pictures, tapes, films, and film strips. Their duties include analyzing the reading interests and information needs of people served by the library and developing a collection of materials to meet those requirements, preparing a catalog to serve as a guide to the collection, and aiding readers in securing information or reading materials. Librarians may also review and abstract published and unpublished materials, prepare bibliographies, advise schools or business organizations on sources of information for research, provide library services for community projects, publicize library services, and plan and operate information storage and retrieval systems.

In a small library, a librarian may perform a great variety of tasks. In a large organization, each librarian may perform only a single function or may specialize in a subject matter area, such as science, business, the arts, or medicine.

Librarians may be classified according to the types of libraries in which they are employed: Public libraries, school libraries, college and university libraries, and special libraries. In each of these, 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. Catalogers and others who perform technical services usually have no contact with readers.

Public librarians serve all kinds of readers—children, students, teachers, research workers, and others. The professional staff of a large public library system may include the chief librarian, an assistant chief, and several division heads, who plan and coordinate the work of the entire system and perform other administrative duties. Such a system may also include librarians who supervise branch libraries, and other librarians who are specialists in certain areas. The duties of some of



A growing number of librarians are men

these specialists are briefly described in the paragraph which follows.

Acquisition librarians have responsibility for the purchase of books and other library materials that are selected by staff members; they may also acquire materials by exchange or gift. *Catalogers* classify books under various subjects and otherwise describe them so they may be identified through card catalogs. *Reference librarians* aid readers in their search for information—answering specific questions or suggesting sources of information about broad subjects. *Children's librarians* plan and direct special programs for children, including preschool children. Their duties include instructing children in the use and content of the library, giving talks on books, and maintaining contact with schools and community organizations. Often they conduct a regular story hour at the library and sometimes on radio or television. *Adult services librarians* may select materi-

als for and advise mature readers. They are often asked to suggest reading materials or to 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 materials for young people, 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 may also 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 work with pupils as well as with teachers and school supervisors concerned with planning 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. They instruct students in the use of the library and visit classrooms to acquaint students with library materials relating to the subjects being taught. 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, sometimes using computers and other modern devices to record and retrieve specialized information.

Special librarians serve in libraries maintained by commercial and industrial firms, such as pharmaceutical companies, banks, and advertising agencies; professional and trade associations; government agencies; and other types of organiza-

tions. These librarians plan, acquire, organize, and catalog 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 library science, in building up 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. Some special librarians develop coding and programing techniques for using electronic and electromechanical information storage devices.

Where Employed

Nearly 60,000 people were employed as full-time professional librarians in 1962, according to the U.S. Office of Education. According to the same source, an additional 15,000 to 20,000 other people were working as librarians; of these some were working part time and others were not regarded as "professional" librarians. School librarians and public librarians each accounted for about one-third of the full-time employed professional group. Librarians in colleges and universities and those employed in special libraries (including libraries in government agencies), each accounted for about one-sixth of the total. A small number of librarians were employed as teachers and administrators in schools of library science.

About 85 percent of all librarians are women. The proportion of men is rising however; in recent years nearly 25 percent of the college graduates who earned a degree in library science were men. 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. Increasingly, rural libraries are being organized into systems with centralized reference and technical services. The headquarters for these library organizations are frequently in the largest town or the governmental seat of the region or county served.

Training, Other Qualifications, and Advancement

To qualify as a professional librarian, one must ordinarily have completed a course of study in a library school. This usually means 5 years of college—four to meet 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 such 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.

In 1962, there were 31 graduate schools in the United States which were accredited by the American Library Association. Approximately 70 other institutions also conferred library science degrees at either the undergraduate or graduate level or both. Many other colleges offer courses within their 4-year undergraduate programs 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 a 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.

Special librarians must have extensive knowledge of the subject with which their work will deal, as well as training in library science. In libraries devoted to scientific information, the librarian must know one or more languages well. Subject matter specialists in other libraries may also be required to know foreign languages.

Many students attend library schools under cooperative work-study programs, combining their academic program with practical work experience in a library. To aid the student in arranging his work-study schedule, many schools have adopted the policy of offering all courses every semester. Scholarships for training in library science are available from certain State and Fed-

eral funds and from library schools, as well as from a number of the large libraries and library associations.

School librarians must be certified in all States as having met the requirements for both librarians and teachers. Certification of public librarians is required in 22 States and is optional in 11 other States. Other requirements, based on different combinations of education and experience, are sometimes established by local, county, or State authorities. In the Federal Government, completion of a 4-year college course, including at least 24 hours of library science or the equivalent in experience, is required for beginning positions; candidates with a year of graduate work in library science are eligible for appointment to a higher grade.

In addition to an appropriate educational background, a person interested in becoming a librarian should have above-average intelligence, an interest in people, an attraction to books, 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 library school, or to those who have had specialized training and experience.

Employment Outlook

The employment outlook for trained librarians is expected to be excellent for the remainder of the 1960 decade. A nationwide shortage of trained librarians was reported in early 1963, by library schools, associations, the U.S. Office of Education, and other sources. This situation is expected to persist despite the anticipated rise in the number of library school graduates. Thus, it appears that employment opportunities will exist in most parts of the country and in all types of libraries. The greatest shortage areas will probably continue to be in cataloging, children's work, school libraries, extension work, and in special library services.

As long as there is a shortage of fully trained librarians, persons who have only a bachelor's degree with a major in library science, as well as some college graduates who have had little or no

library training, will continue to find employment opportunities in libraries. Many part-time positions will also be available for persons trained in library work. Retired librarians should be able to find employment and short-term positions as consultants, as substitutes for librarians during vacation periods, or in other types of library work. Jobs for library assistants will also be available for college students or other persons interested in gaining library experience.

Over the long run, the demand for full 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 tend to rely more heavily on the services of special librarians to keep abreast of new developments. The extension of Federal aid to rural libraries will 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 will increase for librarians who are specialists in this area. Especially well-qualified librarians will probably continue to find some opportunities for employment in American libraries overseas. Several thousand librarians will also be needed each year to fill positions vacated by young women who leave their jobs to take care of their families, and to replace librarians who transfer to other types of work, retire, or leave the field for other reasons.

Earnings and Working Conditions

The annual average starting salary of new library school graduates was \$5,365 in 1961, according to a private survey. Specialists with extensive experience earned up to \$15,000 or more. Degree of responsibility and technical skill required, as well as geographical location, size, and type of library are important factors which determine librarians' salaries.

In the Federal Government, the annual entrance salary for librarians with a bachelor's degree was \$4,565 in early 1963; for those with a master's degree it was \$5,540. Many in supervisory and administrative positions earned salaries ranging from about \$11,000 to \$16,000, and a few earned more.

Annual starting salaries of special librarians with a master's degree in library science generally ranged from \$5,200 to \$6,000 in 1962, according to the Special Libraries Association. Head librarians in special libraries earned salaries which ranged from about \$8,000 in business libraries to \$10,000 and over in science libraries. Scientific information-retrieval specialists earned as much as \$15,000 annually.

The annual salaries of library directors in colleges and universities averaged \$7,300 in private institutions and \$10,000 in public institutions in 1962, according to the U.S. Office of Education. A few in large universities earned as much as \$20,000. In junior colleges, average salaries of library directors ranged from \$5,400 in private institutions to \$7,300 in public institutions. School librarians usually have the same pay scale as teachers.

The typical workweek for librarians is 5 days and 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.

Where To Go for More 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,
31 East 10th St., New York, N.Y., 10003.

Additional information on employment opportunities for librarians and about library development may be obtained from:

Library Services Branch, 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, as well as general information about career prospects in their regions. State boards of education can furnish information on certification requirements and job opportunities for school librarians.

Newspaper Reporters

(D.O.T. 0-06.71)

Nature of Work

Newspaper reporters gather information on current events and write stories for publication in daily or weekly newspapers. They interview people, review public records, observe events, and do research. As a rule, reporters take brief notes while collecting facts and write their stories upon return to the office. Sometimes, to meet deadlines, they telephone their stories to "dictationists" or give the information by phone 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, whereas other local news is handled by general assignment reporters. News on certain subjects, such as sports, politics, science, and religion, is dealt with, to an increasing extent, by specialists in these fields. Reporters on small newspapers get broad experience; they not only cover all aspects of local news but may also take photographs, write headlines, lay out inside pages, and even write editorials. On the smallest weeklies, they may also solicit advertisements, sell subscriptions, and perform general office work.

Newspaper reporting is only one of several occupations open to young people trained in journalism. Persons with this background may also work for magazines, trade, business, and labor publications, and other periodicals; for radio and television stations, advertising agencies, and public relations firms; and for government agencies. These related activities are not covered in this statement.



Reporters preparing news stories in city room

Where Employed

An estimated 25,000-~~30,000~~^{30,000} newspaper reporters were employed in the United States in 1962. 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 approximately 1,800 daily and 9,000 weekly newspapers, the great majority are in medium-size towns, often in the suburbs of large cities. 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 with little or no academic training beyond high school sometimes become reporters, an increasing number of newspapers will consider only applicants with a college education. Some editors prefer those with a degree in journalism; others consider a degree in liberal arts equally desirable.

Professional training leading to a bachelor's degree in journalism can be obtained in more than 150 colleges; about 100 of these have separate departments or schools of journalism. The typical undergraduate journalism curriculum is offered during the junior and senior years of college and is divided about equally between cultural and professional subjects. Students preparing to become newspaper reporters take professional subjects such as reporting, copyreading, editing, feature writing, and the history of journalism. A number of schools award the master's degree in journalism, but only a few offer programs leading to the doctor's degree in this field.

Young people who wish to prepare for newspaper work through a liberal arts course should take English including specialized courses in writing, as well as such subjects as sociology, political science, economics, history, and psychology. Those who look forward to becoming technical writers or to reporting in a special field such as science should concentrate course work in their subject matter areas to the maximum extent possible. (See *Handbook* statement on Technical Writers.) Those without college training usually qualify by gaining experience on rural, small-town, or suburban papers.

Writing ability is fundamental to success in this field. Other personal characteristics of importance are a "nose for news," persistence, initiative, resourcefulness, an accurate memory, and the physical stamina necessary for an active and often fast-paced life. Skill in typing is useful since reporters often type their own news stories. In beginning jobs on small papers, a knowledge of news photography is also valuable.

Many beginners start on weekly or small daily newspapers. Some outstanding college graduates, however, are hired directly for reporting positions by papers that prefer to train them on-the-job. Others, also usually college graduates, start on large city papers as copy boys, acting as messen-

gers or office boys. They may be promoted to reporting jobs as they gain experience and as openings arise.

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 may also be helpful in obtaining employment.

Beginning reporters are first assigned to such work as summarizing speeches, covering civic and club meetings, writing obituaries, interviewing visitors to the community, and covering police court proceedings and minor news events. As they gain experience, they may advance to covering more important developments or to a "beat" or special subject. Reporters with extensive experience may become rewrite men or copy editors. Newspapermen also progress to reporting jobs with larger papers or with press services and newspaper syndicates. Some experienced reporters advance to positions such as columnists, correspondent, editor, or to top executive positions or become publishers, but these positions represent the top of the field and competition for them is keen. Other reporters transfer to related fields such as advertising, radio, television, or public relations.

Employment Outlook

Well-qualified beginners with writing talent will have good employment opportunities in the middle and late 1960's. In early 1963, newspaper editors were actively seeking young reporters with exceptional talent. Other beginners, however, were facing keen competition for jobs, especially on large city dailies, and will probably continue to do so. In addition to seeking young reporters with exceptional talent, editors were also looking for reporters who were qualified to handle news about atomic energy, military developments, labor, and other 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 to enter newspaper reporting. Openings continually 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 who are acquainted with the community.

Large city dailies will also provide openings for inexperienced people with a good educational background as well as a flair for writing to enter as reporter trainees, and a number of opportunities will continue to be available for young people to enter as copy boys and advance to reporting jobs.

In addition to jobs in newspaper reporting, new college graduates with journalism training will find numerous openings in 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 throughout the 1960 decade. Factors pointing toward continuing expansion include rising levels of education 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. Newspapers will share in this growth. Employment of reporters is expected to increase, although not as fast as employment in some related areas. The greatest number of job openings 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.

Special opportunities for women will continue to be found in reporting on such subjects as society news, food, fashions, clubs, and beauty culture for the women's section of newspapers. Many women reporters, however, have the same types of job assignments as men.

Earnings and Working Conditions

Many daily newspapers have negotiated contracts with the American Newspaper Guild which set minimum wages based on experience and pro-

vide for annual salary increases. Papers with Guild contracts often pay salaries higher than the minimum rates called for in their contracts. Particularly successful, experienced reporters on city dailies may earn more than \$200 a week. In early 1963, the minimum starting salaries on most daily newspapers with Guild contracts ranged from \$60 to \$98 a week for reporters with no previous experience. On a few small dailies, the Guild minimum starting salaries were less than \$65 a week; on a few large dailies, Guild minimum rates for beginning reporters ranged between \$95 and \$110 a week. Young people starting as copy boys earn less than new reporters—minimum Guild rates for copy boys with some experience ranged from about \$46 to slightly more than \$80 a week.

On most dailies, minimum Guild rates for reporters with some experience (usually for those with 4 to 7 years) ranged from about \$113 to \$165 a week in early 1963. Contract minimums for experienced reporters on a few small dailies were less than \$115 a week; on a few large dailies they were from \$165 to \$175 a week.

Newspaper reporters on big city papers frequently work 7 or 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. City papers 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 pensions.

Where To Go for More 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.,
44 Broad St., New York, N.Y., 10004.

Sigma Delta Chi,
35 East Wacker Dr., Chicago, Ill., 60601.

Information on union wage rates is available from:

American Newspaper Guild, Research Department,
1126 16th St. NW., Washington, D.C., 20036.

Names and locations of all daily newspapers and a list of departments and schools of journalism are published in the Editor & Publisher International Yearbook, available in most large newspaper offices and public libraries.

Photographers

(D.O.T. 0-56.01 through .31)

Nature of Work

Photography is both an artistic and a technical occupation, involving much more than taking clear pictures of people or views. Some photographers produce pictures which are so beautifully composed, otherwise artistic, and striking that they are recognized as works of fine art. Skillful portrait photographers take pictures which are not only natural looking and attractive, but express the personality of the individual. In taking pictures for advertising and other commercial purposes, the photographer has to understand how the picture is to be used and plan to take it in such a way as to achieve the desired effect. Photographing sports and other news events also calls for special photographic skills, as do other branches of photographic work.

In taking pictures, photographers use a variety of cameras—miniature (35 mm.), still, motion picture, and others. The cameras may be equipped with telescopic, wide-angle, or other special lenses and with different types of light filters, to enable the photographer to get the particular effects desired in each picture. Photographers also utilize many kinds of film and must know which to use for each type of picture, lighting condition, camera, and filter. When taking pictures indoors or after dark, they use lighting equipment—flash bulbs for some pictures, flood and other special lights and reflectors for others. In addition, photographers must understand and be able to carry through the chemical and other processing by which pictures are developed, enlarged, and printed. In small shops and photographic departments, the photographer often has to do all this technical work. This may be required also in large studios, but, as a rule, such studios employ photographic technicians to do the needed technical work. The techniques involved in taking motion

pictures differ greatly from those used in still photography and, therefore, most photographers restrict themselves to one field or the other.

Many professional photographers specialize. The most common specialties are portrait work, commercial photography, and industrial photography. Portrait photographers work in their own studios, though they also go to people's homes and other places to take pictures. Commercial photographers generally take pictures for use in advertising real estate, furniture, food, apparel, and other items, but they may also do other kinds of photographic work. Industrial photographers work for a single firm or company, mainly taking pictures that are used in company publications and for advertising company products or services. They may take motion pictures of workers on the job and of equipment and machinery operating at high speed to simplify work methods or to improve the production process. Other photo-



Skillful portrait photographers capture the individual's personality

graphic specialties include press photography (photo journalism that combines a "nose for news" with photographic ability); aerial photography; educational photography (preparing slides, film strips, and movies for use in the classroom); and scientific photography (taking pictures for use in scientific research or technical journals). Some photographers write for trade and technical publications, teach photography in schools and colleges, act as representatives of photographic equipment manufacturers, manage photofinishing establishments, sell photographic equipment and supplies, produce documentary films, or do freelance work.

Where Employed

About 55,000 photographers were employed in 1962. Roughly half of them worked in portrait or commercial studios—many in business for themselves, the rest as salaried employees. In addition, sizable numbers were employed in industry; some worked for Federal, State, and local government agencies; and others operated camera stores or worked on the staffs of newspapers and magazines. Still others worked as freelance photographers, taking pictures of many kinds and selling them to advertisers, magazines, and other customers.

Photographers work in all parts of the country, in small towns as well as large cities. They are, however, mainly concentrated in States which are heavily populated—New York, Pennsylvania, California, Ohio, and Illinois—and which also have great numbers of businesses and industrial establishments.

Training, Other Qualifications, and Advancement

After graduating from high school, young people may prepare for work as professional photographers through 2 or 3 years of on-the-job training in a portrait or commercial studio. A trainee generally starts by working in the dark-room, where he learns how to develop and print film and to do other related work such as making enlargements. Later, he may set up lights and cameras or otherwise assist an experienced photographer in taking pictures. Photographic training can also be obtained in many colleges and universities, trade schools, and technical institutes, or by taking correspondence school courses.

Several colleges and universities offer 4-year curriculums leading to a bachelor's degree with a major in photography. These curriculums include liberal arts courses as well as courses in professional photography. A few institutions have 2-year curriculums leading to a certificate or an associate degree in photography. Training in design, at art schools or institutes, is also useful, although these schools usually do not provide the technical training for camera work. (See statement on Commercial Artists.)

The kind and amount of training obtained greatly influence the kind of photographic work for which a young person can qualify. Amateur photographic experience may be helpful to the young person considering entry jobs in this field.

Considerable formal post-high school training, plus some photographic experience, is usually needed to enter the fields of industrial, news, or scientific photography. Photographic work in scientific and engineering research generally requires an engineering background as well as skill in photography.

The prospective photographer should have manual dexterity and some artistic ability. In addition, a pleasant personality, the ability to put people at ease, and a good business sense are needed by photographers who expect to go into business for themselves. Imagination and originality are particularly important for those aspiring to careers in commercial photography or freelance work. For press photography, a knowledge of news values and the ability to act quickly are important.

Beginning photographers often work in established studios until they accumulate the capital and experience needed to start their own businesses, although some open their own portrait or commercial studios immediately after completing their training.

Employment Outlook

Employment opportunities are expected to be favorable through the middle and late 1960's for talented and well-trained photographers. Such photographers should find work readily in most parts of the country. People with less ability and training are likely to encounter keen competition and also to have limited chances of advancement.

The greatest number of job openings will stem from the need to replace those photographers who transfer to other fields of work, retire, or die.

The portrait and commercial fields of photography were crowded in 1962, and this situation is likely to persist. These fields may be easily entered, since a photographer can go into business for himself without a large financial investment. Moreover, the available supply of portrait and commercial photographers is continually enlarged by people who are employed in other occupations but who take pictures in their spare time. On the other hand, a strong demand existed for industrial photographers and other specialists with a thorough knowledge of photography as well as some training in a technical or scientific field.

Over the long run, a moderate increase in employment of photographers is expected, with the growth in population. The movement of families to the suburbs will create some opportunities for photographers to open portrait studios in the new shopping centers. Other factors which point toward more employment opportunities for photographers are the more widespread production of film strips and motion pictures for use of business and industry, civic organizations, and government; and increasing use of photographers in research and development in the missile and other scientific fields. The employment of industrial photographers is expected to rise at a more rapid rate than that of either portrait or commercial photographers. Advertising photography, on the other hand, may decline somewhat over the next few years, unless the popular magazines—the chief users of this kind of photography—return to a higher level of sales.

Earnings and Working Conditions

Beginning photographers generally earned from \$60 to \$80 a week in 1962, according to limited information from various private sources.

Nature of Work

The occupation of programmer is one of the very newest—as new as the electronic computer. Computers, although sometimes called “mechani-

cal brains,” can only follow carefully prepared instructions as to what they are to do on each job. The programmer prepares these step-by-step instructions.

Many photographers with established reputations earned much more. For newspaper photographers without previous experience and employed on daily newspapers having contracts with the American Newspaper Guild, minimum salaries were usually between \$60 and \$98 weekly. Minimum rates for photographers with some experience (usually 4 to 6 years) ranged from \$113 to about \$165 a week on most dailies organized by the Guild. Photographers with an engineering background who work with engineers and scientists usually receive beginning salaries of from \$6,000 to \$8,000 a year. The entrance salary for inexperienced photographers in the Federal Civil Service was \$3,665 a year; for those with at least 1 year of routine photographic experience, it was \$3,925 a year. In addition, the salary schedule provides for periodic increases above this amount. Most experienced photographers in the Federal Government earn \$4,565 or more a year; only a few earn over \$10,000 annually. Self-employed photographers generally earn more than salaried workers, but their earnings are greatly affected by business conditions, their workweek, and many other factors.

Photographers with salaried jobs usually work the standard 5-day, 40-hour week and receive benefits such as paid holidays, vacations, and sick leave. Photographers in business for themselves frequently work longer hours, especially during their busy seasons. Working conditions are generally pleasant. Freelance, press, and commercial photographers may be required to travel frequently.

Where To Go for More Information

Information about photography as a career, as well as a list of schools of photography, is available from:

Professional Photographers of America, Inc.,
151 West Wisconsin Ave., Milwaukee, Wis., 53203.

Programers

(D.O.T. 0-69.981)

cal brains,” can only follow carefully prepared instructions as to what they are to do on each job. The programmer prepares these step-by-step instructions.

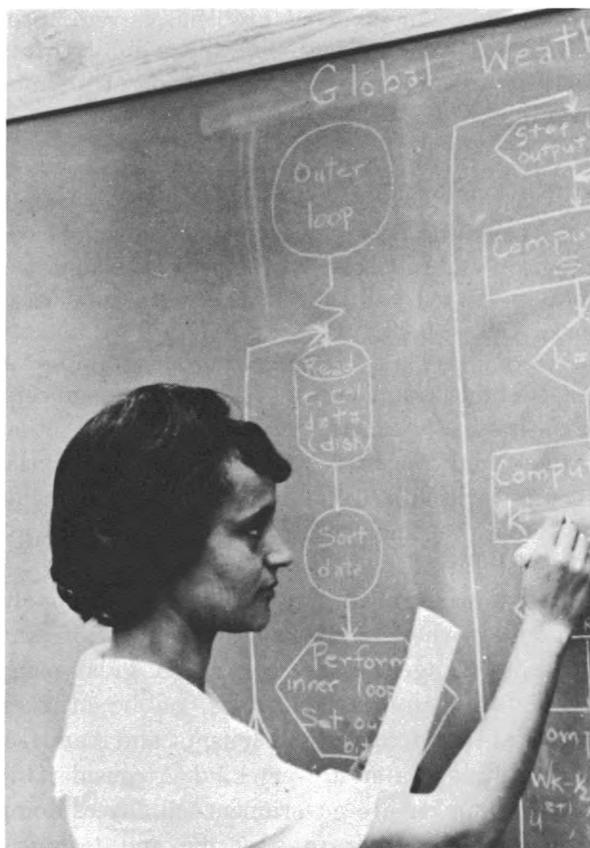
A computer not only makes mathematical calculations at fantastic speeds but stores many thousands of facts in its "memory" which it later uses to carry out its work. Because of their enormous speed and other capacities, computers are used for a great deal of work (or "data processing") which might otherwise require the time of many employees. They handle such varied assignments as making up payrolls, controlling production machinery in factories, and regulating the movement of trains. They have been used for work which otherwise would not be attempted on the same scale because of the time involved—analyzing masses of information about operating costs and potential markets, for example, in order to enable business firms to decide on the most advantageous location for a new plant; and they have accomplished things that would otherwise be impossible—such as controlling the flight of a missile by instantaneously correcting deviations from the planned course. Still other "problems" for which computers have been used include studying the structure of chemical compounds, designing aircraft and missiles, doing legal research, and translating books into Braille for the blind.

Every problem processed on a computer must first be carefully analyzed so that plans can be made for processing the data in the most efficient manner. In some cases, this work is done by an experienced programmer; in others, it is done by specialists known as methods analysts, project planners, or systems analysts.

Once general plans have been completed, the programmer is ready to start writing the "program," or detailed plan for processing the data on the computer. Exactly how he does this depends on the nature of the problem being programmed. The mathematical calculations involved in preparing a payroll, for example, are very different from those required in most kinds of scientific and technical work. The programming techniques are also very different. Special techniques are required also in writing programming "aids" which reduce the amount of detail associated with programming. Because of these differences, many programmers are specialists in certain types of work.

Under most circumstances, the programmer starts preparing instructions for a computer by confer-

ring with professional staff members and other officials in his organization who are in a position to furnish him with detailed information about the subject matter of the problem. If the computer is to be used to make up a payroll, for example, he first determines which facts must be used in order to calculate each employee's paycheck and he finds out the exact form in which these facts—wage rates, hours worked, deductions to be made, and other payroll information—are entered on the company's records. This done, he 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, once they have been transferred to the computer's memory, tell the machine exactly what to do with all of the facts and figures associated with the problem. The programmer is also responsible for preparing an instruction sheet for the console operator to follow when the program is run on the computer. (The



Programmer prepares a flow chart

work of the console operator is described in the chapter on Clerical and Related Occupations. See index for page number.)

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 programmer takes a sample of the data to be processed and reviews step by step just 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 testing by making a trial run on the computer. The console operator sometimes helps with this part of the debugging process.

A comparatively simple program can be made ready 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 programmers. On involved problems, several programmers at different levels of responsibility often work as a team, under the supervision of a senior programmer.

Where Employed

No exact figures are available on the number of programmers. Industry spokesmen estimated the total employed full time in this work in 1962 at more than 50,000. In addition, a great many workers spend part of their time programing. A considerable number of these are engineers, scientists, economists, accountants, and other professional workers, whose programing duties require specialized training in other fields or else are incidental to other major job responsibilities.

Programers are employed chiefly in metropolitan centers where large business organizations and government agencies are located. A great many work for insurance companies, public utilities, wholesale and retail establishments, and manufacturing firms of almost every kind. A considerably smaller number are government employees doing work related either to scientific and technical problems or to the processing of the vast amount

of paperwork which must be handled in many government offices. In addition, a growing number of programers are employed in service centers which furnish computer and programing services to business firms and other organizations on a fee basis.

Training, Other Qualifications, and Advancement

Most programers are chosen for their jobs because they are judged to have an aptitude for the work and have had training or experience related to the problems to be programed. As a rule, they learn the programing techniques they will need only after they are hired for this work. The special abilities most sought after are similar in all kinds of programing, but requirements with respect to education and experience may be very different, depending on the nature of the problems with which the programmer will be dealing. For example, some people in this occupation are college graduates with degrees in engineering, whereas others have had years of experience in such work as accounting or inventory control.

In selecting programmers, employers look for people with an aptitude for logical thinking and the exacting kind of analysis which is part of the job. Prospective programmers are often required to take special tests which indicate whether they possess the high degree of reasoning ability required. In addition, programmers should have a great deal of patience and persistence and be able to work with extreme accuracy, follow instructions carefully, and express themselves clearly in writing and orally. Ingenuity and imagination are very desirable traits, since programmers often have to work out new ways of arriving at solutions to problems.

Practically all organizations which use their computers for scientific and engineering work require their programmers to be college graduates with degrees in engineering, physics, or mathematics. Graduate degrees may be required for some positions; for almost all, 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 the need for college training. Many regard previous experience in related work—in machine tabulation, for example, or in payroll

work or accounting—equally important and fill many of their programmer positions by promoting qualified employees with such experience. However, when they find it necessary to hire outsiders, an increasing number give preference to applicants with education beyond high school. They regard college courses in the general field of electronic data processing, or in accounting, business administration, engineering, and mathematics as especially good preparation.

Entrance requirements for jobs in the Federal Government are approximately the same as those in private industry. For practically all entry programmer positions in the Government, persons hired must have a college degree, preferably with training in mathematics, or else they must have had the equivalent of such preparation in previous work experience.

Young people interested in programming jobs can acquire some of the necessary skills at a steadily increasing number of technical schools, colleges, and universities. The instruction available ranges from home study and extension courses to work in computer technology at the graduate level. Courses in computer programming are also open to students in a few city high schools. High school and post-high school instruction does not entirely eliminate the need for on-the-job training, however. Since technological changes are continually taking place in this field and each type of computer has its own special programming requirements, training is usually necessary even in the case of experienced "oldtimers" who change from one job to another.

Most programmers starting out on the job attend training classes for a few weeks and then, as they work on minor programming assignments, continue with further specialized training. A year or more of experience is usually necessary before a programmer can handle all aspects of his job without close supervision. Once he becomes skilled at it, his prospects for further advancement are good. An experienced and capable programmer in an organization, employing several people in this occupation may move up to a senior job with supervisory responsibilities. Promotion to a position as methods analyst may also be possible. Still other programmers may advance to management positions with their firms.

Employment Outlook

Many thousands of new jobs will become available each year during the remainder of the 1960's. Employment in enterprises of all kinds is expected to rise, with a particularly sharp increase in firms which use computers to process business records or to control manufacturing processes. Some industry spokesmen have estimated that, by 1970, the number of programmers will be at least four times what it was in 1962. The field can be expected to offer excellent opportunities for women as well as for men.

Over the long run, employment is expected to continue rising rapidly—as it has ever since the mid-1950's when computers ceased to be a rarity. Despite the many changes and improvements which have already taken place, computer technology is still in a comparatively early stage of development. Undoubtedly further changes will render computers even more useful to business and government and, as this happens, the number of computer installations will increase and many more programmers will be needed.

The rise in employment may well be accompanied by changes in the nature of the work done by programmers because of changes which can be expected in computer technology. Already, some of the time-consuming and routine work associated with writing a program is being eliminated by innovations such as "automatic programming," the use of programs and parts of programs stored in libraries for future use, and other advances in techniques and in equipment. In the future, the task of preparing a program may thus develop into two quite different types of work—one requiring a highly trained and experienced specialist responsible for preliminary analysis and planning and for developing programs for specialized computer applications; the other requiring an employee who will work primarily as a technician on the detailed machine instructions which comprise the program. These changes may alter training requirements. For some kinds of programming assignments, undergraduate and graduate study is likely to become increasingly important. For other work, programmers may no longer need the kind of technical knowledge now required; there is some evidence, for example, that 2 years of intensive training at the post-high school level, with emphasis on

higher mathematics and physics, may provide sufficient background to enable programmers to handle some kinds of assignments in scientific and engineering fields.

The new jobs that are created will provide most of the openings for programmers in the years ahead. However, other openings will result as programmers advance to more responsible positions or leave their jobs to enter other types of employment. Because this is still a small occupation which includes many comparatively young workers, few positions are likely to become vacant because of retirement or death.

Earnings and Working Conditions

Average salaries for programmers employed by business firms ranged from \$5,000 a year for beginners in 1962, to about \$8,000 for experienced programmers, according to a private survey which covered over 500 companies in all parts of the country. For programmers with supervisory duties, the averages ranged up to \$10,000 a year, and for systems analysts, still higher. The survey indicated substantial differences in the salaries of the lowest and highest paid individuals in the same kinds of positions, however—differences which were probably due to the kind of data processed, the kind of computer used, and the industry involved and its location. The salaries paid programmers in engineering installations, for example, were generally somewhat higher than in other kinds of firms. In some metropolitan areas, according to limited information available, many highly skilled programmers earn considerably more than \$10,000 a year.

Federal Government salaries for programmers are comparable with those in private industry. The great majority earn between \$5,500 and \$12,000 a year. The minimum entrance salary for beginners was \$4,565 a year in early 1963 and top

salaries paid experienced programmers responsible for complex programming or supervisory and administrative work ranged up to \$15,000 or more a year.

The standard workweek for programmers is usually the same—35 to 40 hours—as the workweek for other professional and office workers. Unlike many computer console and peripheral equipment operators who work on a 2- or 3-shift basis, programmers usually work only during the day. Occasionally evening or weekend work 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 better-than-average work surroundings insofar as possible, because programmers working under such conditions can concentrate more readily on the very exacting kind of analysis which is an essential part of their job.

Where To Go for More Information

Additional information about the occupation of programmer and about high school and post-high school training facilities may be obtained from:

Data Processing Management Association,
524 Busse Highway, Park Ridge, Ill., 60068.

A list of reading materials on career opportunities in programming may be obtained from:

Association for Computing Machinery,
211 East 43d St., New York, N.Y., 10016.

School counselors may obtain a copy of the pamphlet *Careers in Electronic Data Processing*, which has been prepared by the National Science Teachers Association and provides information on the occupation of programmer from:

Project on Information Processing, Box 201,
Montclair State College, Upper Montclair, N.J., 07087.

Psychologists

(D.O.T. 0-36.21 through .26)

Nature of Work

Psychologists seek to understand people and explain their actions. They study the behavior of individuals and groups and often help individuals to 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, doing research, advising on psychological methods and theories, and admin-

istering psychology programs in hospitals, clinics, research laboratories, and other places.

Psychologists may obtain information in several ways about people's capacities, traits, and behavior. They may interview and observe individuals, develop and use tests and rating scales, study personal histories, and conduct controlled experiments. In addition, psychologists often conduct surveys, either orally or by circulating questionnaires. Some of their work is of a highly statistical nature.

Since no one person can know all there is to know about behavior, 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 maladjusted or disturbed people. They interview patients, give diagnostic 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); social psychology (the study of the social forces that affect individuals and groups); comparative psychology (sometimes called animal psychology); physiological psychology (the relationship of behavior to physiological 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).

Where Employed

The places where psychologists work range from college classrooms to hospital wards and from research laboratories to business offices. Most are employed in large cities and in university towns, but some are on the staffs of institutions located in rural areas. Altogether, between 25,000 and 30,000 psychologists were professionally employed in early 1963.

Colleges and universities employ the largest number of psychologists—more than one-third

of the total. Government agencies—Federal, State, and local—employ the second largest group. Within the Federal Government, the agencies which have 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 for elementary and secondary schools, for private industry, and for nonprofit foundations, hospitals, and clinics. A small number are in independent practice, and some 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 with this degree can qualify for jobs such as assisting in the administration and interpretation of psychological tests, collecting and analyzing statistical data, assisting in research experiments, and performing routine administrative duties. In addition, they may teach in colleges, assist in counseling students or handicapped persons, or—if they have had previous teaching experience—act as school psychologists or counselors.



Courtesy of National Institutes of Health

Psychologist uses the "Psychomet" to measure individual's reaction speed

(See statements on school counselors and rehabilitation counselors.) Because of the current shortage of psychologists, applicants with only a bachelor's degree with a major in psychology may be hired for certain jobs in work related to psychology or other fields where training in psychology is helpful.

The Ph. D. is needed for many entrance positions and is becoming increasingly important for advancement. Psychologists with 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 take longer. For the Ph. D. degree, a total of 4 or 5 years of graduate work is usually required. In clinical or counseling psychology, the requirements for the Ph. D. degree generally include 1 year of internship or supervised experience.

The American Board of Examiners in Professional Psychology offers diplomas in the specialties of clinical, counseling, and industrial psychology to those with outstanding educational records and experience who can 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 and physical sciences, statistics, and mathematics.

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. The Public Health Service of the U.S. Department of Health, Education, and Welfare supports doctoral study in psychology by providing funds for predoctoral and postdoctoral traineeships and research fellowships. In addition, the National Science Foundation and the U.S. Office of Education offer large

programs of financial aid, including fellowships, grants, and loans.

Psychologists desiring to enter independent practice must meet certification or licensing requirements in an increasing number of States. In early 1963, the following 21 States had such requirements: Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Idaho, Kentucky, Maine, Maryland, Michigan, Minnesota, Nevada, New Hampshire, New Mexico, New York, Tennessee, Utah, Virginia, and Washington.

Employment Outlook

Employment opportunities for psychologists with doctor's degrees will probably continue to be excellent throughout the middle and late 1960's. Psychologists with master's degrees are likely to be in considerable demand but their opportunities for full professional employment will be less favorable than for those with the Ph. D. degree. In early 1963, the American Psychological Association estimated that there were many more vacancies than there were qualified psychologists to fill them. A great shortage of clinical psychologists existed in State mental hospitals and mental hygiene clinics; psychologists were being sought to fill vacancies in both elementary and secondary schools; and a number of openings in research, clinical, and counseling positions were reported by several agencies of the Federal Government. Continued rapid expansion of this profession is likely, particularly in view of the increasing emphasis on comprehensive community mental health centers.

A large increase is anticipated in the number of psychologists employed by State agencies. Currently understaffed mental hospitals and mental hygiene clinics will need many clinical, counseling, social, and physiological psychologists. Prisons, training schools, and other State institutions are expected to use psychologists more extensively in the future.

Increasing awareness of the need for testing and counseling children, plus growing school enrollments, are expected to increase the employment of psychologists in both elementary and secondary schools. In colleges and universities, more psychologists will be needed in student personnel work, as well as in teaching. (See statement on College and University Teachers.) The trend

toward greater use of psychological techniques by private industry is likely to continue, thereby creating new openings for experimental, industrial, personnel, and human engineering specialists.

Many openings for psychologists with 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, in State programs, and in local communities.

Some vacancies will occur each year owing to retirements and deaths. However, such openings will be relatively few during the 1960's because psychologists as a group are young. The transfer of psychologists to work of a purely administrative nature may also create some job vacancies. Most opportunities, however, will result from the rapid expansion that is anticipated for the profession.

Earnings and Working Conditions

Beginning salaries in 1962 were generally between \$5,000 and \$6,000 a year for psychologists with master's degrees and between \$7,000 and \$8,000 for Ph. D.'s, according to the limited data available from private sources. A 1962 survey of

nearly 10,000 employed psychologists, part of the National Scientific Register sponsored by the National Science Foundation, indicated a median annual salary of \$8,000 for those with a master's degree and \$10,000 for those with a Ph. D. degree. In the Federal Government, psychologists with limited experience could start at about \$8,000 in early 1963. Salaries of experienced psychologists were considerably higher.

Where To Go for More Information

General information on career opportunities, certification or licensing requirements, and also a list of universities with approved doctoral programs in clinical and counseling psychology may be secured from:

American Psychological Association,
1333 16th St. NW., Washington, D.C., 20036.

Information on traineeships and fellowships may be secured from colleges and universities with graduate psychology departments and from the following Government agencies:

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

Training Branch, National Institute of Mental
Health,
National Institutes of Health, Bethesda, Md., 20014.

Social Workers

(D.O.T. 0-27.06 through .50)

Nature of Work

Social workers are concerned with many types of social problems and needs, among them poverty; unemployment; illness; broken homes; family maladjustment; physical, mental, and emotional handicaps; antisocial behavior; limited recreation opportunities; and inadequate housing. A great variety of public and private agencies have social work programs designed to meet specific needs in specific ways; for example, public assistance programs; family and child welfare services; social services for the crippled, disabled, and ill; and programs for the prevention of juvenile delinquency. In tackling social problems, many social work agencies emphasize service to people as individuals or in family units; 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. Although social workers in all agencies may use any of these basic methods at times, they tend to specialize in the approach customary in their own agency.

Caseworkers, who deal directly with individuals or families, may help to arrange for financial assistance, homemaker services, vocational guidance, foster family or institutional care, or health services. In addition, through interviews with their clients, caseworkers try to modify feelings, attitudes, and behavior detrimental to normal

adjustment and development. Group workers help people to benefit from group activities, to learn to understand themselves and others better, and to work with others to achieve a common goal. They may plan and conduct leisure-time programs and informal educational activities for children and adolescents, for people in hospitals and homes for the aged, and for many other kinds of groups. Community organization workers help plan and develop health, welfare, and recreation services for a neighborhood or larger area.

The majority of social workers provide social services directly to individuals, families, or groups. But a substantial number (many of them men) perform executive, administrative, or supervisory duties. Still others are college teachers, research workers, or consultants. The wide range of services provided by social workers is suggested by the description of the principal areas of social work which follows.

Public assistance workers are employed largely by State and local government agencies on public welfare programs which extend financial assistance to needy persons such as the disabled, blind, or aged; unemployed persons; and dependent children. Their duties include determining their clients' needs and whether they are eligible for financial assistance; strengthening family ties; helping clients to become self-sufficient; explaining pertinent laws and requirements; and providing or arranging for other needed social services.

Family service workers in private agencies are primarily concerned with providing counseling services to families and individuals. They seek to strengthen family life, by improving interpersonal relationships, and to establish satisfactory relations between the family and the community.

Child welfare workers in government and voluntary agencies deal with the problems of children. They may find foster homes or institute legal action for the protection of neglected or mistreated children, arrange for homemaker service during the illness of a mother, arrange for adoptions or placements in specialized institutions, counsel youthful delinquents, or advise parents on their children's problems.

School social workers or "visiting teachers" employed by school systems also help troubled children, including those who are excessively shy, aggressive, or withdrawn; failing in school sub-

jects for no apparent reason; hungry or ill; or truants. Workers consult with parents, teachers, principals, doctors, truant officers, and other interested people. They frequently refer a child to other social work agencies in the community for help.

Medical social workers employed by hospitals, clinics, health agencies, rehabilitation centers, and public welfare agencies work directly with patients and their families, helping them meet problems accompanying illness, recovery, and rehabilitation. Usually these workers function as part of a medical team composed of doctors, nurses, and therapists.

Psychiatric social workers attend patients in mental hospitals or clinics. In clinical teams, composed of psychiatrists, psychologists, and other professional personnel, these workers help patients and their families to understand the nature of the illness, enlist the patients' aid in using the various kinds of help available, and guide the patients in their social adjustment to their homes and communities. In some organizations medical and psychiatric social workers are grouped together as "clinical social workers." Psychiatric social workers also participate in community mental health programs concerned with the prevention of mental illness and with the readjustment of mental patients to normal home and community living.

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 and later help them adjust to home and community life. (Rehabilitation counselors, a related occupational group, are discussed in a separate statement in the *Handbook*. See index for page number.)

Probation and parole officers and other correctional workers, who are employed primarily by Federal, State, county, and city governments, assist probationers, parolees, and juvenile offenders in their readjustment to society. They make investigations and submit reports to the courts concerning the activities of their clients. They also counsel their clients and may help them find jobs; keep a close watch on their clients' conduct; and

direct them to other services in the community when possible. In addition, they frequently arrange for child placements or adoptions, provide marriage counseling, and collect court-ordered payments for support of families and children.

Social Group Workers are employed by a multitude of agencies—settlements and community centers; youth-serving groups; public housing developments; correctional institutions; resident and day centers for children, adolescents, or elderly people; and general and psychiatric clinics and hospitals. Group workers help individuals to develop their personalities and find satisfaction in life through group experiences in educational, recreational, or other activities. They may plan or direct group activities; or recruit, train, and supervise volunteer workers. Many administer departments and agencies which provide social group services.

Community Organization Workers plan welfare, health, and recreation services for the community; coordinate existing social services; develop volunteer leadership; and assist in fund raising for community social welfare activities. Usually, these workers are employed by community chests, welfare councils, religious federations, health associations and federations, agencies which combine community planning and direct service, and by other professional groups in social work and related fields. Unlike other areas of social work, this field employs men in the majority.

Where Employed

Nearly 125,000 social workers (not including recreation workers) were employed in early 1963. Of this total, approximately 60 percent were employed in State, county, and city government agencies; about 3 percent were in Federal Government organizations; and the remainder were in voluntary or private agencies. In addition, 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 groups, national professional associations, or voluntary agencies.

Almost 60 percent of all social workers are women; however, in recent years the proportion of men in the field has been increasing.

Training, Other Qualifications, and Advancement

Educational requirements are virtually the same for all types of professional social work. Full professional status requires the completion of a 2-year program of graduate study in an accredited school of social work. However, only about one-fifth of the social workers meet this requirement. People with 2 years of paid employment in social work and 2 years of membership in the National Association of Social Workers (open only to graduates of accredited schools of social work), are eligible for certification as members of the Academy of Certified Social Workers (ACSW).

In 1962, there were 56 graduate schools of social work accredited by the Council on Social Work Education. For admission to these schools, a student must have a bachelor's degree representing a broad knowledge of the liberal arts, including courses in economics, history, political science, psychology, sociology, and social anthropology. Courses in biology, statistics, journalism, and public speaking are also helpful.

Many scholarships 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 can take "educational leave" to obtain graduate education; they may pay expenses or a salary, or both.

Although persons with only a bachelor's degree, preferably in the social sciences, are hired by many social welfare agencies, opportunities for advancement for those without graduate education are limited. In voluntary family and children's agencies, graduation from a school of social work is required for employment in positions above beginning levels. In both public and private agencies, employment in certain specialized areas, such as medical and psychiatric social work programs, is generally limited to graduates of schools of 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. Most entrance jobs in State public assistance and public child welfare agencies require a bachelor's degree as a minimum. In all States, beginners must pass a written examination in social work for employment in a government agency.

Personal qualities essential for social workers include emotional maturity, objectivity, a basic interest in people and their social problems, and ability to promote good working relationships and 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 such places as camps, settlement houses, community centers, or social welfare agencies. Many social welfare agencies, both voluntary and public, hire college students and, in some cases, high school students for nonclerical jobs assisting social workers in case and group work.

Employment Outlook

Shortages of social workers existed in every area of social work and in most parts of the country in early 1963. Altogether, there were about 10,000 vacancies in social work, according to the Council on Social Work Education. The need for trained social workers is particularly acute in group work agencies, correctional agencies, and medical and mental health services. Significant numbers of openings were also reported in public assistance, voluntary family services, and child welfare agencies

Social work agencies estimate that they will require more than 15,000 trained workers annually during the rest of the decade. However, up to 1962, fewer than 2,500 persons were being graduated yearly from schools of social work. As a result of the shortage of trained personnel, there will be increasing opportunities for part-time employment of qualified persons, especially in voluntary social work agencies engaged in family casework and group work. Many employment opportunities will continue to exist for those with less than full professional training.

Over the long run, the yearly demand for social workers is expected to remain in the thousands. As in the past, the gap between the demand for and the supply of fully trained social workers will continue to be filled by personnel without graduate training. More workers will be needed to maintain existing service programs for the increasing population and to staff new facilities both here and in other countries, for such groups as elderly people, children of migrant workers, mental patients, juvenile delinquents, and handicapped persons. In addition, many thousands of workers will be needed each year to replace those who retire, die, or leave the profession.

Earnings and Working Conditions

Social workers employed in direct-service positions, such as casework or group work, received an average (median) salary of \$4,800 in 1960—women, \$4,590 a year and men, \$5,060. In the same year, social workers in supervisory positions averaged \$6,220 a year, and in executive positions, \$6,470.

Average (median) salaries of social workers in selected programs in 1960 are shown in the following tabulation:

	<i>Case- workers</i>	<i>Group workers</i>
Psychiatric social work (in hospitals)-----	\$5, 500	-----
Medical social work (in hospitals)-	5, 150	-----
Family services (excluding public assistance)-----	5, 100	\$5, 560
Child welfare work (noninstitutional)-----	4, 730	5, 050
Community organization work...	4, 350	4, 690
Group work-----	-----	4, 620
Public assistance-----	4, 320	-----

Graduates of schools of social work generally received the highest average salaries in the field. Annual earnings of women with a master's degree in social work averaged \$6,340 in 1960, while those of women with a bachelor's degree and no graduate study averaged \$4,350. Earnings of men, at the same educational levels, averaged \$7,020 and \$5,000, respectively. Both men and women in direct service positions earned less than these averages. Salaries of social workers have risen somewhat since 1960, but no overall data are available.

In the Federal Government in 1963, graduates of schools of social work with no experience received starting salaries of \$5,540 a year, and those with 1 year of experience received \$6,675.

The predominant scheduled workweek for social workers in 1960 was 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 week-end 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.

Technical Writers

(D.O.T. 0-06.90)

Nature of Work

The technical writer's function is to present scientific and technical information in a simple, clear, and factual manner, so that it can be readily understood by readers who are not scientists. Since many scientists, engineers, and other specialists find it difficult and time consuming to write in nontechnical language, the technical writer establishes easy communication between these workers and the users of their information.

This occupation is relatively new. Technical writers, as defined in this statement, include only those people primarily employed to interpret and write about technical subjects, but not those primarily employed as scientists, engineers, or other technical specialists, who also do a considerable amount of writing.

Before starting a report, technical writers research their subject. This process may involve studying reports, reading technical journals, and consulting with the engineers, scientists, and other technical personnel who have worked on the project. Then, they prepare a rough draft which may be revised several times before it is submitted for review. Some technical writers also work on the physical makeup of the report and arrange for the preparation of tables, charts, illustrations, and other artwork. They may work with technical illustrators, draftsmen, or photographers.

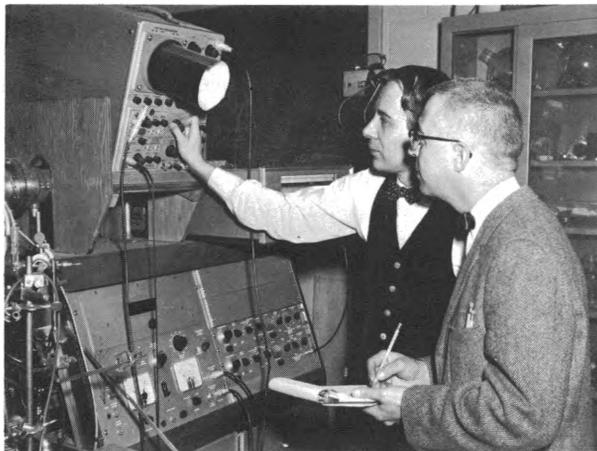
Technical writers prepare reports which deal with a wide variety of subjects that may be pre-

Where To Go for More 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, jointly sponsored by the Council on Social Work Education and The National Association of Social Workers. Write to:

National Commission for Social Work Careers,
345 East 46th St., New York, N.Y., 10017.

sented in many forms. They may prepare manuals or handbooks which explain in detail how to operate, assemble, disassemble, maintain, or overhaul components of complicated machines and systems such as aircraft, missiles, and computers. Some technical writers prepare sales literature, drafts of contract proposals, and publicity releases on scientific and technical developments. They may also write for scientific and engineering periodicals and for popular magazines. Regardless of the type of publication, the aim of the technical writer is to use a style which is free of technical terms that cannot be readily understood by the reader who is not a scientist.



Technical writer consults scientist before writing instructions on operating research equipment

Where Employed

About 20,000 technical writers and editors were employed in 1962, according to an estimate made by the Society of Technical Writers and Publishers. Most technical writers were employed in the electronics and aerospace industries. Many worked 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 worked in the more than 100 job shops which specialize in technical writing. Others were in business for themselves.

Technical writers are concentrated mainly in the Northeastern States and in California, where the principal industries which use their services are found. There are concentrations of these workers in the Washington, D.C., Los Angeles, Chicago, New York, and Boston 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 with less academic training can qualify for some jobs. Employers do not agree on the most appropriate kind of college training needed by technical writers. However, graduates must usually have a combination of courses in writing and scientific and technical subjects. Some employers prefer applicants with degrees in engineering or science who have had courses in writing. Others seek graduates with majors in English or journalism who have taken some courses in scientific and technical subjects. Regardless of the kind of college training they prefer, all employers place great emphasis on writing skills.

Few schools offer formal undergraduate programs leading to a bachelor's degree in technical writing or technical journalism. However, more than 150 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. As of mid-1962, two schools (Rensselaer Polytechnic Institute and Cornell University) awarded the

master's degree, with a major in technical writing, to graduate engineers. Many colleges and universities conduct short-term summer workshops for technical writers.

Young people who plan to become technical writers should learn the fundamental rules of English grammar and composition while still in high school. They should supplement the required science and mathematics courses with as many elective courses in grammar and composition as possible. They can gain helpful experience by working as editors or writers for their school papers.

In addition to the ability to write well, technical writers must have the ability to think logically. They should have a great interest in scientific and technological developments and be able to work well with others.

Beginners often assist experienced technical writers by doing library research and preparing drafts of small portions of the reports. Experienced writers in organizations with large technical writing staffs may become technical editors or progress to supervisory and administrative positions. It is also possible to advance by becoming a specialist in a particular scientific or technical subject. After gaining experience and contacts, technical writers may open their own job shops or do freelance writing. Technical writers who are expert in a particular subject sometimes write syndicated newspaper columns or articles for popular magazines.

Employment Outlook

Well-qualified and experienced technical writers are expected to continue in short supply through the remainder of the 1960's. Beginners who have outstanding writing talent will have many opportunities; those with minimum qualifications will have much competition for jobs. The greatest demand will probably be for technical writers with backgrounds in electronics and communications, particularly in research and development, to work in the aerospace and related industries.

The demand for technical writers is likely to increase over the long run, because of the need to put the increasing volume of scientific and technical information into language that can be understood by management, for making decisions, and

by workers, 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 interrelationship of the components. The growth in this occupation will also be accelerated by the need for 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 are expected to increase because of the country's defense commitments, the expanding space program, the increasing emphasis on medical research, and other reasons. In the years ahead, a continuing demand is expected for technical writers to interpret the new language of science that accompanies scientific discoveries and technological advances, which are expected to accelerate.

Persons with journalism training will also have some employment opportunities in other fields—such as advertising, public relations, trade publishing, radio, and television—that are related to technical writing. A few openings will also arise each year from the need to replace technical writers, who retire, transfer to other work, or leave the field for other reasons.

Earnings and Working Conditions

In 1962, inexperienced technical writers, hired in private industry for trainee positions that

require only a limited amount of technical training, were paid starting salaries averaging about \$100 a week; those who were graduates of engineering schools generally averaged higher starting salaries—about \$130 a week—depending on their major, class standing, and other qualifications. For experienced technical writers, the average salaries ranged from about \$125 to over \$200 a week, depending on such factors as their prior experience, and the type, size, and location of the firms. Earnings of freelance technical writers vary greatly and are related to the writer's reputation in the field.

In late 1962, the annual entrance salary for technical writers in the Federal Government was \$6,675, \$8,045 or \$9,475, depending on the kind and amount of experience and training.

Technical writers usually work the standard 40-hour week. They may work under considerable pressure when a deadline has to be met on a publication or report. Technical writers usually receive the same holidays, vacations, and other benefits as other workers in their organization.

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.,
P.O. Box 3706, Beechwood Station, Columbus, Ohio,
43214.

Urban Planners

(New D.O.T. 0-39.)

Nature of Work

Urban planners develop comprehensive plans and programs (master plans) for the overall development of growing communities. They visualize future conditions in light of trends in population growth and social and economic change, and estimate the community's long-range needs for land, housing, community facilities, transportation, recreation, business and industry. To achieve the goal of an efficient and attractive community, urban planners recommend such measures as rules and regulations to control and guide the use of

land and the construction of transportation and other public facilities. They also work on plans to solve immediate problems such as inadequate highways. Many specialize in making plans for the rehabilitation of city slum areas and the reconstruction of rundown business districts.

Urban planners need to assemble information about the areas in which they will work before they can make meaningful plans for long-range development of their communities. Therefore, they make detailed studies, including maps and charts, which show the current use of land for

residential, business, or community purposes, as well as the arrangement of streets, highways, water and sewer lines, and the location of community facilities such as schools, libraries, and playgrounds. Their studies also provide information on the various industries in the community; the condition of the buildings in each area of the city; population densities and characteristics; income levels; employment and economic trends, and other related information.

After they have analyzed and evaluated the facts, urban planners are in a position to develop plans and make recommendations. They may then design the layout of recommended facilities and land use, supervise the preparation of illustrative materials, and 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 officials of highway departments and other public agencies which do specialized planning, and with private land developers and civic leaders. 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 with only one or two professional workers, the planner must be able to handle all these different kinds of work and the problems described. 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.

Where Employed

Approximately 4,000 people were employed as professional urban planners in 1962, according to an estimate made by the American Institute of Planners. The great majority of urban planners are employed by government agencies, mainly city, county, and metropolitan regional planning organizations; some are employed by various State governments and by the Federal Government. The Housing and Home Finance Agency, the Defense Department, and the National Capital Planning Commission are the major Federal employers of planners. About one-fifth of the planners are independent consultants or they are employed by private planning firms, mainly to

act as consultants to government agencies which do not have a planning staff or which need help on special projects. Other urban planners work for large land developers or private research organizations; a few teach in colleges or universities.

In 1961, nearly 450 cities employed at least one professional planner. Cities with a population of 500,000 or more generally had large planning staffs—the median (average) number of planners employed in these cities was 20. Many metropolitan, county, and regional planning commissions also employed planners. A few planners were employed abroad in connection with programs of aid to less-developed countries.

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 the equivalent, is required for most entrance level positions. However, young people with bachelor's degrees in city planning, architecture, landscape architecture, engineering, and public administration and some other social science fields can qualify as trainees in many local government agencies.

In 1962, about 30 colleges or universities awarded the master's degree in planning. The typical program requires that students must have successfully completed courses either at the undergraduate or graduate level in architecture, land-



Urban planners discuss the development of a growing community

scape architecture, engineering, economics, statistics, sociology, and public administration, as well as in the theory and methodology of 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; 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 few schools which stress physical design, grant a master's degree on completion of 1 year of graduate work to students who have the 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. They must also be able to get along well with people and to appreciate and, insofar as possible, reconcile a wide variety of attitudes and viewpoints. In addition, they must be able to write and speak persuasively. 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 much time drafting, operating a calculating machine, 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, prepare standards for new construction, design the physical layout of a large development, make statistical analyses and projections, or to 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 meetings with officials in other organizations and in addressing civic groups as well as in supervising other professionals. Advancement often occurs through a move 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 examinations are often advertised nationally and usually do not impose residence restrictions.

Employment Outlook

Employment opportunities for graduates with professional training in city and regional planning are expected to continue to be very good for the remainder of the 1960 decade. Shortages of qualified planners have been reported in recent years, even though the number of graduates has been rising. In 1962, the American Society of Planning Officials estimated that there were about 400 vacancies in planning agencies because of the shortage of well-qualified planners. Although most of these vacancies stemmed from the need to fill new planning positions, some also resulted because planners transferred to other fields of work, retired, or left the field for other reasons.

The demand for city planners is expected to continue to rise over the long run, as more communities turn to professional planners for help in determining the most effective way to meet the rising requirements for physical facilities resulting from urbanization and the 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 congestion get worse and the need for more and better planned facilities becomes more acute. Federal financial assistance has been authorized for comprehensive urban planning assistance and for urban renewal. The important role of planners in the large-scale development of land and physical facilities for both public and private use has also been recognized by other governmental and private organizations.

Earnings and Working Conditions

Starting salaries of inexperienced planners without a graduate degree in planning ranged from \$4,700 to \$6,000 a year in 1962 in local government agencies, according to the limited information available. Entrance salaries for qualified beginners with a master's degree in planning ranged between \$6,500 and \$7,500 a year. Salaries for planners with several years of responsible work experience ranged from about \$7,500 a year to more than \$15,000 annually. Consultants are

generally paid on a fee basis. Their earnings are often high and vary greatly according to their reputations and previous work experience.

The usual entrance salary in the Federal Government was \$6,675 a year in early 1963. In rare cases, individuals with less than 2 years of graduate work or its equivalent were hired at salaries of \$4,565 or \$5,540 a year.

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 are likely to work in the evenings and on weekends because of the need to attend meetings with citizen groups.

Most planners find the work rewarding. They must, at the same time, be able to face the discouragement of seeing carefully designed plans

fall through because of opposition or lack of interest.

Where To Go for More Information

Information on the work of urban planners may be obtained directly from planning officials in local planning agencies in many communities. Additional information on schools which offer degrees in planning, and on employment opportunities and earnings 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.

Specific information about how to obtain a Federal Government position may be obtained from the U.S. Civil Service Commission, Washington, D.C., 20415.

Clerical and Sales Occupations

CLERICAL AND RELATED OCCUPATIONS

About 10 million people did clerical or some closely related kind of work in early 1963. A great many of these workers are occupied with the vast amount of recordkeeping and paperwork required in modern business and government offices. Others handle communications through mail, telephone, télégraph, and messenger services; attend to the shipping and receiving of merchandise; ring up sales on the cash registers of stores and restaurants; and do related work.

Occupations in the clerical category represent a wide variety of skills and training. They include real estate appraiser, confidential secretary, and others which involve considerable responsibility and experience, as well as messenger, file clerk, and other occupations which can be entered without specialized training or experience. For women, clerical occupations are a particularly large field of employment. The majority of young girls who go to work after completing high school find jobs in clerical and related occupations; and two-thirds of all clerical workers are women.

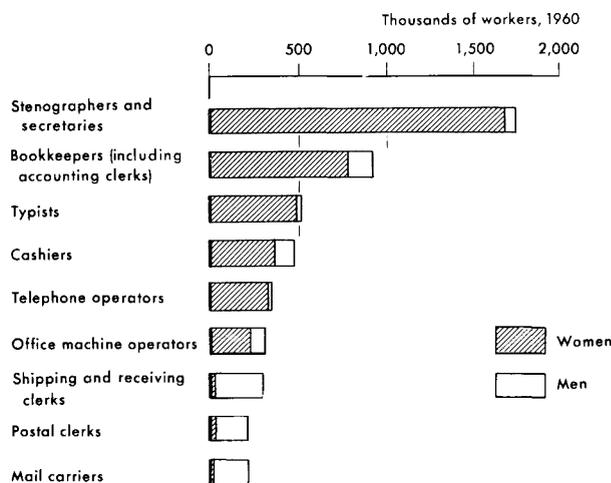
One out of every four clerical workers is a secretary, stenographer, or typist. Other clerical occupations, each with tens of thousands of workers, include bookkeeper and accounting clerk, cashier, telephone operator, office machine operator, shipping and receiving clerk, postal clerk, and mail carrier. (See chart 21.) This *Handbook* contains a report for each of these occupations, as well as for some with a smaller number of workers such as bank teller and airline ticket agent. (See index for page numbers.)

Training, Other Qualifications, and Advancement

For all but the most routine clerical positions, the minimum educational requirement is usually graduation from high school. High school graduates who have had instruction in business subjects

CHART 21

MORE THAN ONE-HALF OF ALL CLERICAL WORKERS ARE EMPLOYED IN THESE OCCUPATIONS



Source: U.S. Bureau of the Census.

are regarded by most employers as particularly well qualified. Some companies cooperate with local high schools and business schools in office education programs under which students work part time, under trained supervision, while still attending school. This experience is useful to beginners seeking office jobs after graduation. Clerical aptitude and ability in arithmetic, spelling, grammar, and reading comprehension are desirable for many types of clerical work, and some employers test applicants' qualifications along these lines.

Practically all beginning clerical workers receive some on-the-job training. They learn, for example, how their employer wishes the firm's records to be kept, and what kinds of business forms are to be used. They may also learn to operate adding and duplicating machines and

other equipment which they will occasionally use. Or, if they are to be employed as operators of tabulating machines or other complex and specialized equipment, their employers may arrange for them to attend a special school which will train them for the work.

Many types of clerical work offer good prospects for advancement. Some of the better paid positions—insurance claim adjuster and private secretary, for example—require a general knowledge of company policies and procedures, and are very often filled by promotion from within. In other instances, promotion may be to more difficult and higher paid assignments in a related type of work, as in the case of a keypunch operator who is selected and trained to operate a tabulating machine. In large business offices, promotion may eventually lead to supervisory or managerial positions.

Seniority within an organization is often an important consideration in selecting employees for promotion or transfer to higher paying jobs. Emphasis is also placed on the individual's training, ability, and personal qualifications. For workers without a good educational background, opportunities for advancement are likely to be limited. Many people in clerical occupations are high school graduates with some additional education in colleges or private business schools. Some are college graduates, who start out as office workers with the idea of gaining experience which will later qualify them for professional or administrative positions.

Employment Outlook

Several hundred thousand openings will occur in clerical and related occupations each year during the remainder of the 1960's. Many will be new positions created as business grows to serve a larger population, but the majority will be positions which become vacant as workers retire or leave their jobs for other reasons. Employee turnover is especially high in clerical and related occupations because of the many young women who do this kind of work for only a few years and then leave their jobs in order to stay at home and care for their families.

Over the long run, employment in clerical occupations is expected to continue to increase rapidly.

It is estimated that by 1975 close to 4 million more people may be doing work of this kind than in 1963. A great many of the additional workers will probably handle paperwork in the offices of private and public organizations—as secretaries and stenographers, typists, bookkeeping and accounting clerks, and shipping and receiving clerks, for example. Employment opportunities for them are likely to be particularly numerous in banks and insurance companies, both of which are expected to continue to expand rapidly; in establishments engaged in manufacturing and wholesale and retail trade; and in government offices, educational institutions, and professional service organizations.

The number of clerical and related jobs is expected to increase in these and in other types of establishments mainly because, as modern business organizations grow in size and complexity, the volume of paperwork will also expand. More and more mechanical equipment will undoubtedly be used to speed the process of keeping business records, particularly in large offices, and in some of these offices there may be substantial reductions in the number of clerical employees. For the economy as a whole, however, it is expected that the new positions created by growth will outnumber the clerical jobs eliminated by mechanization. Furthermore, many types of clerical workers are in jobs unlikely to be materially affected by mechanization—for example, secretaries, receptionists, people responsible for collecting bills and handling complaints, and others whose duties bring them into contact with the public and require initiative and judgment.

Since electronic computers, bookkeeping and calculating machines, and other mechanical devices are used in offices mainly to process routine and repetitive work, their use can be expected to bring the greatest reductions in the number of clerks employed in routine jobs such as sorting bank checks, making up payrolls, keeping track of inventories, and billing customers. And, as routine work of this kind is transferred from clerks to machines, a limited number of new positions for various kinds of machine operators will be created. This shift in type of clerical personnel will probably occur chiefly in large business firms and in the metropolitan areas where such firms tend to be concentrated.

Earnings and Working Conditions

A 1961-62 Bureau of Labor Statistics survey provides salary and other information about office workers employed in 188 of the country's largest metropolitan areas. For workers in smaller communities, salary levels are generally somewhat below those reported for the survey areas, and vacations and other employment benefits are often somewhat less liberal.

The average salaries of women in 13 office occupations surveyed ranged from \$55 a week for beginning file clerks to about \$100 for highly skilled tabulating machine operators. Within each occupation, however, the differences in the salaries paid some individuals were considerable. For example, a few file clerks earned less than \$40 a week, while others earned more than \$100.

Men were generally paid higher salaries than women in similar jobs. The average for office boys was \$2.50 a week more than for office girls, for example, and men employed as accounting clerks averaged from \$15 to \$20 a week more than women in the same kinds of jobs.

Office workers' salaries tended to be higher in the western part of the country than elsewhere. Regardless of location, salaries were also often higher in public utilities and manufacturing firms than in retail stores and other nonmanufacturing industries.

Almost two-thirds of the office workers covered by the survey worked a 40-hour week. The remainder, many of whom were employed in the northeastern part of the country, usually worked 37½ or 35 hours a week.

Practically all office workers employed in large cities receive pay for at least 6 holidays a year. A large number receive 8 paid holidays or more and a few, particularly in the Northeastern States, 11 or more. Office workers also generally receive at least a week of paid vacation after 6 months or 1 year of service with their firms. Longer vaca-

tions, granted by many firms after additional years of service, may range up to 4 weeks or more with pay. Life insurance, hospitalization, surgical and medical insurance, and sick benefits are also generally available, as are retirement pension plans supplementing benefits paid under the Federal social security program.

Where To Go for More Information

Teachers may obtain information concerning training for office occupations from:

Division of Vocational and Technical Education,
Bureau of Educational Assistance Programs,
U.S. Office of Education, Washington, D.C., 20202.

A directory of private business schools located in more than 275 cities throughout the country may be obtained from:

United Business Schools Association,
1518 K St. NW., Washington, D.C., 20005.

Information concerning accreditation and a list of its accredited business schools may be obtained from:

Accrediting Commission for Business Schools,
5057 Woodward Ave., Room 910, Detroit, Mich., 48202.

Information on working conditions and average earnings of office workers in each of 82 metropolitan areas is given in the following publication:

Wages and Related Benefits, 82 Labor Markets,
1961-62, BLS Bulletin 1303-83, Pt. I, 1962. Super-
intendent of Documents, Washington, D.C., 20402.
Price 75 cents.

Information on working conditions and average earnings in 188 metropolitan areas is summarized for the northeastern, southern, north central, and western regions, and for the United States as a whole, in the following publication:

Wages and Related Benefits, 188 Metropolitan Areas,
United States and Regional Summaries, 1961-62,
BLS Bulletin 1303-83, Pt. II, 1963. Superintendent
of Documents, Washington, D.C., 20402. Price 50
cents.

Stenographers and Secretaries

(D.O.T. 1-37.00 through .29; 1-33.)

Nature of Work

In 1960, almost 2 million persons were employed in occupations which required stenographic skills. More than 95 percent of these workers—usually

designated as stenographers or secretaries—were women. Practically all stenographers and secretaries record dictation and transcribe it on the typewriter, although specific duties and job titles

sometimes differ considerably, depending on the nature of the employer's business.

Stenographers (D.O.T. 1-37.12 and .14) take dictation from one or more persons and then transcribe their notes on a typewriter. Most stenographers record their notes in shorthand; a few use machines which print symbols as different keys are pressed. In addition to taking and transcribing dictation, many stenographers also do other typing, answer telephones, operate various types of office machines, and perform other clerical duties. Depending upon the duties, experience, and the amount of supervision they receive, they may be classified as "junior" or "senior" stenographers. Some, called *technical stenographers*, take dictation in medical, legal, or scientific terms. Other stenographers specialize in work such as public stenography, or taking dictation in a foreign language.

Court reporters (D.O.T. 1-37.18) are stenographers who make verbatim reports of proceedings in a court of law, sometimes in difficult technical language, from many speakers, and for several hours at a time. Some court reporters use microphone equipment attached to recording machines for their work. They identify the speakers and repeat what is said, with punctuation, into the microphone. Other court reporters take notes in shorthand or by machine and either transcribe their own notes on the typewriter or dictate them onto sound producing records which are later transcribed by typists. Stenographic workers in jobs similar to court reporting include stenographers who report the proceedings of conferences and meetings, and those who work for police departments doing such things as taking down the statements of people accused of crimes. These workers must be able to take notes very rapidly and with a high degree of accuracy.

Secretaries (D.O.T. 1-33.), in addition to doing stenographic work, relieve their employers of numerous routine duties and often handle a variety of business details on their own initiative. They may schedule appointments for their employers, arrange for airline tickets and hotel reservations, take care of some kinds of correspondence, and handle private or confidential records. Sometimes they also supervise other clerical personnel. Secretarial responsibilities vary, depending on the type of job. Some secretaries,



Secretaries have many responsibilities in addition to taking dictation

like stenographers, specialize in legal, medical, or other technical work.

Where Employed

Stenographers and secretaries are employed by public and private organizations of practically every size and type. Particularly large numbers work for manufacturing firms, banks, insurance companies, schools and colleges, and hospitals. Others, including many who specialize in technical work, are employed in the offices of physicians, attorneys, and other professional people. Stenographic and secretarial jobs for men tend to be concentrated in the field of court reporting and in educational, welfare, and other professional services, manufacturing, and public administration.

Training, Other Qualifications, and Advancement

Adequate performance as a stenographer or secretary requires both a general educational background and technical training. People in jobs of this kind should have the maturity and self assurance that come from a good basic education, and they should also have a knowledge of spelling, punctuation, grammar, and vocabulary, and the ability to take dictation and type. The degree of stenographic skill required varies from employer

to employer, depending sometimes on whether there is a shortage or a surplus of stenographers in a community. To qualify for positions with the Federal Government, stenographers must demonstrate that they can take dictation at the rate of 80 words a minute and type at about 40 words a minute. They must also pass tests of verbal ability and clerical aptitude (including arithmetic computation).

Prospective stenographers and secretaries may learn the skills they will need in a variety of ways. Graduation from high school is practically essential; and high school training alone—provided it has included courses in shorthand, typing, and possibly other business subjects—satisfies the requirements of many employers. In connection with their courses in business subjects, some public high schools conduct cooperative work-study programs which afford students an opportunity to acquire practical work experience under trained supervision.

Other employers, in hiring beginning stenographers and secretaries, prefer applicants with a somewhat more general educational background, supplemented by specialized training taken after graduation from high school. Many schools and colleges offer training of this kind in both day and evening classes. Bachelor's degrees in the field of secretarial studies are conferred by the schools of business and commerce in more than 200 colleges and universities. A few confer the master's degree. In addition, many colleges and universities offer 1- to 3-year curriculums preparing students for general, legal, technical, and medical-secretarial work; and hundreds of private business schools, located in all parts of the country, offer courses of varying length and cost and award certificates or diplomas to students satisfactorily completing the training offered.

Personal qualifications important to stenographic and secretarial jobs include finger dexterity and good hearing. Employers want workers who have attractive personalities and a friendly manner. Discretion, good judgment, and initiative are also important, particularly for responsible secretarial positions.

Capable and well-trained stenographers and secretaries have excellent possibilities for advancement. Many stenographers, once they have ac-

quired experience, become secretaries; and both stenographers and secretaries may eventually be promoted to administrative assistant, office supervisor, executive secretary, or some other responsible position requiring specialized knowledge of their employer's industry or business. Advancement also may come in the form of added responsibilities and higher salary without any change in job title.

Employment Outlook

Many thousands of openings for stenographers and secretaries occur each year. Some are new jobs created by business expansion. Others are jobs which become vacant because of the large number of young women in these occupations who stop working after a few years to remain at home caring for their families. The demand for workers with stenographic skills has been greater than the supply for more than a decade, and this shortage of qualified workers is expected to continue for some years to come. It appears certain that employment opportunities for stenographers and secretaries will be excellent throughout the 1960's.

Over the long run, employment in stenographic and secretarial work is expected to continue its rapid growth. The development of new types of office equipment, such as the dictating machines which have been in use for a number of years, will undoubtedly continue, but technological changes such as this are not expected to affect greatly the growth of employment in these occupations. Also, turnover will undoubtedly remain high, particularly in the case of general stenographers, and will give rise to a substantial number of additional openings for workers with stenographic skills.

Earnings and Working Conditions

According to wage data gathered by the Bureau of Labor Statistics in 1961-62, the average weekly salaries of women in stenographic and secretarial positions in 188 of the country's largest metropolitan areas were as follows:

General stenographers.....	\$75. 50
Senior stenographers.....	87. 00
Secretaries.....	94. 00

The salaries paid different individuals included in the survey varied considerably. For example, about half of all women employed as general stenographers earned between \$60 and \$80 a week—but a few earned less than \$40 and others earned more than \$100.

The usual entrance salary in the Federal Government in 1963 was about \$75 a week (\$3,820 a year) for stenographers and secretaries, about \$88 (\$4,565 a year) for reporting stenographers, and \$97 (\$5,035 a year) for shorthand reporters. Entrance salaries were somewhat higher in the case of experienced persons and those with more than

the minimum required training. (See introductory section of this chapter for more information on Earnings and Working Conditions.)

Where To Go for More Information

Additional information on secretarial work as a career may be obtained from:

United Business Schools Association,
1518 K St. NW., Washington, D.C., 20005.

See introductory section of this chapter for additional sources of information.

Typists

(D.O.T. 1-37.30 through .59)

Nature of Work

Typists operate the one kind of machine found in practically every business office—the typewriter. Typing is their main job assignment, and in this respect their work differs from that of many other office employees who also do some typing but whose principal duties are altogether different.

Typists use their machines to produce typed copies of printed and handwritten materials. Practically all typewriters, including the electric machines being used in an increasing number of offices, have the same type keyboard and are operated in much the same way. Some kinds of typing are considerably more difficult than others, however. Beginners, sometimes called junior typists, often address envelopes, type headings on form letters, copy directly from handwritten or typed drafts, and do other routine work. Experienced, or senior typists, generally do work which requires a particularly high degree of accuracy or involves independent judgment; they may work from rough drafts which are difficult to decipher and which contain technical material, or they may plan and type complicated statistical tables, combine and rearrange materials from several different sources, or prepare master copies of material to be reproduced by photographic processes. A few specially trained typists operate teletypewriters, proportional spacing typewriters, and other special kinds of machines.

Many typists, because of special duties connected with their jobs, also have special job titles.



One-half million women are typists

Thousands, who combine typing with filing, sorting mail, answering the phone, and other general office work are called *clerk-typists* (D.O.T. 1-37.34). Another, comparatively small, group of typists called *transcribing machine operators* (D.O.T. 1-37.36) type letters and other documents as they listen to dictation recorded on tape or on sound-producing records. Still other typists with special duties and job titles include *policy writers*

(D.O.T. 1-37.32) in insurance companies, *waybill clerks* (D.O.T. 1-37.34) in railroad offices, and *mortgage clerks* (D.O.T. 1-37.32) in banks.

Where Employed

About 500,000 workers were employed as typists in 1960. Ninety-five percent of the total were women. In addition to these office workers classified as typists, there were hundreds of thousands of workers in other kinds of clerical occupations which required skill in typing.

Typists are employed in private and public enterprises of practically every kind—particularly manufacturing firms, banks and insurance companies, and national, State, and local government agencies. Almost two-thirds of all typists worked in such establishments in 1960.

Training, Other Qualifications, and Advancement

Most applicants for typing positions are required by employers to meet certain standards of typing speed and accuracy. Usually, therefore, employers have applicants take tests which show how rapidly and accurately they are able to type. Requirements vary from employer to employer, but typists must generally be able to type at least 40 or 50 words a minute.

Practically all prospective typists obtain the training needed by attending day or evening classes in public and private schools. Many employers consider that graduation from a high school business course provides excellent preparation because a typist, in addition to being skilled in using a typewriter, needs the knowledge of business practices and of spelling, vocabulary, punctuation, and grammar which is acquired through this kind of schooling. Ability to operate some of the simpler office machines, such as transcribing, copying, and adding machines, is often helpful to the applicant seeking a job.

Important aptitudes and personality traits for persons in this occupation include finger dexterity, accuracy, neatness, and ability to concentrate in the midst of distractions. A friendly manner and an attractive personality are great assets. Transcribing machine operators should have good hearing.

Typists may advance to better paying and more responsible jobs by being promoted from junior to senior typing positions, or, with training in taking dictation, to stenographic or secretarial work. Many typists, as they work on their jobs, "pick up" the knowledge needed to operate some kinds of office machines, or else take courses offered in local schools and eventually advance to better paying jobs as office machine operators.

Employment Outlook

Many thousands of openings for typists will occur each year during the remainder of the 1960's. Some will arise because of population growth and economic expansion. Most of the openings that occur, however, will be jobs that become vacant as young women stop working in order to stay at home and take care of their families. Turnover among typists has always been high on this account, and is expected to remain high in the future.

Over the long run, the number of typists is expected to increase fairly rapidly. The rate of increase will be somewhat slower than in the past, however, because duplicating machines and other mechanical equipment will probably be used for more and more of the routine typing and clerical work formerly performed by junior typists. The greatest demand is likely to be for typists who are able to do the relatively difficult work involved in senior typing jobs and for typists who can also do other kinds of office work.

Earnings and Working Conditions

The average salary of women employed as junior typists was \$63.50 a week in 1961-62, according to a Bureau of Labor Statistics survey which covered office workers in 188 metropolitan areas. For senior typists, the average was \$75.50. Among individuals in these occupations, there were substantial differences in salary levels, owing mainly to differences in the part of the country and the nature of the firms where they worked. The averages for typists employed by manufacturing firms and public utility companies were up to \$10 a week higher than the averages in other types of businesses, and salaries in the North Central

and Western States were higher than elsewhere in the country.

Entrance salaries for typists employed by the Federal Government early in 1963 were about \$70 a week (\$3,560 a year). For exceptionally well-qualified beginners, the starting salary was about \$75 a week (\$3,820 a year).

Bookkeeping Workers

(D.O.T. 1-01.00 through .49; 1-02.)

Nature of Work

Every business concern must have systematic and up-to-date records of its financial affairs. Keeping these records is the job of the bookkeeper. Bookkeepers record day-to-day business transactions in journals and ledgers and on other accounting forms. At regular intervals, they prepare summary statements showing, for example, the amount of money taken in and paid out by the firm and from whom it came and to whom it went.

In many small establishments, one *general bookkeeper* (D.O.T. 1-01.02) does all of the analysis, recording, and other work necessary to keep a complete set of books. Usually employees in positions of this kind are "hand" bookkeepers; they may use simple office equipment such as adding machines, but they do not operate bookkeeping machines. Often they also file, answer the telephone, mail statements to customers, and perform other general office work.

Large business organizations are likely to have bookkeeping departments where many employees work under the direction of a head bookkeeper (often called an accountant). In most departments of this kind, the *bookkeeping and accounting clerks* (D.O.T. 1-01.30 through .49) and *bookkeeping machine operators* (D.O.T. 1-02.) each handle one or a few of the many kinds of work necessary to keep a complete set of books. Some of these workers may post items in accounts payable or receivable ledgers, and others may take trial balances, prepare summary reports, or do other bookkeeping work. Accounting clerks do much of their work by hand, but occasionally use adding machines. Bookkeeping machine operators use office machines with keyboards not unlike the keyboards on calculating machines.

Working conditions for typists are usually similar to those of other office workers in the firms where they are employed. (See introductory section of this chapter for information on working conditions and on Where To Go for More Information.)



Many bookkeeping workers operate adding machines and other office equipment

Where Employed

About a million workers were employed in bookkeeping jobs in 1960. More than three-fourths of these workers were women. The great majority of bookkeeping workers either do general bookkeeping or are accounting clerks. Bookkeeping machine operators probably number considerably fewer than 100,000.

Particularly large numbers of bookkeeping workers are employed in retail stores, banks, insurance companies, and manufacturing firms of almost every kind.

Training, Other Qualifications, and Advancement

In selecting workers for bookkeeping jobs, most employers give preference to people who have completed at least high school or business or vocational school and who have taken courses in busi-

ness arithmetic and bookkeeping. Some look for applicants who have completed junior college. Training which includes instruction in typewriting and the use of office machines is often very helpful, since many bookkeeping workers perform a variety of office duties. An increasing number of large companies offer some on-the-job training for newly hired accounting clerks and machine operators. In some localities, companies cooperate in work-study programs operated by high schools and business schools; students enrolled in these programs gain practical experience in part-time jobs that may be helpful to them in obtaining full-time employment after graduation.

Beginning bookkeeping workers, who usually start out recording routine transactions by machine or by hand, may advance to more varied assignments involving greater responsibility—for example, preparing summary reports or operating complex equipment such as the bookkeeping machines used in large banks. Some accounting clerks and bookkeeping machine operators eventually advance to supervisory bookkeeping positions.

General bookkeepers and accounting clerks should have above-average aptitude for working with numbers and the ability to concentrate on details. Bookkeeping machine operators need finger dexterity and good eye and hand coordination.

Employment Outlook

More than 50,000 openings for bookkeeping workers are expected each year during the remainder of the 1960's. Most of these positions will be vacancies that occur as workers retire or leave the occupation. Many young women doing this kind of work leave after a few years of employment to marry or take care of their families; for this reason, employee turnover among bookkeeping workers is particularly high. In addition, a

moderate number of new jobs will become available as the field continues to expand.

Over the long run, the number of bookkeeping workers is expected to rise moderately. The increase which might be anticipated as a result of general economic growth and the increasing complexity of business operations would be much more rapid than this, were it not for the likelihood that more and more work time will be saved through the use of bookkeeping machines, electronic computers, and other modern equipment. Offices where this kind of equipment is installed will not only require fewer bookkeeping employees than formerly, but bookkeeping functions will tend to be further broken down into comparatively routine clerical operations. Although employment opportunities for bookkeepers qualified to assume responsibility for a complete set of books will probably continue to be good, more and more bookkeeping positions that open up in the future are likely to be for machine operators and accounting clerks to handle relatively routine assignments.

Earnings and Working Conditions

Information about the salaries of some types of bookkeeping workers is available from a 1961-62 survey which covered office employees in 188 metropolitan areas. The average salary for women accounting clerks was \$70 a week in beginning jobs, \$89 a week in jobs requiring higher skill; beginning bookkeeping machine operators averaged \$65 and experienced operators, \$80. Men in comparable positions earned considerably more than women—in the case of accounting clerks, between \$15 and \$20 a week more.

Working conditions for bookkeeping workers are usually similar to those of other office workers in the same firms. (See introductory section to this chapter for more information on Earnings and Working Conditions and on Where To Go for More Information.)

Cashiers

(D.O.T. 1-01.50 through .69; 1-03.05)

Nature of Work

Most cashiers have one thing in common in their jobs—they handle the money paid by customers for goods and services. Apart from this, their

duties may vary considerably, depending on where they work. Job titles also differ. In a theater, for example, the cashier may be called box office cashier or ticket seller; in a supermarket, checkout

clerk or grocery checker; in an electric light and power company, teller or bill clerk; and in a cafeteria, cashier-checker. Very large business firms with several cashiers sometimes use other special job titles such as disbursement clerk, cash accounting clerk, or credit cashier. (The occupation of bank cashier is altogether different from other kinds of cashier jobs and is not included in this statement.)

Regardless of job title or employer, most cashiers accept money paid by customers and clients, make change when necessary, and often give some kind of receipt for the payment. Records of the amount of money involved in each transaction are kept so that cash accounts can be balanced at the end of the day. Many cashiers also prepare cash and checks for deposit at the bank. Some cashiers in positions with a good deal of responsibility not only receive and record cash paid in to the company, but pay out cash or write company checks to cover such expenses as the purchase of supplies and equipment; they may also prepare pay envelopes or paychecks, prepare sales tax reports, and do related work.

Cashiers—particularly those in very large establishments—often use machines which enable them to do their work more quickly and efficiently. Probably the best known of these machines is the cash register which, as the cashier rings up each sale, prints a record of the amount on a paper tape and releases a money drawer. On some registers, cashiers list and total individual items purchased by each customer and record other details relating to the transaction. Other machines, somewhat like accounting machines, are used by cashiers in hotels and hospitals to record charges for telephone, medical, and other services which are incurred and prepare the itemized bills which cashiers present as guests or patients check out. Cashiers may also use adding machines, change-dispensing machines, and other special equipment.

Many cashiers have certain duties peculiar to the nature of their employers' businesses. In a theater, for example, the cashier may operate a ticket-dispensing machine and answer telephone inquiries. A restaurant cashier may handle customers' reservations for meals and special parties, type menus, or be responsible for a sales counter stocked with candy, cigarettes and cigars, chewing gum, and other items. In self-service stores,



Cashier rings up sale on register

such as grocery stores and supermarkets, cashiers may wrap and bag each customer's purchases and, during slack periods, restock shelves, mark prices on articles, and perform other work. In a hotel, the cashier's special duties usually include recording charges for telephone, valet, and other services used by each guest, taking charge of the safe-deposit boxes used by guests for the safekeeping of valuables, and notifying the room clerk when guests check out.

Where Employed

Cashiers work for business firms of all kinds and sizes. About half are employed in grocery, drug, and other retail stores; other large groups are employed in restaurants and in theaters. Most of these establishments and the other kinds of businesses where cashiers work—hotels, wholesale houses, and telephone companies, to name a few—are located in cities and in the shopping centers of heavily populated suburban areas, but some are to be found in almost every town and rural community throughout the country.

About 470,000 persons were employed as cashiers in 1960. Of these, 4 out of every 5 were women. More than half of all women cashiers work in food stores, restaurants, and department and general

merchandise stores. The largest single group of men cashiers work in food stores and supermarkets.

Training, Other Qualifications, and Advancement

Employers hiring new workers to fill jobs as cashiers usually prefer people who are at least 18 years of age and have completed high school. Many employers consider courses in business arithmetic, bookkeeping, typing, and other business subjects useful.

For some kinds of cashier jobs, employers want persons with special skills or business experience—cashiers who know how to type for example, or who have had selling experience. Sometimes cashier jobs are filled by promoting clerk-typists in offices, bag boys in supermarkets, and other qualified people already employed by the firm.

In some large cities, business organizations and schools offer brief courses through which students learn to operate the cash register and perform other duties of a cashier. Cashier training may also be offered as part of public school distributive education programs which include courses in retail selling or food service work.

New employees who have never before worked as cashiers may be given informal on-the-job training, or, particularly in large firms, attend brief training courses to learn how to perform their duties. Some firms, because of the nature of their business, require all new cashiers to take special training, regardless of previous experience as a cashier. In small firms, new cashiers are more likely to be trained as they work on the job under the close supervision of an experienced employee.

In order to work rapidly, cashiers should have an aptitude for working with figures, finger dexterity, and a high degree of eye-hand coordination. Accuracy is particularly important. Since cashiers deal with the public, they should also be tactful, neat in appearance, and pleasant in their dealings with customers.

A cashier job often affords a young person a good opportunity to learn about his employer's business, and so may serve as a steppingstone to other kinds of clerical work or to some types of managerial positions. In large hotels, for example, men who have worked as cashiers are occasionally advanced to jobs as room clerks. In chain stores and other large retailing enterprises, cashiers may eventually advance to positions as department or

store managers. The cashier who seeks such advancement should make the most of his opportunities to learn about merchandising and other aspects of his employer's business, either by working part time in jobs which will enable him to broaden his background of experience or by taking college level courses in retail store management. Many cashiers employed in stores, eating places, and other small establishments have relatively limited opportunities for promotion, however.

Employment Outlook

Tens of thousands of job openings for cashiers can be expected each year throughout the remainder of the 1960's. In the future, as in the past, the majority of these jobs will be for women. Many will be new jobs created by general economic growth and others—an even greater number—will be openings that occur as cashiers retire or leave their jobs for other reasons. Turnover is especially high in this occupation, mainly because a great many cashiers are women who have family responsibilities and work only for brief periods.

Competition among job applicants is likely to continue to be keen, since many openings for cashiers can be filled by persons with little specialized training. Furthermore, part-time workers are often sought by employers for many cashier jobs and the number of women looking for this type of employment is relatively large.

Over the long run, the number of people employed as cashiers is expected to increase fairly rapidly. Many new jobs will arise as business activities continue their general expansion, and as more and more retailers adopt self-service, install checkout counters, and introduce other changes in merchandising techniques which create additional jobs for cashiers. Other changes taking place, however, make it likely that the rise in employment resulting from these factors will be considerably less than the increase which took place during the 1950's when the number of cashiers doubled. Vending machines, change-making machines, and other kinds of mechanical equipment which replace the cashier or speed up his work will undoubtedly be used for more kinds of merchandise and in more types of business establishments. Opportunities will probably continue to be best for cashiers who have typing, bookkeeping, or other special skills.

There will be many opportunities, also, for cashiers who wish to work part time.

Earnings and Working Conditions

Many large business firms located in metropolitan areas paid cashiers without previous experience about \$50 a week in 1962. Experienced cashiers may earn considerably more, depending on the type, size, and location of the business firms which employ them and on the nature of any additional duties or responsibilities they may have.

In 1962, experienced cashiers in some types of retail stores in metropolitan areas earned between \$60 and \$70 a week and cashier-checkers in supermarkets earned up to \$100 or \$120, according to limited data available. Hotel cashiers in some large cities earned about \$85 a week. Cashiers employed in restaurants are often paid lower salaries than other workers in this occupation, but usually they receive one or two meals a day in addition to their salaries. A 1961 Bureau of Labor Statistics survey which included cashiers employed in eating and drinking places in 26 metropolitan areas throughout the country reported average wages ranging from less than \$1 an hour to almost \$2. Averages were highest in West Coast cities—approximately \$1.45 or more an hour. Wages tended to be lowest in the South, where cashiers in most cities averaged less than \$1.25 an hour.

Cashiers' hours may differ from those of many other clerical workers because they often work

during rush periods which are outside regular office hours—at mealtimes in restaurants and during evenings and weekends in stores and theaters, for example. Cashiers usually work a 5-day, 40-hour week in supermarkets and other large retail establishments but, since Saturday is a busy day in retailing, most cashiers usually work that day and have another day off during the week. Holiday, weekend, and late afternoon work may be required, especially in theaters and restaurants. Many cashiers in such establishments work part time or on split shifts.

Most cashiers work indoors, often in small booths or cages or behind counters near the entrances of stores, theaters, and other establishments. In some cases, their quarters may be uncomfortable because they are exposed to cold drafts in the winter and considerable heat during the summer.

Where To Go for More Information

Information about the job of the cashier in restaurants is contained in the following publication:

Food Service Industry, Training Programs and Facilities, U.S. Department of Health, Education, and Welfare, Office of Education, Vocational Bulletin 298, 1961. Superintendent of Documents, Washington, D.C., 20402. Price 65 cents.

See introductory section of this chapter for additional sources of information.

Office Machine Operators

(D.O.T. 1-25.)

Nature of Work

The kinds of machines used to speed the paperwork in modern business offices are so varied that it would be practically impossible to list them all. They range from simple mechanical devices that open letters to electronic equipment capable of performing highly involved computations. Not all of this equipment is operated by workers classified as office machine operators, however. Some office machines—particularly the simplest kinds which are easiest to operate—are used principally by clerical employees who spend most of their time in other work and need no special training as ma-

chine operators. In addition, statistical clerks and certain other office workers not classified as machine operators, are specially trained to operate some kinds of machines because they have to use them extensively in their regular jobs.

This statement is concerned chiefly with the work done by people whose main job assignment is to operate some of the most common kinds of machines. Those who operate machines equipped with keyboards are trained to do so accurately and at high speed, using the "touch system." Many, like the keypunch operator and billing machine operator, have job titles taken from the kinds of

equipment they use. (Typists, operators of transcribing and bookkeeping machines, and operators of electronic computer systems are not included in this statement, but are discussed in other sections of this chapter.)

Billing machine operators (D.O.T. 1-25.00 through .09) prepare statements relating to customers' purchases. By striking lettered and numbered keys on their machines, they enter on each bill information such as the customer's name and address, the items bought, and the amounts of money involved in each transaction. Then, when the operator presses other keys, the machine calculates and prints totals, discounts, and other items.

Adding and calculating machine operators (D.O.T. 1-25.10 through .19) use electrically and manually operated machines to make the computations needed in preparing payrolls and invoices, and in doing other statistical work. By striking numbered keys, operators "put into" these machines the numbers involved in each calculation and then, when other keys are pressed, the machines make the desired calculations and record the results automatically. *Adding machine operators* (D.O.T. 1-25.12) use their machines to add and subtract numbers, and sometimes to multiply. The calculator is a more complex piece of equipment than the adding machine and has a much larger keyboard. *Calculating machine operators* (D.O.T. 1-25.13) use the calculator to add and subtract, multiply, divide, take square root, and do other computations. Many office workers who are expert in operating adding machines and calculators use this equipment part of the time and also perform other office duties. However, operators of the most complex calculating machines—that is, comptometer-type calculators which require considerable skill and knowledge on the part of the operators—usually spend full time in this work.

Mail preparing and mail handling machine operators (D.O.T. 1-25.40 through .49) run automatic equipment which handles incoming and outgoing mail. Some operators feed incoming mail into machines which open the envelopes. Other operators place outgoing mail on the loading racks of machines which fold enclosures and/or insert them in envelopes or address, seal, or stamp envelopes. Operators of addressing machines work mainly in offices where circulars, magazines, and

other materials are regularly sent to people on mailing lists; they run machines which print addresses and related information either from stencils which have been cut by typists or else from plates prepared by *embossing machine operators* (D.O.T. 1-25.42 and .43) on a special kind of typing machine.

Operators of duplicating and copying machines run equipment which produces copies of typewritten, printed, and handwritten documents more quickly and/or more inexpensively than is possible by typing. Some equipment of this kind—particularly copying machines which use photographic and other chemical processes—are used chiefly to make only a limited number of copies of a document and can be operated by almost any office employee who has taken a few minutes to learn how. Full-time machine operators are seldom used for this work. Other, and more complicated, duplicating machines, which are capable of producing thousands of copies of typewritten and handwritten documents in a single "run," are usually operated by specially trained *duplicating machine operators* (D.O.T. 1-25.20 through .29) who spend most of their time doing this kind of work. The main job of the operators who run these machines is to insert in the machine a "master" copy of the document to be reproduced (a stencil on some machines, and on others raised type) and then to adjust the mechanism and start the machine. The operator must see that the machine is kept properly adjusted so that it produces legible copies. On some machines the operator also feeds in the paper used for making copies and removes finished batches of work manually; on other machines, feeding and off-bearing are done automatically.

Operators of tabulating machines and related equipment (D.O.T. 1-25.60 through .69) run machines designed to sort and count large quantities of accounting and statistical information. Information to be processed in a tabulating machine is first transferred to cards by *keypunch operators* (D.O.T. 1-25.62). Using machines similar in action to typewriters, these workers punch holes in the cards in such a position that each hole can be identified as representing a specific item of information. *Sorting machine operators* (D.O.T. 1-25.63) then run the punched cards through sorting machines which automatically separate the



Keypunch operator records data on cards for machine tabulation

cards according to the location of the holes and arrange them in any desired order. Next, *tabulating machine operators* (D.O.T. 1-25.64) insert the batches of punched cards into machines which count the various items punched on each card, multiply and make other calculations, and print the results on accounting records and other business forms.

Where Employed

Slightly more than 300,000 people were employed as office machine operators in 1960, according to the Census of Population. (Included in this total were an estimated 50,000 to 100,000 operators of bookkeeping machines and electronic computer systems, discussed elsewhere in this chapter.) Three-fourths of all office machine operators are women. Women outnumber men in practically all types of operator jobs except those

which involve operating tabulating machines and electronic computer systems.

Office machine operators are more likely than most other office workers to be employed in firms handling a large volume of recordkeeping and other paperwork. Consequently, a great many operators work in large cities where such firms are usually located. Roughly one-third of all office machine operators work for manufacturing companies. Others work for banks and insurance companies, government agencies, and wholesale and retail firms. Some office machine operators are employed in "service centers"—agencies which are equipped with various kinds of office machines and contract to handle, for other firms without this equipment, such tasks as preparing monthly bills and circularizing customers.

Training, Other Qualifications, and Advancement

Graduation from high school or business school is the minimum educational requirement for all but the most routine office machine operator jobs. For work such as operating comptometer-type calculators and some kinds of tabulating and duplicating equipment, specialized training is usually necessary. For most beginning positions, however, a general knowledge of the equipment used is usually regarded as sufficient. High school courses in the operation of office machines are helpful, and business arithmetic is valuable for the many jobs involving work with figures. It is helpful also for office machine operators to have some knowledge of typing or to be able to operate more than one type of office equipment, since many office positions entail varied assignments.

Employers usually give newly employed office machine operators some on-the-job training. Even employees with some earlier training or experience in office machine operation need to become familiar with the kinds of equipment they will be using on the job. Differences exist between the calculating machines produced by one manufacturer and by another, for example; and new models sometimes differ considerably from older models. The amount of instruction and on-the-job experience needed by a new employee varies, depending chiefly on the type of machine. A few days only may be required to train operators of

some duplicating machines, for example, while a few weeks may be required for the basic training of keypunch and calculating machine operators. Generally, it takes several weeks for operators of tabulating machines to learn how to set and adjust their equipment and do simple wiring of plugboards. Operators of tabulating equipment are often trained at company expense in special schools established by equipment manufacturers.

Finger dexterity, good coordination of eye and hand movements, and good vision are important for most office machine operator jobs. It is helpful for billing and calculating machine operators to have a sufficient sense of mathematical relationships to enable them to detect quickly obvious errors in computations. Some mechanical ability is advantageous, especially for duplicating and tabulating machine operators.

Most employers follow a promotion-from-within policy, taking into consideration seniority and on-the-job performance as shown by supervisors' ratings and recommendations. Promotion may be from a beginning, routine machine job to a position in which the worker operates several kinds of office machines or is responsible for training beginners and for the accuracy of their work. Sometimes, employees are advanced by being transferred to the operation of more complex machines—for example, from tabulating to electronic computing machines. Other office machine operators, employed in firms with large clerical staffs, may advance to supervisory positions as section or department heads.

Employment Outlook

Many thousands of job openings for office machine operators are expected each year during the remainder of the 1960's. Some will arise as business organizations continue to grow in size and the volume of billing, computing, duplicating, and other work continues to mount. The number of service centers also is expected to increase. Other openings for office machine operators will probably be created through the introduction of new types of mechanical office equipment which speed recording, copying, and other office jobs. Still other openings will occur because of the need to fill vacancies; most machine operators are young

women, many of whom may stop working after a few years of employment in order to stay at home and care for their families.

Although the number of workers employed as office machine operators is likely to increase substantially during the years just ahead, in the long run this expansion in employment will probably be slowed by further advances in office automation. Precisely how automation may affect employment in specific office occupations is difficult to foresee. As yet, business firms are only beginning to use computers and other modern electronic equipment for office work. In time, employers will undoubtedly find many additional uses for this kind of equipment and, as machines take over an increasing amount of clerical work, the number of billing, computing, and tabulating machine operators needed in some offices will be substantially reduced. Nevertheless, the total number of workers who will be employed to operate these and other kinds of office machines will continue to rise.

Earnings and Working Conditions

A 1961-62 survey, which covered large firms in 188 metropolitan areas, provides information about the weekly salaries of women in three office machine operator occupations. The highest average—\$100.50 a week—was reported for the most highly skilled operators of tabulating machines; tabulating machine operators working on simple assignments averaged \$69 a week. For keypunch operators on comparatively difficult types of assignments, the average was \$80.50 a week, and for other keypunch operators it was \$70. Compometer operators averaged \$76 a week.

The salaries paid to men, according to the 1961-62 survey, were often higher than those of women in the same types of jobs. For example, men employed in some types of tabulating machine jobs earned, on the average, about \$7 a week more than women doing similar work.

Working conditions for office machine operators are usually similar to those of other office workers in the same firms. (See introductory section to this chapter for additional information on Earnings and Working Conditions and on Where To Go for More Information.)

Electronic Computer Operating Personnel

Nature of Work

Operators of several kinds of mechanical equipment may be required in connection with "data processing"—preparing a payroll, for example—on an electronic computer. The computer's "input" must be prepared in a special code, or "machine language," which the computer uses when it processes data; the computer console must be operated while data are being processed; and, finally, the computer's "output," must be translated back into words and numbers. In a small computer system—and some computers are no bigger than an office desk—one or two employees may do all of the work necessary. A large system, on the other hand, may require several operators, each of whom performs a specific task.

The operators' jobs, as described here, illustrate the work done when computers are used for such work as keeping inventories, billing customers, and processing other office records. Most computers are used for work of this type. The operating personnel of computer systems used for controlling production lines in factories, analyzing the structure of chemical compounds, and other technical and scientific work often have somewhat different responsibilities and are not covered in this statement.

A computer's input consists of the data to be processed and the step-by-step instructions prepared by programmers which tell the machine how

to do the work. (Information about the occupation of Programmer is given elsewhere in this *Handbook*. See index for page number.) In many computer systems, the input consists of punched cards or paper tapes, and is prepared either by keypunch operators or operators of typewriters or adding or bookkeeping machines with special attachments which perforate tapes. These machine operators do much the same work as workers who use the same general type of equipment for other purposes. (For additional information on these occupations, see statements on Typists, Office Machine Operators, and Bookkeeping Workers elsewhere in this chapter.)

In some computer systems, punched cards or paper tapes can be used directly to feed information into the central computer. The fastest computer systems, however, get their input from magnetic tapes (narrow strips of plastic tape, on which data have been recorded in the form of magnetic spots or characters). Such computer systems include auxiliary equipment which transfers to magnetic tape the data which have been recorded on punched cards or paper tapes. Some machines used for this kind of work, called converters, may be run by *peripheral equipment operators* (D.O.T. 1-25.60 and .98). An operator of a converter may be required to wire a fairly simple plugboard, and must know how to interpret signals from a panel of lights on the machine. Converter operators should also have sufficient understanding of the whole computer system to recognize any errors that may have occurred in preparing input or other situations which could prevent the system from operating properly.

Once the facts and figures to be processed have been converted into the form used by the computer, the data are ready for the "run." This is the responsibility of the *console operator* (D.O.T. 1-25.17)—or computer operator, as he is sometimes called. The console operator first examines the programmer's instruction sheet for the run and ascertains the procedure to be followed. He then readies the equipment, makes sure the computer is loaded with the tape or cards needed, and starts the run. As he operates the console during the run, he may have dozens of switches to manipulate and



An assistant loads magnetic tape unit as console operator prepares to start a run

lights to observe. If the computer stops running, or its lights signal an error, he must try to locate the source of the trouble. Some console operators do fairly standardized work whereas others, in senior positions, have considerable responsibility for the proper functioning of the whole computer system.

Before a computer's output can be read, it must be translated from machine language to words and numbers. In some systems, this is done by "printers" or other machines directly connected to the computer and run by the console operator or his assistant. In many large systems however, this work is done on converters, highspeed printers, and other specialized machines run by peripheral equipment operators. The operators, like operators of other kinds of peripheral equipment, may have to wire plugboards and watch for lights on their machines which signify errors. Some types of peripheral equipment are relatively difficult to operate and, when computer systems include such equipment, operators sometimes specialize on one kind of machine. Many operators run all kinds of peripheral equipment used in a computer system, however.

The tape or cards used in processing data on a computer are stored after the run, and are often used again and again—as, for example, in making up a payroll at the end of every pay period. A *tape librarian* (D.O.T. 1-20.04), or a console or peripheral equipment operator, may be responsible for storing tapes and making them available when they are again needed.

Since electronic computers are very expensive, many of them are operated for 16 or 24 hours a day and, in such cases, the employees who operate the consoles and auxiliary equipment work on two or three different shifts. Usually all operators work under the general direction of a chief supervisor, and employees on each shift work under the direct supervision of the console operator on that shift.

Where Employed

Nationwide, more than 10,000 computers were in use in early 1963. No exact figures are available concerning the number of console and peripheral equipment operators, but it was undoubtedly small compared with the great number of work-

ers employed in many other clerical occupations. Both men and women may be employed as operators of computer systems, but men predominate.

Jobs for operating personnel are found chiefly in metropolitan areas—for the most part in government agencies and in insurance companies, banks, transportation and other public utility companies, and manufacturing firms. Many operators are also employed in service centers which process statistical data for other firms on a fee basis.

Training, Other Qualifications, and Advancement

Many employers, when they install electronic computers, fill their new operator positions by transferring employees from other types of jobs—frequently from jobs as operators of tabulating and bookkeeping machines which may no longer be needed after the computer is installed. Computer operating personnel may also be recruited on the outside, however, when employers do not have enough employees with the special abilities needed.

In hiring outsiders, private employers usually require at least high school graduation. For positions as console operator, some college training may be required. In the Federal Government also, applicants for peripheral equipment operator jobs must be high school graduates, unless they have had specialized training or previous experience in some related work. Console operators employed by the Federal Government are generally required to have a college education or its equivalent in work experience; or they may be able to qualify for appointment on the basis of previous experience in computer work and general aptitude for it, as demonstrated by special tests. Many private employers also screen applicants for operating positions by giving them tests designed to measure their aptitude for the work, and especially their ability to reason logically. Men are often given preference in hiring, partly because work is frequently done on late afternoon and night shifts, and partly because men, once they have been trained for their work, are more likely than women to remain in their jobs for prolonged periods.

Beginners hired for work of this kind, or transferred to it from other positions in their firms,

are seldom expected to have had specific training as operators. Most employers provide the necessary training after the worker is hired. The training of peripheral equipment operators may require a few weeks, that of console operators from 2 to 6 months or longer. Console operators usually attend classes where they are taught not only how to operate the console but also the fundamentals of programming. This period of formal training is followed by further instruction on the job.

As they gain experience, operating personnel may be assigned to operate more complex pieces of equipment. Eventually they may be promoted to supervisory positions or jobs which combine some supervisory duties with console operation. Because console operators can often acquire, through on-the-job experience, a good basic understanding of programming, they are sometimes selected and trained by their employers for programmer positions.

Employment Outlook

The use of electronic data-processing equipment is expected to increase very rapidly throughout the remainder of the 1960's and, as a result, the number of jobs for operators will also increase rapidly. In addition, some openings will occur as operators of computer systems transfer to other kinds of work or stop working for other reasons. As in the past, employers will fill some of the openings by training people already in their employ, but many other positions will be filled by hiring outsiders who demonstrate an aptitude for this kind of work.

More important, perhaps, than the total number of openings likely to occur is the possibility that job requirements may change in this very new field of work. Computer systems are constantly being modified and, along with these changes, the duties of console and auxiliary equipment operators are also changing. If operating a computer console continues to require the special aptitudes now often needed, employment opportunities will be very good for the comparatively limited number of candidates who can qualify. If, on the other hand, the next few years bring changes which simplify the work, newcomers may find it easier to qualify, and competition

for the jobs that become available is likely to become correspondingly greater.

Earnings and Working Conditions

Information about the salaries of computer operating personnel in over 500 companies throughout the country is available from a private survey conducted in 1962. The average salary for beginning console operators was about \$85 a week. Operators with more experience generally earned from \$95 to \$105, and senior console operators and others with supervisory responsibilities earned between \$115 and \$135 a week. The salaries of peripheral equipment operators working with high-speed printers averaged \$95 a week; and for tape librarians, the average was about \$90. The difference between the salary of the lowest and highest paid employees in each of these job classifications was much greater than these figures suggest, however. In each case, some employees earned more than twice as much as others. This wide range was due to differences in salary levels in various parts of the country and in individual companies and industries and, to some extent also, in the complexity of the work performed by operators classified under the same job titles.

Salaries of computer personnel in the Federal Government are roughly comparable with those in private industry. In early 1963, trainee console operators started at about \$88 a week (\$4,565 a year) and peripheral equipment operators at about \$75 a week (\$3,925 a year). Console operators in supervisory positions could eventually work up to almost \$12,000 a year after several years of experience. The maximum for experienced peripheral equipment operators was about \$6,005 a year.

Operators of electronic computer systems generally work the same number of weekly hours and enjoy the same holidays, vacations, and other benefits as do most office employees. Since many computers are operated on a two- or three-shift basis, scheduled hours for some console and peripheral equipment operators include late evening or nightwork. Tape librarians usually work only when day shifts are on duty. (See introduction to this chapter for additional information on working conditions and on Where To Go for More Information.)

Shipping and Receiving Clerks

(D.O.T. 1-34.)

Nature of Work

Shipping and receiving clerks make sure that supplies are shipped and received in good condition and maintain records of their transfer. In a great many companies, one clerk handles all the shipping or all the receiving work. In large companies, however, there may be many shipping and receiving clerks in separate departments, working under the direction of supervisors who are often called head shipping clerks or head receiving clerks—or sometimes warehouse managers.

Before a shipment is sent out from a business establishment—whether lumber from a planing mill, baseball equipment from a sporting goods manufacturer, or coffee from a wholesale dealer—shipping clerks check to be sure the order has been correctly filled. They type or prepare by hand the bills of lading and other shipping forms needed, look up freight and postal rates, record the weight and cost of each shipment, and check to see that the shipment is properly addressed. They also maintain the shipping records. Sometimes shipping clerks requisition the merchandise from the firm's stockroom and wrap and pack the shipment. They may also have to order the proper size company truck for the transportation of shipments from warehouses, and direct the loading, ensuring that the weight is evenly distributed and fragile items are safely placed.

Receiving clerks do similar work when shipments reach their destination. They make sure their employers' orders have been correctly filled by comparing the original order with the items received and the accompanying bill of lading or invoice, and they must see whether all supplies have arrived in good condition. Receiving clerks maintain records of all incoming shipments, including information on the condition of supplies upon arrival; they may process claims and do other clerical work relating to lost shipments. Routing shipments to the proper department of the company or section of the warehouse or to the stockroom may also be part of their job.

Where Employed

Of the 280,000 shipping and receiving clerks employed in 1960, 2 out of every 3 worked in

manufacturing firms. Another fairly large group worked for wholesale houses or retail stores. The remainder were employed by transportation and freight forwarding companies, and by many other kinds of business firms. About 90 percent of all shipping and receiving clerks are men.

Shipping and receiving clerks are employed wherever there are large factories, warehouses, and stores. The majority work in metropolitan areas, where such establishments tend to be concentrated.

Training, Other Qualifications, and Advancement

High school graduates are preferred for beginning jobs in shipping and receiving departments. Although beginners without a high school diploma may qualify for a few jobs of this kind, it is becoming increasingly difficult for such workers to advance to better positions. Business arithmetic, typing, and other high school business subjects are helpful in preparing for the work. The ability to write legibly is important. Dependability and an interest in learning about the firm's business activities are also qualities which employers seek.

New employees are usually given on-the-job training under the supervision of an experienced worker. In some firms, beginners help stockroom workers until they learn about the firm's products. Handling certain types of merchandise—delicate instruments or garments, for example—often requires special care and skill; and forwarding merchandise by air freight, or sending it by boat to another country, requires a knowledge of the regulations which apply to different types of shipments.

Newly hired shipping and receiving clerks often do routine work such as checking addresses and attaching labels to each shipment, checking the items included, or filing. As clerks acquire experience, they may be assigned tasks requiring a good deal of independent judgment—for example, tracing lost shipments, handling problems that arise because of damaged merchandise, or supervising other shipping or receiving room workers.

Work as a shipping or receiving clerk provides an excellent opportunity for an ambitious young

man to learn about his company's products and business connections. Some clerks, particularly those who acquire college training or take courses in transportation, may eventually advance to positions as warehouse managers, industrial traffic managers, or purchasing agents. (The work of industrial traffic managers and purchasing agents is discussed elsewhere in this *Handbook*. See index for page numbers.)

Employment Outlook

Thousands of openings for shipping and receiving clerks will occur each year throughout the rest of the 1960's. Some openings will be in newly created or expanding business firms, but most will result from the need to replace workers who retire, die, or leave the occupation for other reasons. At least 5,000 vacancies can be expected each year solely because of deaths and retirements. Competition for openings may be keen for beginners, since this kind of work requires relatively little specialized training and the number of qualified applicants seeking entry jobs is sometimes large.

Over the long run, as the quantity of goods distributed increases with population growth and rising income levels, the number of shipping and receiving clerks needed will also increase. The rate at which employment rises, however, will probably lag somewhat behind the increase in the volume of goods distributed. As firms handle larger quantities of merchandise, they will continue to strive for increased efficiency in their shipping and receiving operations by streamlining record-keeping and eliminating duplication of paperwork, and by modernizing warehouses with the installation of moving belts and other mechanical equipment which helps to speed the work of clerks. Undoubtedly, shipping and receiving departments will be able to handle a larger volume of work with fewer clerks. Even so, there will probably be a gradual increase in the number of

clerks whose main job assignment is in shipping or receiving work.

Earnings and Working Conditions

Average hourly earnings for men employed in 1961-62 as shipping and receiving clerks ranged generally from \$1.75 to \$2.75 an hour, according to a survey which covered 82 metropolitan centers. Earnings were generally highest in western cities and lowest in some of the southern cities surveyed. Regardless of the location of the city, salaries tended to be higher in public utilities and manufacturing companies than in other types of establishments.

Shipping and receiving clerks generally work a 40-hour week. Many, when they work more than 40 hours, receive time and a half for overtime. Nightwork and overtime, including work on Saturdays, Sundays, and holidays, may be necessary when raw materials are needed immediately on factory production lines, when shipments have been unduly delayed in arriving, or in other emergencies.

Shipping and receiving clerks do much of their work in warehouses and shipping and receiving rooms; they may do some of it on outside loading platforms. Work places are often large, unpartitioned areas which may be drafty and cold, and littered with packing materials and containers.

Some of the work done by shipping and receiving clerks requires physical stamina and strength. Most clerks must stand on their feet for long periods while they check quantities of merchandise. Locating numbers and descriptions on cartons often requires a great deal of bending, stooping, and stretching. It may be necessary for clerks to help load or unload shipments or move materials about in the warehouse. Occasionally, the work must be performed under considerable pressure in order to move shipments on time. (See introductory section of this chapter for Where To Go for More Information.)

SALES OCCUPATIONS

Workers in sales occupations help make it possible for people to buy, in their own and nearby communities, goods and services produced in thousands of other localities in all parts of the country. These workers sell for manufacturers, insurance companies, and other producers of goods and services; for wholesalers who stock large quantities of goods so that smaller lots may be purchased and resold by retail stores; and for drug stores, dress shops, and other retailers who deal directly with the public. Their customers include housewives buying groceries, college students buying textbooks, and manufacturers and other businessmen purchasing such things as machine tools, office furniture, and stationery. A list of all the things sales workers sell would be practically endless—houses, shoes, steel, candy, and stocks and bonds, to name a few more examples. Nearly 4.5 million workers were employed in sales occupations in 1962. About one-third were part-time employees who usually worked fewer than 35 hours a week.

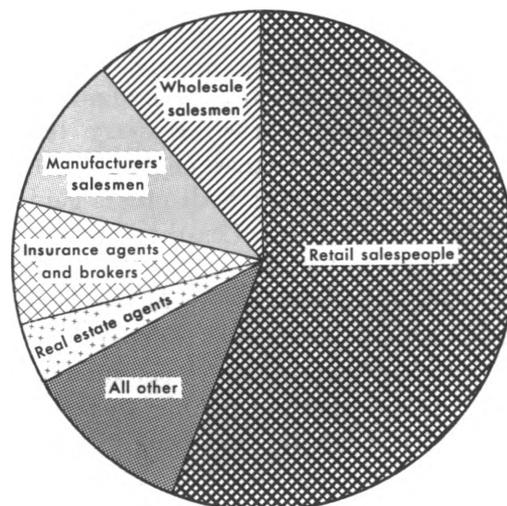
Women account for about 2 out of every 5 workers in sales occupations and are employed mainly in retail stores. In insurance, real estate, and other sales work outside retail stores, the great majority of employees are men.

This chapter gives information about six large groups of sales workers—salesmen and saleswomen in retail stores, salesmen in wholesale trade, manufacturers' salesmen, life insurance agents, property and casualty insurance agents and brokers, and real estate salesmen and brokers. These workers account for 9 out of every 10 people employed in sales occupations. (See chart 22.) Other sales occupations, almost all of which are considerably smaller but nevertheless employ thousands of workers, include news vender, door-to-door salesman, advertising salesman, stock and bond salesman, demonstrator, and auctioneer.

CHART 22

AMONG THE 4.5 MILLION WORKERS IN SALES OCCUPATIONS....

About one-half are retail salespeople



Source: 1960 Census of Population
U.S. Bureau of the Census.

Training and Other Qualifications

Sales occupations afford job opportunities for people with widely differing backgrounds and abilities. Thousands of salespersons have routine jobs, selling standardized merchandise such as the magazines, candy, cigarettes, and cosmetics stocked by many drug stores. Similarly, the salesgirl behind the counter of a variety store needs to do little more than “wait on” people who have already made their selections from the stock which is on display. Salespeople in such jobs are seldom required by their employers to have specialized training. They usually learn their duties on the

job as they work with experienced sales clerks or—in some large stores—they may attend brief training courses. Even in the most routine kinds of selling, however, a high school diploma is an asset to a beginner seeking a job. High school courses in business subjects, as well as the specialized courses in distributive education offered in some city school systems, are regarded by most employers as particularly good preparation for sales work.

The salesman who sells complex products or services—electronic equipment or liability insurance, for example—has a job which is altogether different from that of most retail sales clerks. Beginners on jobs of this kind sometimes receive training which lasts many months. For some positions, they must be college graduates who have specialized in engineering or some other field. Other salesmen dealing in specialized services and products may acquire the necessary technical knowledge by taking courses offered at universities or by manufacturers. Still others gain their know-how through years of on-the-job experience. Thus, a salesman of stocks and bonds may qualify for his job by attending university extension courses; a beauty counselor in a department store may participate in an industry-sponsored training program before entering on her duties; and a salesman of fine jewelry may acquire his knowledge of gems during years of observation and study as he works on the job.

In any type of selling, the successful salesman or saleswoman must be a person with a pleasing personality who is poised, at ease in dealing with strangers, and prompt to be of assistance to customers. Skill in dealing with people, self-confidence, imagination, and the ability to express one's self clearly are very important in some kinds of sales jobs. In almost all sales work outside retail stores, the salesman must have the initiative to locate his own prospective purchasers.

Employment Trends and Outlook

During the 50 years between 1910 and 1960, the number of workers in sales occupations almost tripled—a rate of increase which was considerably faster than the rate for the labor force as a whole. During the last 10 years of this period, the large occupations of real estate salesman, insurance agent, manufacturers' salesman, and wholesale salesman showed a greater-than-average increase; the smaller sales occupations of demonstrator, stock and bond salesman, and house-to-house salesman also increased rapidly. Among the slowest growing of all sales occupations during this same period was retail sales worker—an occupation which nevertheless employed more people in 1960 than all other sales occupations combined.

During the rest of the 1960's the number of people in sales occupations of all kinds is expected to increase by about 1 million. By 1975, sales employment will probably rise another half million, bringing the total to nearly 6 million. As employment rises, the proportion of part-time workers—already higher than in most occupational groups—is also likely to increase. Particularly in the growing number of suburban shopping centers—where many retail stores remain open for business several nights a week—a larger proportion of the sales force is likely to be made up of "contingents" employed only on Saturdays and during evening shopping hours.

The main reason for the anticipated rise in employment is the prospect of an increase in sales volume. Increased sales, owing to rapid population growth, business expansion, and rising income levels, will cause employment in many sales occupations to rise rapidly. Within retail stores, however, special circumstances which have limited employment growth in the recent past will probably continue to do so. Information about employment prospects for sales workers in retail stores and in other major fields is given in the statements which follow.

Salesmen and Saleswomen in Retail Stores

(D.O.T. 1-70.; 1-75.; and 1-80.)

Nature of Work

The success of any retail business depends in large part on its salespeople, whether they sell

automobiles or pianos or everyday things such as toothpaste or thread. Courteous, efficient service from behind the counter or on the sales floor does

much to satisfy customers and to build a store's good reputation. Aside from the contact with customers, which is a part of all sales jobs, there are differences in the duties, skills, and responsibilities of salespeople which are fully as great as the differences in the merchandise they sell.

In selling expensive items such as furniture, electrical appliances, or some types of wearing apparel, the sales worker's primary job is to assist the customer as much as possible in order to create a desire to buy the merchandise. The salesperson may spend much of his time showing various styles or colors, demonstrating an article, pointing out its desirable features, answering questions about its construction or use, and helping the customer to make a selection. Special skills are required to sell certain items. For example, an automobile salesman must be able to drive and to explain the advantages of power brakes and steering or other features of a new model car; whereas a salesperson in a music store may be required to know how to play an instrument.

People who sell standardized articles, such as many of the items in hardware and drug stores, may have little more to do than assemble the items desired by each customer. In stores with goods clearly labeled and arranged so that customers

can easily make their selections from shelves or counters—as in many variety stores and newsstands—the salesclerks' chief duties are to tell the customer where to find merchandise, suggest additional items for sale, wrap or bag purchases, and receive payment and make change.

In addition to their selling duties, most retail salespeople make out sales or charge slips, receive cash payments, and give change and receipts. Salespersons are usually responsible also for keeping their work areas neat and presentable at all times. In small stores, they may assist in ordering merchandise, stocking shelves or racks, marking price tags, taking inventories, preparing attractive merchandise displays, and promoting sales. (Route salesmen, who sell bread, milk, and other products directly to customers on a regular route, are discussed in the chapter on Driving Occupations. See index for page number.)

Where Employed

Two and one-half million salespersons—more than half of them women—were employed in 1962 in close to 100 kinds of retail businesses. The stores where they worked range in size from the small drug or grocery store which employs only one part-time salesclerk to the giant department store with hundreds of salespersons. The largest employers of salespersons are department and general merchandise, food, and apparel and accessories stores. Men predominate in stores selling furniture, household appliances, hardware, farm equipment, shoes, and lumber, and in automobile sales agencies. Women outnumber men in department and general merchandise, variety, apparel and accessories, and drug stores.

Sales jobs are found in practically every community in all parts of the country. However, the vast majority of salespersons work in large cities and in the shopping centers of nearby suburban areas.

Training, Other Qualifications, and Advancement

Employers generally prefer to hire high school graduates for most sales jobs. Subjects such as salesmanship, commercial arithmetic, and home economics help to give the student a good background for selling positions. Many high schools



Saleslady helps customer select a necklace

692-408 O-63-20

have distributive education programs, which include courses in merchandising, principles of retailing, and retail selling, and also provide an opportunity for students to get practical experience under trained supervision by working part time in local stores. Store owners cooperating in these programs often offer full-time employment to students who complete the courses.

Young people interested in obtaining sales jobs may apply to the personnel office in larger retail establishments. Applicants are usually given personal interviews and are sometimes required to take special tests which indicate their aptitude for sales work. Employers prefer to hire people with a pleasing personality, an interest in sales work, a neat appearance, and the ability to express themselves well. Prospective salespersons should also be able to stand on their feet for long periods. Part-time selling experience is helpful in obtaining a full-time job.

Practically all retail stores give new personnel some on-the-job instruction. In small stores, this training may consist of a short talk about the job, given by an experienced salesperson who may also be the proprietor; in large stores, training programs are often more formal and may last several days. Beginning salespeople are usually taught how to make out sales slips and use the cash register; they are also told about credit and other store policies.

Executive positions in large retail stores are often filled by promoting college graduates who were originally hired as trainees and assigned to sales jobs to gain practical experience. However, retail selling is one of the few fields in which an employee with initiative and ability may be selected for promotion, regardless of his education. Many stores offer good opportunities for persons without a college degree to advance to executive positions. Some salespersons advance to positions as buyers, department managers, or store managers; others, particularly in large stores, may be transferred to administrative positions in personnel, public relations, or other fields of work. Opportunities for advancement are more limited in small stores where one person, usually the owner, frequently performs most managerial functions. Sales experience in retail stores is often a valuable asset in qualifying for other sales jobs.

Employment Outlook

Thousands of job openings for salespersons—both full- and part-time—will occur each year throughout the rest of the 1960's. Some openings will be new jobs, mainly in the rapidly growing suburban areas of big cities. The greatest number of employment opportunities, however, will result from the need to replace salespeople who stop working or leave retailing to take other types of employment. Turnover is high in retail stores because many young people change employment after gaining some sales experience and many of the women in this work leave to marry or take care of families. In addition to full-time sales jobs, there will be many opportunities for temporary and part-time workers during peak selling periods such as before Christmas and during special sales.

Over the long run, the number of salespeople employed in retail stores is expected to rise moderately. More workers will be needed as the volume of sales increases with population growth. Particularly in metropolitan areas, where the trend is for stores to remain open for business 50 or more hours a week, more employees will be needed as the weekly hours worked by salespersons are further shortened.

Certain changes in the way goods are sold are likely to limit the number of new sales jobs and also affect the types of openings. Because self-service—already the rule in most food stores—is rapidly being extended to drug, variety, and other kinds of stores, customers will purchase more articles without the help of salespeople. On the other hand, rising income levels will probably increase the demand for some kinds of merchandise which usually require the salesperson to spend a good deal of time with each customer—for example, electrical appliances or automobiles which prospective customers want to see demonstrated. In view of these developments, it appears likely that sales employment will increase somewhat more slowly than the volume of sales. Little of the increase is likely to be in routine sales jobs; much of the demand will be for workers who are skilled in salesmanship and well informed about the merchandise they sell.

Sales workers have more stable employment than workers in many other occupations. When

retail sales are affected by downturns in the economy, employers—particularly in large stores—can reduce the number of employees by not filling vacancies that result from turnover, or they can eliminate some part-time jobs. Competition for sales jobs tends to increase when other jobs are scarce, however, because workers in other occupations can often qualify for sales work.

Earnings and Working Conditions

Many young people who start in routine jobs where they are required to do little more than “wait on” customers are paid \$1 an hour (the minimum wage required by law, in 1963, in many stores); in small stores, starting salaries are sometimes less than \$1 an hour. Many part-time workers are paid at the same rates as beginners. Experienced workers in jobs requiring skill in dealing with customers and those who must have technical knowledge of the merchandise they sell sometimes earn more than three times as much as beginners.

Many salespeople are paid on a straight salary basis, and some also receive commissions—that is, a percentage of the amount of sales they make. Others, including some of the highest paid, are on a straight commission basis. The highest earnings, often averaging \$150 or more a week, are received by persons who sell automobiles, major appliances, and furniture. In stores where customers can readily select from the merchandise on display, the earnings of sales workers are generally lower than in stores where salesmanship is important. Earnings are usually somewhat lower in rural than in metropolitan areas.

Salespersons in many retail stores are allowed to purchase merchandise at a discount, often from 10 to 20 percent below regular prices. This privilege is sometimes extended to the worker's family. Some stores, especially the large ones, pay all or

part of the cost of employee benefits such as life insurance, retirement, hospitalization, and surgical and medical insurance.

Some full-time salespersons work a 5-day, 40-hour week, although in many stores, the standard workweek is longer. Some stores are required by law to pay overtime rates for more than 44 hours' work a week. A few pay overtime after 40 hours a week. Since Saturday is a busy day in retailing, employees usually work that day and have another weekday off. Longer than normal hours may be scheduled before Christmas and during other peak periods, and employees who work overtime receive additional pay or an equal amount of time off during slack periods. Some salespersons regularly work one or more evenings a week, especially in stores in suburban shopping centers.

Part-time salespersons generally work during the store's peak hours of business—daytime rush hours, nights, and weekends.

Salespeople in retail trade usually work in clean, well-lighted places. Many stores are air conditioned. Some sales positions require work outside the store; for example, an automobile salesman may visit prospective customers at their homes and take them on demonstration rides.

Where To Go for More Information

Information on retailing courses given in high schools may be obtained from local Superintendents of Schools or Coordinators of Distributive Education, or from the State Supervisor of Distributive Education in the Department of Education at each State capital.

Information on careers in retailing may be obtained from local retailers' or merchants' associations or from:

Committee on Careers in Retailing, National Retail Merchants Association,
100 West 31st St., New York, N.Y., 10001.

Salesmen in Wholesale Trade

(D.O.T. 1-85. and 1-86.)

Nature of Work

Wholesale salesmen have an important part in the movement of goods from factory to consumer. They represent companies that assemble hundreds—sometimes thousands—of similar products and

thus enable retailers and other customers to purchase merchandise from one or a few nearby wholesale firms rather than from many widely scattered manufacturers. A wholesale drug company, for example, may stock its warehouse with

many brands of drugs, soap, and cosmetics to supply drug, variety, and other stores that sell to the consumer.

A wholesale salesman makes his sales by calling at regular intervals on retailers and buyers for industrial and commercial firms and institutions such as schools and hospitals. He shows them samples, pictures, or catalogs of the items his wholesaler stocks, and tries to convince them that they will profit by buying these products. The salesman seldom urges customers to purchase any particular item, since he may handle a very large number of items—as many as 50,000 if he works for a wholesaler of hardware or drugs. Rather, his objective is to persuade buyers to become regular customers of the wholesale firm he represents. His success depends on establishing a friendly personal relationship with his customers, and keeping them well supplied at all times and otherwise giving prompt and dependable service.

Wholesale salesmen may also render a variety of special services which are becoming an increasingly important part of their job. Retailers sometimes depend on them to check the store's stock and prepare orders for items which will be needed before the next visit. In addition, they often advise retailers how to advertise new products, what

prices to charge, and how best to arrange window and counter displays.

Salesmen are responsible for some paper and detail work. They must write orders and send them to the wholesale house, prepare expense accounts and reports, plan their work schedule, make appointments, compile lists of prospects, and study literature relating to the products they sell. Some salesmen also collect the money owed to their companies.

Where Employed

About a half million salespeople were working for wholesalers in 1960. Ninety-five percent of the total were men.

Wholesale houses are located mainly in cities, but the territories assigned to their salesmen may be in any part of the country. A salesman's territory may cover a small section of a city with many retail stores, or, in less populated regions, it may cover half a State or more.

Leading employers of wholesale salesmen are companies that sell food and food products. Other salesmen work for wholesalers dealing in drugs, electrical appliances, and other items for home use, or they sell products such as automotive equipment, machinery, or building materials for use by industrial and business firms.

Training, Other Qualifications, and Advancement

In hiring trainees for sales work, most wholesalers look for young men with friendly, outgoing personalities. Other traits helpful to salesmen include self-confidence, enthusiasm for the job, and an understanding of human nature. High school graduation is the usual educational requirement, although many companies selling technical and scientific products such as heating and air-conditioning equipment, medical supplies, and electronic equipment prefer men with specialized training beyond high school.

A young man may start in a nonselling job in a wholesale company and later apply for a sales job, or he may be hired directly as a sales trainee. In either case, the beginner must usually work in several kinds of nonselling jobs before being assigned as a salesman. He may begin in the stockroom or shipping department, where he becomes familiar with the thousands of items the wholesaler carries. Later, he may transfer to the pricing



Wholesale salesman gives pharmacist explanatory material on a new product

desk to learn prices of articles and discount rates for goods sold in quantities. Next, he is likely to be an order clerk, writing up orders that come from customers by telephone. In this job, and later as he accompanies an experienced salesman on his calls, the trainee becomes acquainted with many of the firm's customers. The amount of time spent in these initial jobs varies among companies; it usually takes 2 years or more to prepare the trainee for outside selling. Only after he has become familiar with the company's products and the proper techniques of selling is he assigned a small territory of his own.

Experienced salesmen with the necessary leadership qualities and sales ability may advance to supervisory and managerial jobs in the sales field or to other executive positions in wholesale firms.

Employment Outlook

Opportunities to enter work leading to wholesale selling jobs are expected to be good throughout the 1960's for high school and college graduates with the necessary qualifications. New positions will be created as the economy expands. As many as 10,000 additional job openings may occur each year because of the retirement or death of experienced salesmen. Openings will also arise as some workers transfer to other jobs; a considerable amount of turnover occurs among new entrants who fail to make good.

Over the long run, the number of wholesale salesmen is expected to rise at about the same rate as the labor force as a whole, because of population and economic growth and the increase in the volume of business transacted by wholesale houses. Competition for sales will continue to be keen, however, as more chain stores and other large businesses centralize their purchasing activities and the value of sales to individual customers becomes larger. Partly to meet this competition, many wholesalers are already providing a number of additional services to their customers. They will probably continue to emphasize special customer services; these services will occupy an increasing amount of the salesman's time.

Earnings and Working Conditions

Earnings of most junior or beginning salesmen in wholesale houses were between \$400 and \$500

a month in 1962. Experienced wholesale salesmen generally earn \$6,000 or more a year, the amount depending, in part, on the nature of the product sold. Many salesmen make considerably more than \$10,000 a year.

Most employers pay a straight commission—that is, a percentage of the dollar sales of each salesman; others pay a fixed salary plus commission. Practically all wholesale salesmen have steady year-round work; but their sales (and their commissions) vary from month to month because the demand for some things—for example, air-conditioning equipment or apparel—is greater during certain seasons than others. To cushion these fluctuations, it is becoming increasingly common for companies to pay their experienced salesmen a weekly or monthly “draw” against the commissions they can be expected to earn annually. This “draw” provides salesmen with a steady income, regardless of how sales fluctuate from one month to another. Most companies provide each salesman with a car, or an allowance if he uses his own car, and reimburse him for certain expenses on the road.

The salesman often works long, irregular hours. He calls on customers when they are open for business and, if his territory is large, he may travel at night or on weekends to meet his schedule. However, most salesmen are seldom away from their homes for more than a few days at a time. Many of their evenings may be spent writing reports and orders. Salesmen generally carry heavy catalogs and sample cases and are on their feet for long periods of time.

Most salesmen have paid vacations of from 2 to 4 weeks, depending on length of service with their employers. Some are covered by company benefit programs, including health and life insurance and retirement benefits.

Where To Go for More Information

Information on jobs in wholesale selling may be obtained directly from local wholesale houses or from associations of wholesalers in many of the larger cities. If no local association is available, write to:

National Association of Wholesalers,
1725 K St. NW., Washington, D.C., 20006.

Manufacturers' Salesmen

(D.O.T. 1-85. and 1-86.)

Nature of Work

Practically all manufacturers—whether they make airplanes or dolls, women's dresses, or nuts and bolts—employ salesmen to sell their products. Manufacturers' sales representatives sell mainly to other businesses—factories, railroads, banks, wholesalers, and retailers. Sales may also be made to hospitals, schools, and other institutions. The manner in which they go about making their sales and the types of buyers they deal with depend to a large extent on whether they are selling highly 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, chiefly to wholesalers, less often to big retail stores. Their job is to visit firms in their assigned territory, to introduce new products and sell established items. Sometimes, they promote the sale of their products by setting up displays in hotels and holding conferences with wholesale salesmen. Some manufacturers' salesmen—for example, those employed by drug manufacturers—call on physicians and other potential users to inform them about their companies' products and to distribute samples.

Salesmen of nontechnical products need a thorough knowledge of the items made by their companies and a sales approach adapted to these items. Thus, a salesman of crackers or cookies may emphasize the popularity of his manufacturer's products, the attractive way they are packaged, and the many kinds available. A clothing salesman, on the other hand, needs a knowledge of style, design, fabrics, and the details of apparel manufacture.

A salesman of highly technical products—electronic equipment or air-conditioning systems, for example—is often 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 and selecting new ma-

chinery or particular types of raw materials that will increase efficiency and profits. He presents his solution and tries to persuade officials—usually department heads or other executives—that the purchase would be a wise investment. Often, sales engineers work with the research and development departments of their own companies, devising ways to adapt products to a customer's particular needs. After the equipment is sold and installed, sales engineers sometimes train the customer's employees to operate and maintain it, and make frequent return visits to be sure that it is giving the desired service.

Although manufacturers' salesmen spend most of their time in visiting prospective customers, they also have to do some paperwork. They must 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 may also be required to write reports on the sales made and on sales prospects in an area, their competitors' products, and customers' credit ratings.

Where Employed

About 500,000 manufacturers' salesmen were employed in 1960, according to the Census of Population. Of these, approximately 35,000 were reported as sales engineers in manufacturing industries. Some manufacturers' salesmen work out of their company's "home office," often located at a manufacturing plant. The majority, however, work out of branch sales offices, which are usually 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. Other industries employing large numbers include printing and publishing and manufacturers of 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 are generally preferred for training as manufacturers' salesmen because most employers believe a college education is helpful in dealing with company officials. However, persons with little or no training beyond high school, who are exceptionally well qualified in other respects, can achieve successful careers as manufacturers' salesmen.

Manufacturers of nontechnical products often prefer persons with college degrees in liberal arts or business administration. Some training at a college of pharmacy is usually required for jobs as drug salesman. 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 engineering or chemistry graduates. (More detailed information on chemists, engineers, and others who may work as industrial salesmen is given in the statements on each of these professions. See index for page numbers.)

Although prospective salesmen can often get jobs by applying directly to sales offices of manufacturing concerns, many are recruited by manufacturers who send representatives to colleges to interview students who will soon graduate. Recruiters look for students who have the required academic qualifications and who also have participated in extracurricular activities. As salesmen must be able to meet and get along well with many types of people, recruiters also pay close attention to 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 or recommend applicants to his company. In many cases, several executives of a company interview applicants before final selections are made.

Most beginning salesmen are given some training before they start to sell. Some companies, especially those manufacturing complex technical products, have formal training programs which

may last 2 years or more. Some trainees may be rotated among jobs in several departments of the plant and office to learn all phases of production, installation, and distribution of the product; others receive formal instruction in classes at the plant, sometimes followed by intensive on-the-job training in a branch office under the supervision of field sales managers.

Sales representatives with good sales records and leadership ability may advance to higher positions, such as sales supervisor, branch manager, or district manager. Those with unusual ability and managerial skill may eventually move up 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 with companies to which they sell products. Some salesmen go into business for themselves as manufacturers' agents selling similar products of several manufacturers. Experienced salesmen can often find opportunities in advertising, market research, and other occupations related to selling.

Employment Outlook

Opportunities for manufacturers' salesmen are expected to be good throughout the 1960's. As competition in promoting the sale of products is expected to be keen, many manufacturers will expand their sales forces. Replacement needs will also account for a large number of job opportunities; retirements and deaths alone will probably create about 10,000 openings each year. Nevertheless, manufacturers are likely to be selective in hiring. For the most part, they will look for the "self-starter"—the person with ambition to succeed and the initiative to plan and manage his own work.

Over the long run, population and economic growth and rising living standards can be expected to create a demand for more products and for new kinds of products. Manufacturers, competing to get new and improved goods on the market, will continue to place more emphasis on sales activities. The number of manufacturers' salesmen

employed will therefore rise considerably. Technically trained men who are able to sell complex industrial equipment are likely to continue to be in particular demand.

Earnings and Working Conditions

According to a private survey, many large and medium-size companies were recruiting 1963 college graduates with the bachelor's degree at \$450 to \$500 a month. For positions requiring a degree in engineering, starting salaries ranged from \$550 to \$600 a month. Salaries in small companies are somewhat below these levels. The aircraft and automotive industries and manufacturers of electrical machinery and equipment generally pay the highest starting salaries. Beginners without college degrees usually start in lower-paid nonselling jobs but may be given training at company expense to prepare them for sales work.

Some manufacturing concerns pay their salesmen a straight commission, based on the dollar amount of sales made; others pay a fixed salary without regard to the amount of sales; the majority, however, use a combination of these two plans. The amount earned through commissions varies according to the salesman's ability, percent of commission, geographic location, nature of products sold, types of customers, and other factors. It is difficult, therefore, to express the earnings of experienced salesmen in terms of averages. Many manufacturers' salesmen earn \$10,000 or

more a year; a few—particularly in the technical field—earn several times this figure.

Some manufacturers' salesmen have large territories and do considerable traveling. Others work mostly 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 has to be away from home for days or weeks at a time. On the other hand, a salesman of food products may work within such a small area that he can return home each evening.

Salesmen are usually reimbursed for their expenses when away from home on business trips. Some of the items which may be included in expense accounts are transportation costs, hotel bills, meals, tips, customer entertainment, telephone calls, and stenographic services. Some companies either provide a car or pay an allowance to salesmen who use their own cars.

Salesmen have no standard working hours. They make calls at the time most convenient to their customers, and, in order to meet their schedules, often have to travel at night or on weekends. Frequently, they spend evening hours writing reports, planning itineraries, and scheduling appointments. In most cases, however, they may plan their work schedules so they can take time off when they want it. Most salesmen have 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.

Life Insurance Agents

(D.O.T. 1-57.10)

Nature of Work

Life insurance agents, or salesmen, sell policies that provide life insurance, retirement income, and related financial protection. Many agents also sell health or other types of insurance. Because they may be required to judge insurance risks on some policies, agents are often referred to as life underwriters.

An agent spends most of his time discussing different types of insurance policies with prospective customers. Some time is spent planning insurance programs that are especially tailored to prospects' needs, preparing reports, maintaining records, and doing other office work. The agent

may also arrange for the physical examination usually required when clients take out life insurance, assist policyholders with benefit claims and changes in insurance coverage or beneficiaries, and perform other services. Agents who sell "industrial" life insurance (small policies on which the premiums are paid weekly or monthly) also collect the premiums.

An agent's success depends on his sales, and he must use initiative in locating new prospects. The people he meets in his business and social contacts, new residents in his community, and high school or college graduates entering the labor force are potential clients. Clients who have re-



Life insurance agent explains policy terms to clients

cently purchased a new home or had a birth in the family or an increase in income also provide possibilities for sales.

(The chapter on Occupations in the Insurance Business gives additional information on insurance workers and the insurance business. See index for page number.)

Where Employed

More than 200,000 agents and brokers were engaged primarily in selling life insurance in 1962, according to a privately sponsored survey. Nearly all were men. In addition, thousands of agents who sold other types of policies also sold some life insurance, and many other people sold on a part-time basis.

Most life insurance agents represent a single company. Depending on the company's sales organization, the agent may work in one of its district offices or in a general agency which represents it in a specific locality. Life insurance agency offices are scattered throughout the country, but the greatest number of agents are employed in large centers of population.

Training, Other Qualifications, and Advancement

Although employers seldom specify age or formal educational requirements, practically all of the agents hired in recent years have been at least 21 years of age, and most have had some college training. Many are college graduates. College courses helpful to the future agent include economics, business law, sociology, and psychology, as well as courses in insurance subjects.

A successful life insurance agent wins the confidence and commands the respect of his clients. He must be able to explain in nontechnical language the different types of protection afforded by the policies he sells, and to balance each client's financial resources against his insurance needs in order to assist him in making a wise decision about the policy he purchases. Sales ability is also important. Some skill in salesmanship can be acquired from experience and from classroom courses in such subjects as sales techniques. Most, however, comes from natural aptitude—a capacity for meeting and talking easily with strangers, and a cheerful, buoyant personality, self confidence, and enthusiasm for the job.

An agent must obtain a license in each State where he sells insurance and, in applying for the license, be sponsored by the company he represents. The company usually pays for the license. Most States issue licenses only to applicants who pass written examinations covering life insurance fundamentals and State insurance laws; a few issue licenses, without examination, on the basis of the sponsoring company's statement concerning the applicant's place of residence and character.

Young people interested in becoming agents should apply to agencies in their own communities or write the home offices of insurance companies. They are usually interviewed personally and often also take tests to determine their aptitude for selling insurance. Most companies provide on-the-job training for beginners. Some sponsor classes in sales problems and insurance principles, which are held for a period of several weeks or a few months; others assign beginners to sell jointly with supervisors or experienced agents for a brief period.

Agents may broaden their knowledge of life insurance by taking intermediate and advanced training which is available at many colleges and universities and at institutes, conferences, and seminars sponsored by insurance organizations. By taking college-level courses, an agent who has a high school education or its equivalent, plus at least 3 years of insurance experience, may prepare for examinations which qualify him for membership in the American Society of Chartered Life Underwriters and for the designation Chartered Life Underwriter (CLU)—a recognized mark of attainment. The CLU examinations test the

agent's ability to apply to insurance problems his knowledge of life insurance fundamentals, economics, business law, taxation, trusts, and finance.

A life insurance agent who demonstrates sales ability and leadership qualities may be promoted to assistant manager or manager of an agency office. A few agency managers advance eventually to regional supervisor of a group of agencies or to a home office position such as superintendent of agencies or vice president or president of the company. Many agents who have built up a good clientele prefer to continue selling because they like the work, however. Some go into business for themselves as general agents.

Employment Outlook

Employment opportunities for life insurance agents are expected to be good throughout the 1960's. Several thousand job openings can be expected each year, owing to death and retirement alone. Others will occur because turnover among beginners is high and many new agents will be needed to replace those who leave their jobs to enter other kinds of work. Also, some new positions will be created by population and economic growth. Opportunities will be particularly numerous in areas with rapidly growing populations. The great majority of these openings will be filled by men.

Over the long run, the number of life insurance agents will probably rise at a rapid rate. Contributing to this rise will be larger personal incomes and the increase in population—particularly in the number of people under 35, the group most likely to purchase life insurance. Many agents will be needed, also, as life insurance companies increase the types of policies sold, especially individual and family health insurance. Also, as more people recognize the likelihood of their living well past the age of retirement, the sale of annuity policies which pay retirement income will increase. Although it is likely that an increasing number of individuals will participate in group insurance plans, which require the services of fewer agents relative to the number of individuals covered, sales of individual policies are expected to continue to rise.

The further expansion of group life insurance, as well as increasing social security benefits, will

continue to make the agent's job more complex, because these forms of protection must be considered in planning financial protection for an individual or a family.

Earnings and Working Conditions

A beginning agent is usually guaranteed a moderate salary for the first year or two while he is building up a clientele. Thereafter, earnings are based on a percentage of the premiums paid by the clients to whom the agent sells policies. On newly sold policies, the commission is a relatively large percentage of the premium. On policy renewals, agents receive smaller commissions each year for several years and, subsequently, still smaller annual service fees. As renewal commissions and service fees build up over a period of years, an agent's total income increases even if his sales of new policies remain about the same each year. After 4 or 5 years, a life insurance agent may earn from \$7,500 to \$10,000 a year; eventually, a highly successful agent may earn as much as \$25,000 or more. In many companies, agents may participate in group life and health insurance and retirement plans.

Agents make several calls a day and often use a car in their work. They usually pay their own automobile expenses. Although agents are usually free to arrange their own hours of work, their appointments must often be scheduled during evenings and weekends for the convenience of clients. Successful agents usually spend more than the customary 40 hours a week on the job.

Where To Go for More Information

General information on employment opportunities may be obtained from personnel directors of life insurance companies and local organizations of life insurance agents. Information on State licensing requirements may be obtained from the department of insurance at any State capital. Additional information about the work of life insurance agents is also available from:

Institute of Life Insurance,
488 Madison Ave., New York, N.Y., 10022.
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.

Property and Casualty Insurance Agents and Brokers

(D.O.T. 1-57.10)

Nature of Work

Property and casualty insurance agents and brokers sell policies which help individuals and companies cover expenses and losses from fire, burglary, traffic accidents, hurricanes, and many other emergencies. They can insure almost any kind of property or personal possession against loss or damage, whether it be a factory, an ocean liner, or a valuable piece of jewelry. They also write policies to cover costs when policyholders are injured or are legally responsible for injuries received by other people. Agents and brokers are sometimes called property and casualty insurance underwriters.

An agent selling property and casualty insurance usually works under contract as the authorized representative of several insurance companies—less frequently of only one company—and he writes each policy he sells in accordance with company requirements. A broker, on the other hand, is not under contract to any particular company. He does not write the policies he sells but orders them, either directly or through an agent, from the insurance company he feels can best meet his clients' needs. In other respects, agents and brokers do much the same kind of work. They sell the same types of insurance, collect premiums from policyholders, attend to renewals and changes in policy coverage, and assist their clients in getting claims settled. They may supervise the work of salesmen (or solicitors), whom they employ to sell insurance.

Because most agents and brokers sell several kinds of policies, they must have a knowledge of many lines of property and casualty insurance. Some specialize in only one general type such as homeowners' policies, or automobile insurance. Practically all of these salesmen, including those who specialize, must know about the protection provided against many kinds of risks; for example, an agent may sell an owner of a home or industrial plant one policy insuring him against losses caused by such different hazards as fire, burglary, explosion, and windstorm. And most automobile insurance covers, in a single policy, financial losses from theft, collision, injury to other people, and damage to other people's prop-

erty. For each type of risk, brokers and agents must be well informed about the precise differences in the protection offered by each company they represent.

Agents and brokers spend a great deal of their time explaining policy terms to prospects and evaluating insurance needs. They need a thorough understanding of insurance fundamentals, as well as ability to establish sound personal relationships with their clients, many of whom seek advice as well as information about insurance requirements.

Agents and brokers also do a certain amount of office work related to their sales activities. A part of each day is usually spent scheduling calls, working out the details of insurance programs for clients, and making sure that policies are properly written and delivered to clients. Agents also draw up lists of prospects, keep up to date on changes which might affect their clients' insurance needs, and try to assist their policyholders in any way possible.

(The chapter on Occupations in the Insurance Business gives additional information on the casualty insurance business. See index for page number.)

Where Employed

In 1962, an estimated 150,000 agents and brokers were engaged primarily in selling property and casualty insurance. The agencies and brokerage firms for which they work do business in every section of the country, but are concentrated in the large metropolitan areas. Many operate on a small scale as one-man organizations or as partnerships. Others are local sales offices of large brokerage firms that employ hundreds of people throughout the country.

Training, Other Qualifications, and Advancement

All agents and most brokers must obtain licenses in the States where they sell insurance. Two-thirds of the States require an agent to pass a written examination which usually covers the insurance laws of the State and property and casualty insurance fundamentals. To be eligible for the licensing examination in some States, an

applicant must meet certain educational requirements in the field of insurance. States not requiring examinations generally issue licenses upon receipt of statements concerning the agent's residence and character.

Large agencies and brokerage firms often prefer to hire new salesmen who are college graduates or have had some college training. Such beginners—especially those who have taken courses in insurance or have a general background in accounting, economics, and business law—are usually quicker to grasp insurance fundamentals and acquire an understanding of the property and casualty field.

Before they start selling, new agents usually receive training, either at insurance company home offices or at the agencies and brokerage firms where they will be working. In some cases, the training is in the form of on-the-job supervision; in others, it is given in formally organized training programs. Other basic training in the fundamentals of property and casualty insurance and their practical application is offered through the Insurance Institute of America. Certificates are issued to those who pass Institute examinations.

Opportunity for advanced study leading to the designation Chartered Property Casualty Underwriter (CPCU) is available through a program offered by the American Institute for Property and Liability Underwriters, Inc. Under this program, salesmen and other insurance company employees may study at home or in classes conducted by colleges, insurance societies, and company groups; those who pass five written examinations and meet certain other requirements related to experience and training qualify for the CPCU designation—a recognized mark of attainment.

Many experienced agents establish their own agencies or brokerage firms. Others transfer to supervisory positions in district or home offices of insurance companies. However, many successful agents prefer to remain in selling.

Among the characteristics which are especially helpful to agents and brokers are ease in meeting and conversing with people and the ability to explain insurance matters simply and clearly. Since agents and brokers are largely responsible for planning their own work, they must also be willing to take the initiative in locating prospects for sales and in giving service to policyholders.

Employment Outlook

Several thousand openings for property and casualty insurance agents and brokers are anticipated annually throughout the rest of the 1960 decade. Many will be new positions created to meet the growing needs of individuals and business firms for this type of insurance. Other openings will arise because of the need to replace agents and brokers who retire or leave the field for other reasons.

The number of people working as agents and brokers is likely to increase fairly rapidly in the long run, as the population grows and business expands. Since most businessmen and other policyholders budget insurance as a necessary expense, every expansion in industrial plant or equipment, and every purchase of a home, automobile, or other expensive item represents a potential sale of insurance. Continued extension of laws such as workmen's compensation and automobile liability will also create a larger insurance market. Although employment prospects are generally favorable because of the anticipated increase in the number of policies issued, competition for sales—always keen in the insurance field—will continue to be strong.

Earnings and Working Conditions

New salesmen are usually paid moderate salaries while they learn the business. After they become established, however, commissions are their major source of income. An agent's earnings, therefore, depend largely on his ability to find prospective clients and make sales. After a few years, when he has built up a clientele, his commissions may total from \$5,000 to \$10,000 annually. Highly successful agents and brokers earn substantially more.

The agent or broker who owns his business must pay operating expenses, like any other independent businessman. Major items are usually rent and clerical salaries, which vary with the size and location of the agency. Agents and brokers generally pay their own automobile and other transportation expenses. Although agents and brokers are free to some extent to arrange their own working schedules, they often find it necessary to work long hours, including evenings and weekends, to meet the convenience of clients.

Where To Go for More Information

Information on employment opportunities may be obtained from most property and casualty insurance companies and local agencies. Information about State licensing requirements may be obtained from the department of insurance at any State capital.

Further information on property and casualty insurance occupations is available 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.

Information concerning training in the fundamentals of property and casualty insurance is available from:

The Insurance Institute of America, Inc.,
270 Bryn Mawr Ave., Bryn Mawr, Pa., 19010.

Real Estate Salesmen and Brokers

(D.O.T. 1-63.10 and .20)

Nature of Work

The real estate salesman or broker—also called real estate agent—is at the center of most property transactions. He represents property owners who want to sell and finds potential buyers for homes and business properties.

Salesmen are employed by brokers to show and sell real estate; a few handle rental properties. Brokers are independent businessmen who not only sell real estate but sometimes rent and manage properties, make appraisals, arrange for loans to finance purchases, and develop new building projects. Some brokers combine real estate with insurance work. In addition, brokers manage their offices, advertise properties, and do other things necessary to run their businesses.

Most real estate salesmen and brokers sell residential property, sometimes specializing in homes within a certain price range or in a particular area of a city. A few, usually those in large real estate firms, handle multimillion dollar hotels, giant office buildings, and other extremely valuable commercial properties. Still other brokers and salesmen specialize in farm properties or unimproved land.

Because a real estate purchase is a large investment, most people buy only after careful investigation and deliberation. For this reason, a salesman must spend much time away from his office showing and discussing properties with prospective buyers. In answering questions, he emphasizes those selling points which are likely to be most important to each buyer. To a housewife looking at a house, for example, he may point out the convenient floor plan and the fact that schools and shopping centers are close by; to her husband,

he may emphasize the soundness of the construction and the attractive financing arrangements available. He must be familiar with tax rates, zoning regulations, and insurance needs. It is important that he try to meet the buyer's needs and preferences and, at the same time, follow the seller's instructions. When bargaining on price is necessary, the salesman or broker must be a skilled negotiator who considers both the buyer's and the seller's interests. In the closing stages of the sale, the real estate salesman or broker often arranges for a loan, a title search, and the meeting at which the new owner finally takes possession of the property.

Real estate salesmen and brokers usually spend some of their time checking listings of properties for sale or rent and making telephone calls to prospective clients. They may also answer telephone inquiries about properties, arrange appoint-



Real estate salesman shows home to prospective buyers

ments to show real estate, and keep records on properties sold.

Where Employed

In 1960, almost 200,000 people were working as real estate salesmen and brokers, according to the Census of Population. Slightly more than three-fourths were men. Many additional thousands of people sell real estate occasionally. In 1962, the total number of men and women licensed to sell real estate was about 700,000.

Most real estate salesmen and brokers work in small business establishments; a few, in metropolitan centers, are employed in large firms with many salesmen. Salesmen and brokers are found in every part of the country, but are concentrated in large urban areas and in smaller rapidly growing communities.

Training, Other Qualifications, and Advancement

A license is required for work as a real estate salesman or broker in every State and in the District of Columbia. Most States require prospective agents to pass written examinations which generally include questions on the State license law and fundamentals of real estate transactions. The examination is more comprehensive for brokers than for salesmen. In more than one-fourth of the States, candidates for the broker's license must also have a specified amount of experience as a real estate salesman (generally from 1 to 3 years); in some States, college credits in real estate courses may be substituted for experience. State licenses usually can be renewed annually without reexamination. Real estate agents who move to another State must generally qualify under the licensing law of that State.

Although a specified amount of education is seldom required, employers prefer to hire persons who have at least a high school education. Important factors necessary for success in selling real estate include enthusiasm for the job, maturity, integrity, and tact and patience in dealing with prospective customers. Agents must also have an understanding of their customers' problems and an ability to gain their confidence.

Young men and women interested in beginning jobs as real estate salesmen often apply to brokers in their own communities, where they can use to

advantage their knowledge of local neighborhoods. The beginner usually works under the direction of an experienced salesman or broker while he learns the practical aspects of selling.

Training opportunities are available for both beginners and experienced agents. A number of colleges offer one or more courses in real estate and, at some, a student can earn the bachelor's degree with a major in real estate; a few offer advanced degrees. Many local real estate boards which are members of the National Association of Real Estate Boards (NAREB) sponsor courses in subjects such as real estate fundamentals, principles, and practices; real estate law; and real estate financing. Advanced courses in appraisal, mortgage financing, and property development and management are also available through local real estate boards and NAREB affiliates such as the American Institute of Real Estate Appraisers.

Salesmen with experience and training can advance in many ways. Those who become licensed brokers may open their own offices. Training in the methods used in estimating the value of property can lead to work as a real estate appraiser. Persons familiar with the problems of operating and maintaining rental properties may specialize in property management. Those who gain a wide general experience in real estate and a thorough knowledge of business conditions and property values in their localities may enter the field of mortgage financing or real estate counseling.

A member of the NAREB may use the term "Realtor," and this designation has prestige value in the real estate field. Qualified persons may become members of the American Institute of Real Estate Appraisers, the Institute of Real Estate Management, and the National Institute of Farm Brokers (all affiliated with the NAREB). Such membership indicates recognition in specialized fields.

Employment Outlook

Many opportunities to enter the real estate field are expected each year during the remainder of the 1960's. Some will be new positions created to fill the need for more salesmen to serve a growing population. The majority, however, will be openings resulting from turnover. The average age of real estate salesmen and brokers is considerably higher than that of workers in most occupations,

and death and retirement rates are high. In addition, a relatively large number of agents transfer to other types of work.

Most of the jobs that become available will be for men. Women, however, are finding increasing opportunities in real estate, because of their familiarity with home features of special interest to housewives, who share decisions on home purchases. Many openings are likely to be filled by mature workers, including retired persons and persons who transfer from other kinds of sales work. The proportion of part-time salesmen is expected to decline, as State licensing requirements change and more specialized knowledge is required of the agent who handles real estate transactions in urban areas.

Employment of real estate salesmen and brokers is expected to accelerate during the early 1970's when the many young people born shortly after World War II will be establishing their own homes. Among the factors contributing to a growing need for agents in the long run are: The expected expansion in residential and commercial construction due to the increase in population and economic activity, migration to metropolitan areas, and urban renewal. Therefore, although this field is likely to remain highly competitive, persons with an aptitude for selling real estate will find that it offers many career opportunities in the future.

Earnings and Working Conditions

Commissions on sales are the only source of earnings for most real estate salesmen and brokers. The usual commission on the sale of a moderately priced home was 5 percent in 1962, although 6 percent was being paid in a growing number of localities. Thus, the sale of a house for \$20,000 brings a commission of \$1,000 to \$1,200. When the broker makes a sale, he receives the full commission. When a salesman employed by a broker or real estate firm makes a sale, however, he usually receives only a portion of the commission—often half—and his employer receives the rest.

Most full-time real estate agents earn between \$5,000 and \$10,000 a year, according to the limited data available. Beginners usually earn less. At the other extreme, there are many experienced salesmen with yearly incomes of \$20,000 or more.

Income usually increases as an agent gains experience, but earnings are also affected by individual ability, type of property sold, geographic location, economic conditions, and other factors. Those who are active in community organizations and on local real estate boards can broaden their contacts and, as a result, may increase their earnings. Earnings, especially for beginning salesmen, are often irregular; a few weeks or even months may go by without a sale, and then several sales may be made close together. Therefore, the beginner should have enough money to support himself until his income from commissions becomes large enough to meet his living expenses.

Salesmen are provided with office space by the brokers for whom they work. They are expected to furnish their own automobiles. Although salesmen and brokers have much independence in planning their working schedules, it is often necessary for them to work evenings and weekends because of the nature of the work and the need to meet the convenience of customers.

Where To Go for More Information

Information on licensing requirements for real estate salesmen and brokers is available from the Real Estate Commission or Board located in each State capital. This information can also be obtained from most local real estate organizations. Many States can furnish manuals which help applicants prepare for the required written examinations.

Additional information on opportunities in the real estate field, and a list of colleges and universities offering real estate courses may be obtained by writing to:

Department of Education, National Association of
Real Estate Boards,
36 South Wabash Ave., Chicago, Ill., 60603.

Service Occupations

Workers in this occupational group provide services that add to people's comfort and enjoyment and protect lives and property. Early in 1963, about 1 in every 8 workers, or almost 9 million people, were in service occupations.

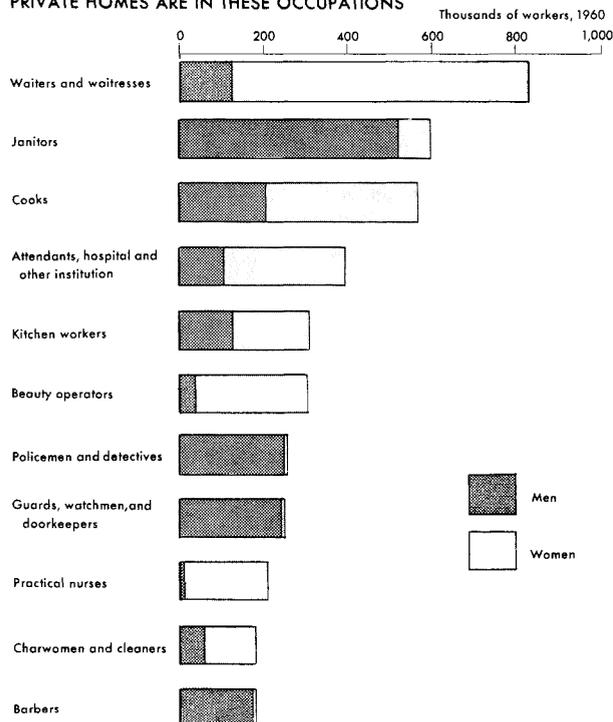
About one-fourth of all service workers are employed in private households, performing tasks which are familiar to all homemakers. These domestic service workers prepare and serve meals, make beds, do cleaning and laundering, and take care of children. Almost 2.5 million people do this kind of work. An exceptionally high proportion are women—97 out of every 100. The proportion of part-time workers is also high. About two-thirds of all private household workers are day-workers, babysitters, and others who work less than 35 hours a week.

The remaining service occupations employ more than 6.5 million people, practically all of whom work outside private homes. About one-fourth are part-time workers. More than one-third of all service workers employed outside private homes are cooks, waiters, and others who prepare and serve meals and beverages in restaurants, hotels, and other eating places. Among the remainder are firemen, policemen, and others who protect life and property; elevator operators, janitors, and other building service and custodial workers; personal service workers such as barbers and beauty operators; and practical nurses, hospital attendants, and similar workers. In some of these occupations, such as practical nurse, women predominate; in others, such as fireman, practically all workers are men. Among all types of service workers employed outside private homes, however, women slightly outnumber men. The largest of these occupations are shown in chart 23.

Service workers are employed in every city and village in the Nation. Hospital attendants, maids, bellmen and other hotel service employees, and ushers and attendants at theatres and other places of amusement are found chiefly in the larger towns and cities, however.

CHART 23

THREE-FOURTHS OF ALL SERVICE WORKERS EMPLOYED OUTSIDE PRIVATE HOMES ARE IN THESE OCCUPATIONS



Source: U.S. Bureau of the Census.

Training, Other Qualifications, and Advancement

Training and skill requirements vary greatly by type of service occupation. Some, such as FBI agent, require a college education; others, such as barber and beauty operator, require specific vocational training. For still others—elevator operator, for example—there are usually no stated educational requirements. However, a good education is always an advantage, even in occupations for which employers seldom require specialized training or extensive formal schooling. For example, both boys and girls will find high-school home economics courses useful in preparing for many kinds of work in hospitals, restaurants, and private homes.

For many service occupations, special personality traits and abilities may be fully as important as formal schooling. For example, porters, life guards, and window cleaners must have physical strength and endurance, and a pleasing manner and appearance are especially desirable in such occupations as elevator operator, waitress, and theater usher. Other service workers, such as store and hotel detectives and travel guides, should possess good judgment and ingenuity and be particularly good in dealing with people.

Some service workers eventually go into business for themselves—as caterers, for example, or proprietors of barber or beauty shops. Others, such as elevator operators and ushers, may work up to supervisory positions. Advancement may be difficult, however, for those who fail to make the most of their opportunities to acquire a basic education and a knowledge of the business in which they are employed.

Employment Trends and Outlook

During the 50-year period 1910 to 1960, the number of workers in service occupations increased much faster than the labor force as a whole. All of the increase was among service workers employed outside private homes. In 1960, the number of people in such jobs was three times the number 50 years earlier, while the number of workers in private households was slightly less than in 1910. Chart 24 shows how employment in private households has fluctuated during this 50-year period, whereas employment in other service occupations has risen steadily.

Employment in service occupations is expected to rise during the rest of the 1960's and early 1970's even more rapidly than in the past. By 1970, the total will probably be almost 3 million more than in 1960 and, by 1975, another 1.5 million may be added. As the total rises, different occupations within the service group are likely to be affected quite differently—some growing rapidly, others moderately, and a few decreasing in size.

Most of the employment increase during the next decade is expected to be among policemen and certain other protective service workers; attendants in hospitals and in businesses rendering other professional and personal services; practical nurses; beauty operators; cooks, waiters, and others who prepare and serve meals outside pri-

CHART 24

EMPLOYMENT HAS --
 Changed little for private household workers
 Risen steadily for workers in other service occupations



Source: U.S. Bureau of the Census.

vate homes; and janitors, caretakers, and building cleaners. Practically all of these large occupations are expected to grow rapidly. Some of the factors responsible for their growth are the added medical care and service resulting from the increase in population and especially in the number of older people; the greater need to protect life and property as urbanization continues and cities become more crowded; and the more frequent use of restaurants, beauty parlors, and other services by families and individuals as income levels rise and as an increasing number of housewives take jobs outside the home.

Little, if any, of the anticipated employment increase during the next decade is likely to be among workers employed full time in private homes or in some comparatively small service occupations outside private homes. New products and equipment are likely to continue to limit the number of workers needed in some service occupations. For example, frozen foods, drip-dry textiles, and garbage disposal units each reduce the time that must be spent and the number of workers required for certain household tasks. Similarly,

because of television, motion pictures are no longer viewed exclusively in theaters and, because of electromechanical equipment, more and more elevators are operated automatically by passengers; thus, the occupations of theater usher and elevator operator have been added to porter, bowl-

ing alley pinboy, bootblack, and a few other occupations which are declining in size. However, the number of service jobs eliminated as these occupations decline is expected to be far fewer than the number of new jobs created as other occupations in this group expand.

PROTECTIVE SERVICE OCCUPATIONS

More than three-quarters of a million civilian workers in the United States are employed in jobs that protect life and property. About 95 percent of these workers are men.

Policemen and detectives are the largest group of protective service workers—well over one-third of the total number. Most policemen and detectives are government employees, but some work for hotels, stores, and other companies, or as private detectives. Guards and watchmen, the second largest group of protective service workers, are employed chiefly by private companies to protect their property and enforce company rules and regulations; some guards and watchmen are employed in jails and other government buildings. Firemen, who work mainly for city governments, are the third largest group. The remaining protective service workers—less than a tenth of the total number—are sheriffs and bailiffs, crossing watchmen and bridge tenders, and marshals and constables.

The number of protective service workers in the United States has increased almost twice as fast as the population, during the past 50 years, owing partly to the increasing proportion of people living in cities where police, firefighting, and other protective services are especially needed. In 1910, there was only 1 protective service worker

for every 450 persons in the United States. By 1960, the ratio had nearly doubled—about 1 for every 235 persons. The need for protective service workers will probably continue to increase faster than the population. In addition to the new jobs created by this need, many thousands of vacancies will occur each year as protective service workers retire, die, or transfer to other occupations.

The rate of growth expected for the various protective service occupations differs greatly. One of the fastest growing groups is policemen and detectives. A second, but much smaller group, made up of bridge tenders, tollgate keepers, school crossing guards, and related workers, more than doubled in size during the 1950's and is expected to continue to grow very rapidly. On the other hand, the large group consisting of building guards, watchmen, and doorkeepers—which has grown comparatively slowly during recent years—is likely to remain one of the slowest growing.

The employment outlook for FBI agents, and for firemen and policemen employed by municipal governments—three protective service occupations which offer many career opportunities for young people—is described in the statements which follow.

FBI Agents

(D.O.T. 2-66.99)

Nature of Work

Federal Bureau of Investigation (FBI) agents investigate many types of violations of Federal laws, such as bank robberies, kidnappings, frauds against the Government, thefts of Government property, and cases of espionage or sabotage. The

FBI, which is part of the U.S. Department of Justice, has jurisdiction over 168 Federal investigative matters. Agents may be assigned to any type of case, but those with 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 agents function strictly as investigators. To perform their duties, agents may interview people, observe the activities of suspects, make arrests, and participate in raids. Because of the highly confidential nature of the FBI's work, agents may not disclose to unauthorized persons, including members of their family, any of the information which they gather in the course of their official duties. 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, agents work alone but must maintain continual contact with their superiors by radio or telephone. For potentially dangerous duties, such as arrests and raids, two or more agents are assigned to work together.

Where Employed

Most of the approximately 6,000 agents in early 1963 were assigned to the FBI's 55 field offices located throughout the Nation and in Puerto Rico. These agents work either in the city of the field office headquarters 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.

Training, Other Qualifications, and Advancement

To be eligible for appointment as an FBI agent, an applicant must have graduated from a State-accredited resident law school or a 4-year resident accounting school. The law school training must have been preceded by at least 2 years of resident undergraduate college work. Accounting graduates must also have had at least 3 years of experience in accounting or auditing or a combination of both.

Applicants for the position of FBI agent must be male citizens of the United States, at least 23 and not more than 40 years of age, and willing to serve anywhere in the United States or Puerto



Courtesy of Federal Bureau of Investigation

FBI agent fires Thompson machine gun

Rico. They must be at least 5 feet 7 inches tall and capable of strenuous physical exertion, and they must have unimpaired hearing, very good vision, normal color perception, and no physical defects which would prevent their using firearms or participating in dangerous assignments. Each applicant must pass a rigid physical examination, as well as written and oral examinations testing his knowledge of law or accounting and his aptitude for meeting the public and conducting investigations. All of the tests except the physical examination are given by the FBI at its facilities. Exhaustive background and character investigations are made of all applicants. Appointments are made on a probationary basis and become permanent after 1 year of satisfactory service.

Each newly appointed agent is given 14 weeks of training before he is assigned to a field office. He receives most of this training at FBI headquarters at Washington, D.C., and the rest at the FBI Academy at the U.S. Marine Corps Base in Quantico, Va. During this period, he is taught defensive tactics and becomes familiar with Federal criminal law and procedures, FBI rules and regulations, investigative work, fingerprinting, and firearms normally used by the FBI. After assignment to a field office, the new agent usually works closely with an experienced agent for a period of about 2 weeks before handling any assignments independently.

All higher grade positions are filled from within the ranks of FBI agents. It is possible, therefore, for an experienced agent to advance to more re-

sponsible administrative and supervisory positions such as field supervisor, agent in charge of a field office, and inspector.

Employment Outlook

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 agent.

Earnings and Working Conditions

The entrance salary for FBI agents was \$7,290 in early 1963. This was somewhat higher than the usual annual starting salary for college graduates entering employment in other Federal agencies. FBI 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 agents was \$14,070 in early 1963. Agents in supervisory and administrative positions received higher salaries.

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 of approximately \$1,020 a year. They are granted paid vacations and sick leave and annuities on retirement. Some aspects of the FBI agent's work are adventurous; he travels frequently and meets all kinds of people. The work is potentially dangerous and involves a great deal of responsibility.

Where To Go for More Information

The Federal Bureau of Investigation,
U.S. Department of Justice, Washington, D.C., 20535.

Firemen

(D.O.T. 2-63.)

Nature of Work

Firefighters in city and town fire departments protect life and property from fire—whether it be a smoldering trash fire that can be brought under control with a hand fire extinguisher, or a spectacular waterfront blaze requiring equipment from several fire companies. For many thousands of firemen in towns and cities, the job is full time; this statement is concerned principally with the work of such firemen.

During their hours on duty at the fire station, firemen must be prepared, at a moment's notice, to go to a fire and handle whatever emergency they find when they arrive. Because firefighting is sometimes very dangerous and complicated, it must be well organized. The scene of a large fire may appear to be one of confusion, with firemen working at a feverish pace amidst hundreds of feet of hose and many firetrucks and other equipment. Nevertheless, each truckdriver, hoseman, ladderman, and other firefighter is performing specific duties assigned by a commanding officer, and, depending on the judgment of the officer in charge, any fireman's assigned duties may be



Hosemen direct streams of water on fire

changed at any time while the company is in action. For example, a fireman directing a stream of water at flames may be reassigned to help carry people to safety and administer first aid. After a fire is put out, firemen carefully inspect the premises to make sure no further danger

exists, and sometimes remain at the scene on standby watch to guard against any further outbreak of fire.

Another important responsibility of city fire departments is fire prevention. In big departments, specially trained personnel do some kinds of fire prevention work, but in most cities regular firemen perform practically all of this work. They inspect factories, theatres, and other public buildings for conditions that might cause fire and for compliance with local regulations relating to fire escapes, fire doors, storage of flammable materials, and other possible hazards. Educating the public about fire prevention and safety measures is also a part of their job. Sometimes they speak on this subject before school assemblies and civic groups and, in many communities, they inspect private homes in an effort to prevent fires by pointing out possible hazards to homeowners.

Between alarms, firefighters spend much time at their local stations improving their knowledge of firefighting and doing maintenance work. They participate in practice drills, clean and lubricate firefighting equipment, stretch hoses to dry, stand watch at fire alarm instruments, and verify and record alarms. They may also study fire manuals and textbooks in order to prepare for promotional examinations. Some firemen, who are on duty at the station for 24 hours at a time, take turns performing various housekeeping duties such as mopping floors or making beds.

Where Employed

An estimated 125,000 to 150,000 full-time firefighters were employed in 1962 by city fire departments. In addition, thousands of part-time volunteer firemen and paid "call men" are organized in small towns and rural communities to help fight fires whenever their services may be needed. A few very large cities have several thousands of firemen, while many small cities have fewer than 25.

Training, Other Qualifications, and Advancement

To become eligible for appointment as a fireman, young men generally have to pass written intelligence tests, rigid physical examinations, and athletic performance tests (running, climbing, etc.) as specified by local civil service regulations.

In most communities, these examinations are open only to men who are at least 21 years of age, meet certain height and weight requirements, and have a high school education. The men who receive the highest grades on their examinations have the best chances for appointment. Extra credit is usually given for military service. Experience gained as a volunteer fireman or firefighting training in the Armed Forces may also improve chances for appointment.

As a rule, the beginner in a large fire department is given training for several weeks at the city's fire service school. Through formal study and practice drills, the recruit learns about such fundamentals as local building codes, fire prevention, ventilation, first aid, and the use of lifelines, chemical extinguishers, ladders, and other firefighting equipment. He is then assigned to a fire company, often as a hoseman or ladderman. As he gains experience, he may be advanced to progressively higher ratings and, after 10 years or more of service, become eligible for promotion to the grade of lieutenant. In a large city, the line of further promotion is to captain, then battalion chief, assistant chief, and finally to chief. Chances for advancement generally depend upon the candidate's position on the promotion list, as determined by his rating on a written examination, his work as a fireman, and his seniority. Throughout their service, many firemen continue to study fire prevention, incendiarism, and related subjects, in order to inform themselves about new developments and prepare for promotional examinations.

Among the important personal qualities for firefighters are above average physical stamina, mental alertness, courage, and mechanical aptitude. Leadership qualities and good judgment are valuable assets for officers, since they have the responsibility of establishing and maintaining a high degree of discipline and efficiency, as well as planning and directing the activities of firemen.

Employment Outlook

Several thousand employment opportunities for firefighters are expected each year during the remainder of the 1960's. Most openings will arise from the need to replace men who retire, die, or otherwise leave the occupation; the replacement rate is higher than that for many occupations, largely because firefighters are often permitted to

retire at an earlier age. A moderate number of new jobs will also become available as city fire departments enlarge their staffs and as new departments replace volunteer fire companies in rapidly growing communities. In addition, some openings will probably be created as city fire departments continue to shorten the scheduled hours of duty.

The number of young men who apply and qualify for firefighter jobs in large cities is usually greater than the number of job openings, even though the written examination and physical requirements eliminate many applicants. Competition among candidates is apt to be particularly keen when there is considerable unemployment, since employment in this occupation is very stable.

Over the long run, as cities grow, the number of firefighters will increase moderately. The rise in employment would be fairly rapid, were it not for the fact that firefighting techniques and equipment are becoming more effective. As cities become more crowded, however, firemen will give more time to such activities as inspecting buildings for compliance with fire codes and other regulations, and participating in fire prevention campaigns.

Earnings and Working Conditions

Average (median) beginning salaries of firefighters in early 1962 ranged from about \$4,000 a year in small cities (10,000 to 25,000 population) to about \$5,000 in larger cities (over 500,000 population), according to a study by The International City Managers' Association. Beginning salaries ranged from \$2,400 or less in a few small cities to \$6,000 or more in several large ones. Generally, firemen receive salary increases annually during the first 2 to 5 years of service. Maximum salaries of firemen (below the rank of officer) averaged about \$4,600 in small cities and \$6,100 in the largest ones. Fire chiefs in small cities averaged \$6,100, and in large cities the average was \$15,000. Practically all city fire departments furnish or pay allowances for protective firefighting clothing (helmets, boots, and rubber coats) and many also provide for dress uniforms.

In most cities, firemen are on duty for a 24-hour shift, and then off for 24 hours, with an extra day off at intervals. In a few cities, the day shift is 10 hours, and the night shift 14 hours, with firemen rotating shifts at frequent intervals. The

time firemen are scheduled to be on duty ranges from 40 hours a week in some cities to 96 hours in others; many observe a workweek of between 50 and 60 hours. The scheduled workweek in metropolitan centers with large fire departments tends to be considerably shorter than in small communities. Scheduled hours on duty usually include some free time when firemen are free to read, play cards, or pursue other personal interests.

In addition to their scheduled hours, firemen must work as many extra hours as necessary to bring a fire under control. When overtime is worked, many city fire departments either give compensatory time off, or pay for the extra hours at straight time or time and one-half.

The job of a firefighter involves risk of life or injury from sudden cave-ins of floors or toppling walls, as well as hazards associated with exposure to flames, smoke, and bad weather. In fighting fires in industrial establishments, firemen may come in contact with poisonous, flammable, and explosive gases and chemicals.

Firemen are generally covered by liberal pension plans, which often provide for retirement at half pay at age 50 after 25 years of service, or at any age if disabled in line of duty. Firefighters receive regular paid vacations. Provisions for sick leave are usually very liberal. Some fire departments give paid holidays or allow time off for working on holidays.

Many firefighters are members of the International Association of Fire Fighters (AFL-CIO).

Where To Go for More Information

Information on how to obtain a job as a firefighter may be obtained from your local civil service commission or fire department.

General information on the occupation may be obtained from:

International Association of Fire Fighters,
815 16th St. NW., Washington, D.C., 20006.

International Association of Fire Chiefs,
232 Madison Ave., New York, N.Y., 10016.

Additional information on the salaries and hours of work of firemen in various cities is published by The International City Managers' Association in its *Municipal Yearbook*, available in many libraries.

Policemen and Policewomen

(D.O.T. 2-66.)

Nature of Work

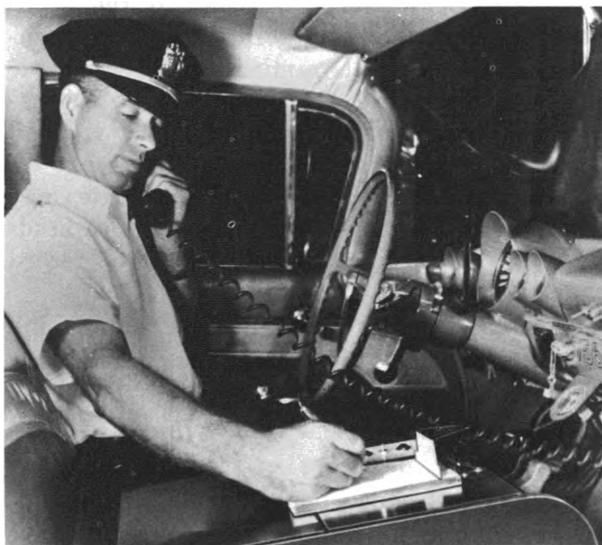
Police officers—whether directing traffic at busy intersections, making newspaper headlines by arresting dangerous criminals, or carrying out some other assignment—are all helping to preserve law and order. As municipal government employees, their job is to prevent crimes and to deal with individuals who have broken the law. Whether on or off duty, they are expected to exercise their authority whenever necessary. (This report covers policemen and policewomen employed on the police forces in cities and towns. It does not include civilian employees of police departments; State, county, and Federal Government police employees; or policemen and detectives employed by railroads, stores, and other private businesses.)

The policeman who works in a small community customarily handles many kinds of police duties. He may, for example, direct traffic at the scene of a fire, rescue a household pet from a tree, investigate a housebreaking, and give first aid to an accident victim—all in the course of a day's work. In a large city police department, each officer is usually assigned to a specific type of police duty. Most city policemen are detailed either to patrol or traffic duty; smaller numbers are assigned to special work such as accident prevention or operating radio and other communications systems. Some officers are detectives (plainclothesmen) assigned to criminal investigation, and others are experts in chemical and microscopic analysis, firearms identification, and handwriting and fingerprint identification. In very large cities, a few officers may be specially trained for work with mounted police, harbor patrols, canine corps, mobile rescue teams, or other special units.

An increasing number of city police departments—more than 150 in 1960—are including women on their police forces. Policewomen are assigned mainly to work which involves women and young people. They may work with juvenile delinquents, for example, or investigate cases of desertion or neglect, try to locate lost children and runaways, or question, book, and fingerprint women prisoners. Usually policewomen are in crime prevention work, but some have also shared

in such dangerous assignments as capturing gunmen or breaking up narcotics rings.

Patrol duty has become particularly important as a means of preventing crime in large metropolitan districts and most police recruits start with assignments of this kind. The policeman's beat may be a congested business district, an outlying residential area, a high-speed thoroughfare, or some other section of the city; he may cover it alone or with other patrolmen; and he may be on "walking" patrol, or ride in a car or on a motorcycle. In any case the patrolman becomes familiar with conditions throughout his area. For example, he knows the hours when neighborhood children use the streets to go to and from school, he learns when shopkeepers close their stores and go home for the day, and he is familiar with the intersections and highways where auto accidents are most likely to occur. As he patrols his beat, he watches closely for stolen automobiles, wanted or missing persons, or anything suspicious or out-of-the-ordinary, such as lights or open windows in vacant buildings. He notes any hazards to public safety, such as burned-out street lights, fallen trees, or damaged pavements. He may also enforce traffic regulations by making out tickets for parking violations and other traffic offenses.



Police officer on patrol duty receives instructions by radio telephone

He later prepares and turns in reports about his activities and he may be called on to testify in court about what he has observed. While on his beat, he keeps in touch with police headquarters by reporting at regular intervals through call boxes or by radio.

Where Employed

Almost 175,000 full-time police officers were employed, at the end of 1961, by city and town police departments. Included were about 3,000 policewomen. Policewomen work mainly in large police departments, whereas policemen are employed in departments of all sizes. New York City has about 24,000 police officers and Chicago almost 11,000, while hundreds of small cities have fewer than 25 each.

Training, Other Qualifications, and Advancement

Local civil service regulations govern the appointment of police officers in practically all large cities—and in many small ones also. Candidates must be United States citizens, usually at least 21 years of age, and able to meet certain height and weight standards. Each candidate's eligibility for appointment is determined by his performance on a written test, his physical and personal qualifications, and his education and experience. The written tests are a measurement of the candidate's intelligence and suitability for police training, while the physical examinations often include tests of his strength and agility. Also, because personal characteristics such as honesty, good judgment, and a sense of responsibility are especially important in police work, candidates may be interviewed by a senior officer at police headquarters and their character traits and record investigated.

Many cities accept men with less than a high school education as police recruits, particularly if they have had work experience in a field related to law enforcement. The number of these cities has been declining in recent years, however. In large police departments, where most jobs are to be found, applicants must usually have at least a high school education; a few cities require some college training. College training is

likely to be required for policewomen, because of their specialized assignments.

Many police officers receive training for their work at the growing number of colleges which offer 2- and 4-year programs in law enforcement. Other courses—high school as well as college—which are considered helpful in preparing for a police career include English, American history, civics and government, business law, psychology, sociology, and physics. Physical education and sports activities are especially helpful to men in developing the physical stamina and agility needed in police work. Training or experience in social work, teaching, or nursing is considered desirable for policewomen.

Young men who have completed high school and do not want to wait until they are 21 years old before entering police work can start in some very large cities by working as police cadets while still in their teens. A cadet is a paid civilian employee of the police department who attends classes part of the time to learn various aspects of police science, and also does clerical and other nonenforcement work. When he reaches the age of 21, provided he qualifies in other respects, he may be appointed to the police force.

Before being sent out on his first assignment, a policeman usually goes through a period of training. The instruction is given informally in many small communities, as the recruit works along for a week or so with an experienced officer. More extensive training, such as that provided in large city police departments, usually includes several weeks of classroom instruction in State laws and local ordinances, and in the procedures to be followed in accident investigation, patrol, traffic control, and other police work. The recruit learns how to use a gun, defend himself from attack, administer first aid, and deal with other emergencies.

Policemen and policewomen in most cities become eligible for promotion after completing specified periods of service on the force. Promotions to the rank of sergeant, lieutenant, and captain are made in accordance with each candidate's position on a promotion list, as determined by his performance on written examinations and his work as a police officer. Opportunities to advance are generally most numerous in large city police departments where the work is carried on in

separate bureaus, under the direction of administrative officers and their assistants. Most top ranking positions are occupied by men. Opportunities for women to advance beyond the rank of sergeant are mainly in the few city police departments which have separate bureaus for women and juveniles.

Many types of training are available to help police officers improve their performance on the job and prepare themselves for advancement. Through training given at police department academies, and at colleges and other institutions, officers have opportunities to become informed on such varied subjects as civil defense, foreign languages, and forgery detection. Many police departments encourage officers to work toward college degrees, and some pay all or part of the tuition. Each year, also, a limited number of policemen are selected for administrative training given in an intensive 12-week course at the National Academy of the Federal Bureau of Investigation, Washington, D.C.

Employment Outlook

Many opportunities for qualified candidates to enter police work will occur annually throughout the 1960's. Some new positions will arise as cities increase the size of their police forces to meet the needs of growing populations, and other openings—probably at least 5,000 a year—will occur as policemen and policewomen retire or leave their jobs for other reasons. Police officers usually retire at a somewhat younger age than workers in most other occupations, and replacement rates are relatively high for this reason.

Police employment will continue to rise fairly rapidly over the long run, as population and economic growth create a need for more officers to protect private property, regulate traffic, and provide other police services. Although the vast majority of the new jobs that arise will be for men, many openings will occur for women also. As cities become more congested, police departments will require more officers who are qualified to undertake preventive and enforcement work with juveniles—a field in which women have proved particularly effective.

The kinds of police jobs that arise in the future are likely to be affected to a considerable degree

by changes now taking place in police methods and equipment. Specialists are becoming more and more essential to the effective operation of modern city police departments. The need for officers with specialized training is rising, for example, as engineering techniques are applied to traffic planning and control, and social work techniques to crime prevention. At the same time, relatively fewer officers are required for routine police assignments because of the use of cars and motorcycles for patrol duty, automatic signal lights to control traffic at busy intersections, and other devices.

Earnings and Working Conditions

Early in 1962, entrance salaries for police officers ranged from less than \$3,000 a year in some small cities to more than \$6,000 in several of the largest, according to a report on salaries issued by The International City Managers' Association. The average (median) entrance salary in middle-size cities (50,000 to 100,000 population) was slightly over \$4,500 a year.

Most policemen and policewomen receive regular pay increases during their first years of employment, until a specified maximum is reached. Sergeants, lieutenants, and captains are paid progressively higher basic salaries than patrolmen in the same police departments. Top salaries paid to police chiefs or commissioners in early 1962 ranged from less than \$5,000 a year in some small cities to more than \$20,000 in a few of the largest.

Police departments usually provide officers with special allowances for uniforms, and furnish revolvers, night sticks, handcuffs, and other equipment required.

Most police officers work a 40-hour week. In small city police departments, the workweek often ranges up to 48 hours and sometimes longer. Police protection must be provided round the clock and, in all but the very smallest communities, some officers are usually on duty over weekends, on holidays, and at night. Policemen are subject to call at any time their services may be needed, and in emergencies may work long hours of overtime. Overtime, in some city departments, is paid at straight time or time and a half; in

others, officers may be given an equal amount of time off on another day of the week.

City police officers are generally covered by liberal pension plans under which many are able to retire at half pay by the time they reach the age of 55. Paid vacations, sick leave, and medical, surgical, and life insurance plans are among the other benefits frequently provided.

Policemen may be assigned to work outdoors for long periods in all kinds of weather. The injury rate is higher than in many occupations, and reflects the risks police officers take in pursuing speeding motorists, capturing lawbreakers, and dealing with disorderly conduct cases. Each year about 50 officers lose their lives while on duty—a relatively small number in view of the hazards connected with some of their assignments.

Where To Go for More Information

Information about local entrance requirements may be obtained from local civil service commissions or police departments.

Additional information on the occupations of policeman and policewoman may be obtained from:

International Association of Chiefs of Police,
1319 18th St. NW., Washington, D.C., 20036.

International Association of Women Police,
100 North LaSalle St., Chicago, Ill., 60602.

Additional information on the salaries and hours of work of policemen in various cities is published by The International City Managers' Association in its *Municipal Yearbook*, available in many libraries.

OTHER SERVICE OCCUPATIONS

About 8 million workers are employed in service occupations (not counting protective service workers, discussed in the preceding chapter). About 7 out of every 10 are women. Some of these service occupations—waiter and waitress, janitor, and cook—each employ more than 500,000 workers; still others employ considerably fewer than 100,000—among them bootblack, laundress, usher, attendant in places of recreation and amusement, airline steward and stewardess, and elevator operator.

The number of workers in service occupations not classified as protective has increased much faster than the total work force during the past 50 years and will continue to rise rapidly. Although most of the growth will be in jobs outside private homes, some rise in employment of domes-

tic workers is also probable because of the increasing number of working mothers with young children. However, most job openings, both in and outside private households, will result from the need to replace the thousands of workers who annually leave their jobs. Turnover is high and will undoubtedly remain high because many jobs in this group are temporary or part-time, many of the workers are women who leave after a few years to remain at home with their families, and earnings are relatively low.

Information on three service occupations—barber, beauty operator, and practical nurse—is given in the statements which follow. (The occupations of airline stewardess, cook and chef, and waiter and waitress are discussed elsewhere in this *Handbook*. See index for page numbers.)

Barbers

(D.O.T. 2-32.01)

Nature of Work

About 200,000 people were employed full time or part time as barbers in 1960. The great majority of barbers are men.

Besides cutting hair, barbers give hair and scalp treatments, fit hair pieces, and provide other services such as shaves, facial massages, and shampoos. They sometimes sell hair tonics, shampoos, and related preparations, and give advice on care of the hair and scalp. Barbers must be able to give all types of haircuts and to follow customers' wishes about the particular type desired. They must also know how to finish each haircut in the way best suited to the shape of the customer's head.

A barber builds a steady clientele by giving good haircuts, putting customers at ease and giving them quick, courteous service, and keeping a clean, attractive shop. In a small shop, it may be part of his job to keep his own work area clean and sometimes sweep the shop. Each barber is

usually responsible for keeping his barbering instruments sterilized and in good condition. Those who run their own shops have responsibilities such as ordering supplies, paying bills, keeping records, and hiring and managing employees.

Where Employed

More than half of all barbers own and operate their own shops. Small shops, in which the owner either works alone or with one other barber, provide employment for the majority of workers in this occupation. Many barbers also work in larger shops such as those in suburban shopping centers and in hotels and office buildings in downtown city districts. Some barbers work in combination barber and beauty shops, and a few for government agencies and in such places as hospitals and on ocean liners.

All cities and towns and most villages have barbershops. However, barbers are concentrated in large cities and in the most populous States.

Training, Other Qualifications, and Advancement

Practically all barbers must be licensed or certified by their State board of barber examiners or some other public authority. To qualify for a license or certificate, a barber is required, in most States, to pass an examination which includes a written test and a demonstration of his ability to perform barbering services. Nearly all States admit to their licensing examinations only those candidates who are at least 16 or 18 years old, meet certain health standards, and have completed at least the eighth grade and then graduated from a State-approved barber school. In most States, the new barber school graduate is required first to take an examination for a license as an apprentice barber; then—usually after 1 or 2 years of experience—he takes another examination for his journeyman barber's license. A few States issue journeyman licenses to beginners without requiring apprenticeship. Barbers who move to another State must meet the licensing requirements of that State.

Barber training is offered in many public and private schools and colleges. Courses generally range from 6 to 9 months. A student barber studies the basic services—haircutting, shaving, massaging, and facial and scalp treatments—and, under supervision, practices these services on

fellow students and customers. Besides attending lectures on barber services and the use and care of barber instruments, the student also takes courses in anatomy, sanitation, and hygiene, and learns how to recognize certain skin conditions. Instruction is also given in salesmanship and general business practices. Advanced courses are available in some localities for licensed barbers who wish to specialize in work such as hair styling and coloring.

A beginner may obtain his first job by being recommended to an employer by the barber school he attended, or he may locate a job through the barber's union or through acquaintances in the community. He customarily furnishes his own tools, which usually cost about \$75 to \$100.

Experienced barbers may become managers of large shops or they may open and manage their own shops. A few, who meet the requirements, may become teachers at barber schools. Barbers who go into business for themselves must have the capital to buy or rent a shop and install equipment. The amount of capital needed differs, because some owners buy used equipment and fixtures at reduced prices, whereas others pay higher prices for new equipment. The cost of equipping a one-chair shop is roughly estimated at \$1,500.

Dealing with customers may require patience and a better-than-average disposition. Good health and stamina are important also, as barbers must stand for long periods, much of the time working with both hands above shoulder level.

Employment Outlook

Several thousand openings for barbers are expected each year during the remainder of the 1960's. Most of the openings will arise from the need to replace barbers who retire, die, or transfer to other fields of work. The death and retirement rates in this occupation are relatively high, since barbers are somewhat older, on the average, than workers in many other occupations. Additional vacancies are created when beginners and experienced barbers are attracted to other types of jobs.

In addition to vacancies that result from turnover, many new positions will be created as the number of barbers employed rises during the rest of the 1960's and early 1970's. Employment is expected to rise at a moderate rate during these years, as more barbering services are required by



Student barbers get practical experience in addition to attending classes

the growing population. The small shop with only one or two barbers will probably remain the most common type of establishment; however, the continuing shift of population to suburban communities should result in more opportunities to open new large shops in these areas, and also to expand staffs in established shops.

Earnings and Working Conditions

Most full-time barbers earned between \$50 and \$150 a week in 1962, according to the limited data available. A few, in the most desirable locations in big cities, probably earned up to \$175 or more a week. These estimates include tips, which are often an important part of barbers' earnings. Aside from tips, most barbers not in business for themselves are either paid commissions—usually 65 to 80 percent of the money they take in—or receive salaries plus commissions. A few barbers are paid straight salaries. In the Federal Government, most barbers received straight salaries of \$75 to \$90 a week in 1963.

A barber's earnings depend, to a great extent, on the size of the community and the location of his shop, because the income level and tipping customs of the community, the competition from other barbershops, and the prices that can be charged all affect earnings. The price of haircuts, for example, ranged from \$1 in some cities in 1962 to more than \$2 in others. Earnings, of course, depend also on the barber's skill and personality, which help bring him regular customers. Barbers who own and work in their own shops generally earn considerably more than other barbers.

Most full-time barbers work between 5 and 6 days and 40 and 50 hours weekly. A barber may have to serve a steady stream of customers during peak hours and on especially busy days, such as Saturday, but during slack periods he can have time off to attend to personal matters. Under some union contracts, barbers receive 1- or 2-week paid vacations, insurance, and medical benefits.

The principal union which organizes barbers—both employees and shopowners—is the Journeymen Barbers, Hairdressers, Cosmetologists, and Proprietors' International Union of America. The principal trade association which represents and organizes shopowners and managers is the Associated Master Barbers and Beauticians of America.

Where To Go for More Information

Information on State licensing requirements may be obtained from the State board of barber examiners or other State authority at each State capital, and information about approved barber schools from each State's division of vocational education.

Additional information on this occupation and a list of schools accredited by the Council may be obtained from:

National Educational Council, Associated Master Barbers and Beauticians of America,
537 South Dearborn St., Chicago, Ill., 60605.

General information on the occupation may also be obtained from:

Journeymen Barbers, Hairdressers, Cosmetologists, and Proprietors' International Union of America,
1141 North Delaware St., Indianapolis, Ind., 46207.

Beauty Operators

(D.O.T. 2-32.11 through .31)

Nature of Work

Beauty operators—or hairdressers, cosmetologists, or beauticians, as they are sometimes called—provide their customers with a variety of services, largely related to the care of the hair. They give permanent waves and cut, style, shampoo, set, straighten, bleach, or tint the hair. Beauticians may also give manicures and scalp and facial treatments, provide makeup analysis, shape eye-

brows, tint eyebrows and eyelashes, and arrange wigs and chignons. Beauty operators may occasionally perform such general duties as making appointments, cleaning the shop, equipment, and furniture, and sterilizing implements.

In a small shop, where the principal services are permanent waving, shampooing, and setting hair, each operator may do all types of work. In large salons with a wider range of services, operators may specialize in different phases of the work,



Beauty operator styles customer's hair

such as hair styling, hair coloring, permanent waving, facial treatments, or manicuring. Men are more likely than women to specialize; frequently they work as hair stylists.

The owner-operator of a beauty shop, in addition to working as an operator, usually performs a number of managerial duties, such as record-keeping, property maintenance, control of supplies, and supervision of employees.

Where Employed

More than 300,000 people were employed as hairdressers and cosmetologists in 1960, according to the U.S. Census of Population. Slightly more than 10 percent were men. The proportion of part-time workers is somewhat higher than in many other occupations.

Beauty operators are employed mainly in private shops and salons, department and specialty stores, and hotels in all parts of the country. The majority are either owner-operators of small shops, or are employed in small establishments with 1 to 3 employees; few shops have as many as 15 workers. Employment opportunities are concentrated in urban areas, although in recent years the number of jobs in small towns and rural areas has increased substantially.

Training, Other Qualifications, and Advancement

Practically all States require that beauty operators be licensed. To obtain licenses, applicants

must usually meet certain requirements with respect to age, health, and training, and pass examinations on the theory and practice of cosmetology given by an agency of the State in which they intend to practice. More than three-fourths of the States provide for reciprocity, and therefore operators licensed to work in one State can often move to another and continue their work without taking the examination necessary to qualify for another license.

Requirements for admission to licensing examinations vary by State. Applicants must usually be 16 years of age or older and have completed at least the 8th grade—in many States the 10th, and in a few the 12th. Most States also require applicants to obtain certificates of good health, and practically all require completion of a State-approved cosmetology course or apprentice training.

In 1961, more than 2,000 private schools and public vocational schools offered training which met State licensing requirements for cosmetologists, according to an estimate by the National Association of Cosmetology Schools. Most private school courses are 6 to 9 months in length; in a few States, courses last up to 12 months. Courses given in public vocational schools may last from 2 to 3 years, since they usually include academic subjects required for a high school diploma. Apprentice training, which is also accepted by nearly half the States for admission to licensing examinations, usually continues over a longer period than training in public and private schools. Many States issue a special manicurist's license which requires substantially fewer hours of training than the general operator's license.

Public and private school training includes classroom study, lectures, demonstrations, and practical work. Students who are beginners usually practice by working on each other or on manikins and, when they have satisfactorily completed the preliminary training, they may practice on customers in school "clinics." Practically all beauty schools try to help their students find jobs after graduation.

Most beauticians start as all-round operators performing a variety of services. Advancement may come as they gain experience and become specialized in one or more phases of the work. For those who wish to specialize, advanced courses in hair styling or coloring, permanent waving, and

other types of work are available in many localities, sometimes offered by public or private schools, and sometimes by manufacturers of beauty preparations, or other individuals and organizations. Experienced operators may also advance to positions in which they manage large salons or teach in cosmetology schools. Others advance by using their knowledge and skill in some quite different type of employment—working for manufacturers of cosmetics, for example, or as beauty editors for newspapers and magazines, makeup artists in motion picture and television studios, or inspectors and examiners for State licensing boards.

To be successful, a beauty operator should keep abreast of changing hair styles and beauty techniques. Ability to establish and maintain friendly relationships with people is also important, as is good grooming, dexterity, a sense of form and artistry, and willingness to follow instructions and customers' wishes. The work also calls for physical stamina, since a great deal of standing is normally required.

In small shops, operators may be required to furnish such equipment as brushes, combs, and clips, but in large establishments most of the equipment is provided by the management. Operators almost always furnish their own uniforms.

Employment Outlook

Thousands of jobs for beauty operators can be expected to become available each year during the rest of the 1960's. Because many operators are young women who work only a few years before leaving to remain at home with their families, turnover creates a comparatively large number of vacancies. Many openings will also occur as new jobs are created because of the growing population and increasing awareness of the part good grooming plays in business and social life.

In the long run, employment is expected to expand rapidly, as it has for some years past. The number of men employed as hairdressers and stylists has increased particularly rapidly, and is expected to continue to do so. Opportunities will continue to exist for both young and mature workers, and also for people who wish to work part time.

Earnings and Working Conditions

The earnings of a beautician depend on such factors as experience, speed of performance, and ability to please customers and build up a clientele. The location of the shop may be a factor also. For example, the earnings of an operator in a small shop in a rural area might be quite different from the earnings of an operator in a large multi-service salon in the main business center of a large city.

Beauty operators are often paid a basic wage plus a commission. Under the most common arrangement, operators receive commissions only after they have taken in twice their basic wage in customers' fees. On any fees received thereafter, they are paid a specified percentage as commission, often 40 or 50 percent. Instead of being paid a basic wage plus commission, some operators are paid a straight salary or a straight commission. In shops where cosmetics are sold directly to the customer, a small commission (up to 10 percent) may be paid when operators sell these products.

It is difficult to estimate the earnings of beauty operators because most of them, in addition to their basic salaries, receive commissions and customers' tips. Tipping practices vary in different localities; in the larger cities, tipping is likely to be more prevalent and the tips more liberal than elsewhere. The basic wage of beginning operators was estimated at about \$55 a week in 1962. Expert operators in exclusive salons earn considerably more; top stylists and a few others in highly specialized jobs may earn up to \$300 or more a week.

Most full-time operators work 40 hours a week, although in some areas the 44-hour week is common. Scheduled hours frequently include evening and Saturday work.

Beauticians who work in large shops and in establishments such as department stores usually participate in group life and health insurance and other employee benefit plans sponsored by the employer. Most shops allow their employees annual vacations of at least 1 week with pay. In some organizations, an operator may have as much as 3 weeks of paid vacation, depending on length of service.

Although the occupational field is not highly organized, one union—The Journeymen Barbers, Hairdressers, Cosmetologists, and Proprietors' International Union—is active in the United States. Other organizations in the field are The National

Hairdressers and Cosmetologists Association, which includes both shopowners and operators, and the National Beauty Culturists' League, made up of Negro operators, teachers, managers, and shopowners.

Where To Go for More Information

State boards of cosmetology can supply information about approved training schools and requirements for licensing. Information about ca-

reers in beauty culture and State licensing requirements, and a list of schools approved by the Association can be obtained from:

National Association of Cosmetology Schools, Inc.,
3839 White Plains Rd., New York, N.Y., 10067.

Information about careers in cosmetology may also be obtained from:

National Hairdressers and Cosmetologists
Association,
175 Fifth Ave., New York, N.Y., 10010.

Licensed Practical Nurses

(D.O.T. 2-38.20)

Nature of Work

Licensed practical nurses, also known as licensed vocational nurses, assist in the care and treatment of the physically and mentally ill, under the direction of physicians or professional nurses. As members of a nursing team, they perform many of the less complex tasks, thus freeing professional nurses for more skilled and specialized duties. They may also assist physicians or professional nurses with complicated diagnostic procedures or treatments.

Practical nurses usually give prescribed treatments and medications, take patients' temperature, pulse, and blood pressure readings, and help with bathing and other personal hygiene tasks. They may also provide nursing care for newborn babies and their mothers, the handicapped, the chronically ill, or the convalescent. In doctors' offices, practical nurses assist physicians or professional nurses in the examination of patients, give simple medications or treatments as directed, make routine laboratory tests, and perform some clerical tasks.

Auxiliary nursing workers—who may be called nursing aids, orderlies, hospital attendants, and psychiatric aids or assistants—are not included in this statement, but are discussed briefly in the introduction to the chapter on the health service occupations.

Where Employed

Approximately 225,000 practical nurses were employed in 1962, not all of whom were licensed.



Courtesy of National Institutes of Health

Licensed practical nurses are in demand

The majority worked in hospitals, clinics, homes for the aged, and in rest homes or other institutions in which ill or convalescing people were cared for. A sizable number were employed in private homes—many on a part-time basis. Most of the remainder worked in doctors' offices, schools, and public health agencies.

Nearly all practical nurses are women. Some are mature women who have returned to paid employment after a period devoted to homemaking responsibilities.

Training and Other Qualifications

To obtain a license for practical nursing an applicant must graduate from a State-approved school of practical nursing and pass an examination in every State and the District of Columbia. In addition, most States require that applicants be U.S. citizens or have applied for naturalization.

Practical nurse training, which generally lasts 1 year, may be obtained in schools operated by public school systems, usually as part of a vocational-school or adult education program, or in private schools which are usually controlled by hospitals, health agencies, junior colleges, or universities. In recent years, an increasing number of high schools have included practical nursing courses in their regular curriculums. Approval of schools of practical nursing is given by State boards of nursing. In addition, standards of operation are established by State boards of vocational education for schools under their control. In 1962, there were more than 700 practical nurse training programs, of which about three-fifths were operated by public school systems. In most States, applicants to schools of practical nursing who are under 25 years of age are required to have completed at least 2 years of high school or its equivalent. Schools in six States, however, require a high school diploma for admission. Candidates usually must have a preentrance health examination, take a psychological test, have a personal interview, and submit references and school records.

Practical nurse training includes classroom study of basic nursing skills and related subjects, such as body structure and functions, conditions of illness, nutrition, and types of medicine and medications, as well as supervised clinical practice in applying this training to actual nursing situations.

Postgraduate education and in-service training programs are provided in some hospitals. Such programs usually prepare licensed practical nurses to give nursing care in specialized areas such as psychiatric nursing and operating room technique.

Among the personal qualities essential for practical nurses are the desire to help sick people and an aptitude for the work. Also important are tact, patience, understanding, emotional stability, dependability, and good physical health.

Employment Outlook

Licensed practical nurses are expected to have excellent employment opportunities throughout the remainder of the 1960's. Although the number of practical nurses completing training has risen steadily in recent years to approximately 18,000 in 1962, the supply of licensed workers has not kept pace with the demand generated by the establishment of new positions and the need to replace practical nurses who retire, die, or leave the nursing field for other reasons.

The successful use of licensed practical nurses as members of nursing teams and the likelihood of continuing shortages of professional nurses are among the leading factors pointing toward greater utilization of practical nurses in the long run. The growing proportion of older people in the population will also create a greater demand for trained practical nurses in private homes, rest homes, and homes for the aged. Also, the number of people receiving psychiatric care is rising, and more practical nurses will be needed in mental hospitals. In addition, many employment opportunities for practical nurses will arise because of the growth of population, the increasing health consciousness of the public, and many other factors affecting the demand for all types of health care.

Many part-time positions will continue to be available, thus enabling women, who have families or other responsibilities, to continue to work as practical nurses.

Earnings and Working Conditions

Average weekly salaries of women practical nurses in hospitals in 15 metropolitan areas surveyed during mid-1960 ranged from \$42 a week in Atlanta to \$75.50 a week in the Los Angeles-Long Beach area. Practical nurses in hospitals had an average workweek of 40 hours or less in most of the cities surveyed.

Graduates of approved schools of practical nursing who met the U.S. Civil Service require-

ments, and passed the written examination, were hired by the Federal Government at \$3,820 a year in early 1963.

Practical nurses on private duty usually received three-fourths of the prevailing pay for professional nurses in the same geographic area in early 1963. (See statement on Registered Professional Nurses.)

Where To Go for More Information

National League for Nursing, Committee on Careers,
10 Columbus Circle, New York, N.Y., 10019.

National Association for Practical Nurse Education
and Service,
475 Riverside Dr., New York, N.Y., 10027.

National Federation of Licensed Practical Nurses,
Inc.,
250 West 57th St., New York, N.Y., 10019.

Skilled Trades and Other Manual Occupations

More than a third of all employed workers in the United States in early 1963 were manual workers—skilled, semiskilled, and unskilled.

Young persons with mechanical interests and abilities, or others who like to work with their hands, will find most of their employment opportunities among the hundreds of different occupations in this group. Levels of skill vary considerably among these occupations, which range from unskilled laborer to highly skilled tool and die maker.

Men and women in these occupations perform important functions in industry by helping to transform the ideas of scientists and the plans of engineers into goods and services. Many of them help to operate transportation systems, communication facilities, and atomic installations. Others build homes, office buildings, and factories. Large numbers work in factories where they build, install, control, maintain, and repair the complex equipment needed by our highly mechanized society. Still others repair automobiles, television sets, and washing machines. The efficient operation of the Armed Forces depends on skilled workers in uniform, as well as upon civilian craftsmen who produce and maintain weapons, vehicles, ships, tanks, planes, and communication equipment.

During the last 10 years, employment of skilled workers increased at about the same rate as the total working population, semiskilled workers increased at a slower rate, and the number of unskilled workers did not grow at all. As a proportion of the working population, skilled employment remained about the same over the decade, whereas semiskilled and unskilled employment declined.

The United States is on the threshold of a new age of technological progress which may bring major changes in the future occupational composition of the labor force. Rapid advances in the industrial application of scientific knowl-

edge and invention, particularly in electronics, are making possible greater use of electronic, mechanical, hydraulic, pneumatic, and other devices to feed, control, handle, and adjust the machinery and equipment used in factory production processes. These developments, popularly called "automation," are just beginning to be applied generally in industry and, therefore, it is difficult to estimate their effect on employment and occupational skills. The numbers of skilled and semiskilled workers, however, are expected to continue to increase during the years ahead despite rapid mechanization and automation of production processes. With respect to skill requirements, it is expected that our increasingly complex technology generally will require workers with higher levels of skill.

Changes in employment and skills in the skilled, semiskilled, and unskilled groups generally will represent extensions of recent trends that have resulted from technological gains. Employment of skilled workers is expected to increase at about the same rate as the Nation's total working population which, it is estimated, will grow by about 30 percent between 1960 and 1975. The semiskilled group is expected to grow at a much slower rate than the skilled worker group, because many simple repetitive operations such as the loading or unloading of machines will be taken over increasingly by automatic and semi-automatic devices. Little change in the number of unskilled laborers is expected and they will continue to decline as a proportion of the working population, as shown in the following tabulation:

	Actual 1960		Projected 1970		Projected 1975	
	Number (mil- lions)	Percent	Number (mil- lions)	Percent	Number (mil- lions)	Percent
Total employed.....	66.7	100.0	80.5	100.0	87.6	100.0
Skilled.....	8.6	12.8	10.3	12.8	11.2	12.8
Semiskilled.....	12.0	18.0	13.6	16.9	14.2	16.3
Unskilled.....	3.7	5.5	3.7	4.6	3.7	4.3
Other.....	42.4	63.7	52.9	65.7	58.5	66.6

In addition to the general discussions of skilled, semiskilled, and unskilled workers that follow, this section includes statements on individual manual occupations found in a wide variety of industries or activities, or in particular industries

for which an entire chapter has not been prepared. Many other manual occupations, however, are described in the section, *Some Major Industries and Their Occupations*, starting on page 505.

Skilled Workers

The Nation's economic and military strength depends to a great extent on the initiative and competence of its craftsmen. The contributions of physicists, engineers, chemists, and other professional workers to the national security and well-being are transformed into goods and services by a skilled, intelligent, and flexible work force. Skilled workers make the patterns, models, tools, dies, machines, and equipment without which industrial processes could not be carried out by semiskilled and unskilled workers. They repair the equipment used in industry, as well as the mechanical equipment and appliances used by consumers. They also construct homes, commercial and industrial buildings, and highways.

In early 1963, there were more than 8½ million skilled workers. More than half of these workers were employed in three broad occupational groupings—mechanics and repairmen, building trades, and skilled machining occupations. At least a dozen skilled occupations had more than 100,000 workers each. Among these were approximately 800,000 carpenters and 700,000 automobile mechanics. (See chart 25.) Many skilled occupations, such as linotype repairman, gunsmith, and stonemason, however, had relatively small numbers of workers.

Although skilled workers are employed in almost every branch of industry, over 60 percent are employed in manufacturing and construction. A large majority of employed craftsmen work for private employers; others are self-employed or work for Federal, State, or local governments. The building trades have a fairly large percentage of self-employed craftsmen. As might be expected, employment of the skilled work force is concentrated in the highly industrialized States such as New York, California, Pennsylvania, Illinois, and Ohio. Job opportunities for skilled workers, however, are found in every

State. A very small proportion (less than 3 percent) of skilled workers are women.

Training, Other Qualifications, and Advancement

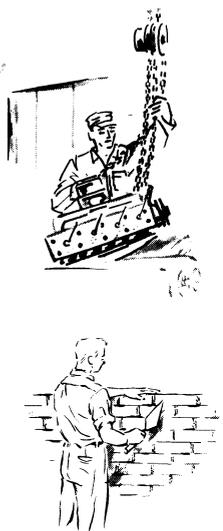
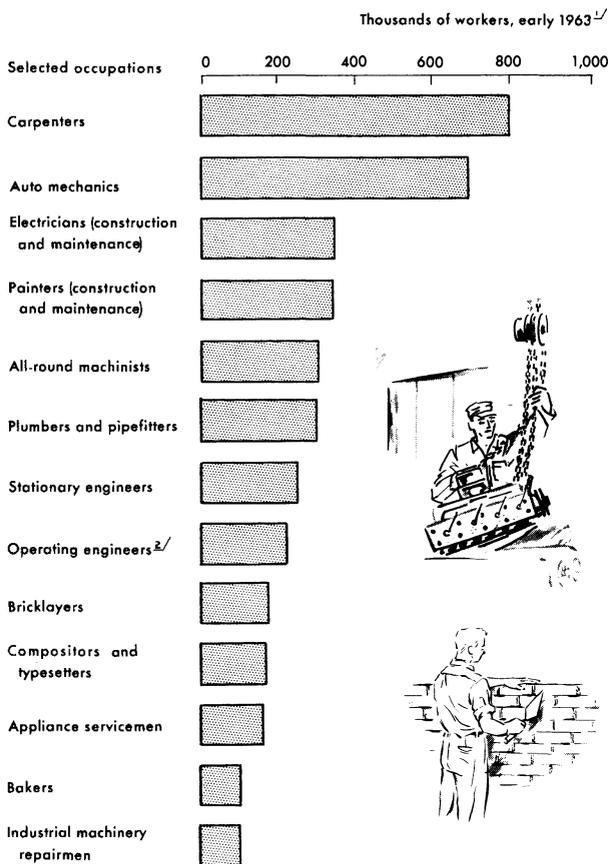
Skilled workers must have a thorough knowledge of the processes involved in their work. They exercise considerable independent judgment and, in some instances, they are responsible for valuable equipment or products. These workers often need a high degree of manual dexterity.

Workers in skilled occupations usually receive extensive training. Many acquire their skills through apprenticeship or other formal training programs. Many others, particularly during periods of labor shortage, acquire their skills through work experience, but without participation in a planned training program. Large numbers of young men also acquire skills in the armed services. For others, vocational school training plays an important role. Most training authorities agree that the best way to learn a skilled trade is through a formal apprenticeship program. Apprenticeship is a period of systematic on-the-job training, supplemented by related trade instruction, which is designed to familiarize the apprentice with the materials, tools, and principles of the trade. The apprenticeship program provides the worker with a balanced knowledge of his trade and the ability to perform duties competently. The formal apprenticeship agreement stipulates the number of hours of training the apprentice is to receive in the various aspects of the trade. Most apprenticeship programs last from 3 to 6 years.

Apprenticeship has a number of advantages over less formal methods of learning a trade. An apprentice receives broad training and experience which enable him to adjust more easily to changing job requirements, and to work in a wide range of jobs. The completion of an apprentice-

CHART 25

MANY SKILLED OCCUPATIONS HAVE MORE THAN A HUNDRED THOUSAND WORKERS.....



¹ Estimated.

^{2/}Construction machinery operators.

over a period of many years, acquire sufficient knowledge and skills which eventually enable them to become skilled workers. Others begin learning a skilled trade in vocational, trade, or technical schools. A small proportion of these students move directly into jobs in their trade and, after acquiring experience, qualify as skilled workers. Other young persons, who are already employed in semiskilled or unskilled jobs, move into skilled occupations through vocational training related to their work, such as correspondence courses, manufacturers' training programs, and night school courses.

Large numbers of young men in the Armed Forces acquire skills which enable them to qualify, with some additional training, for skilled jobs in civilian life, such as automobile mechanic, electronic technician, airplane mechanic, electrician, or office machine repairman.

Employment Trends and Outlook

Employment in skilled occupations grew from about 7.8 million workers in 1947 to nearly 8.7 million in early 1962. Continued growth in the number of skilled jobs is expected in the years ahead. Job opportunities will also result from the need to replace skilled workers who transfer to other fields of work, are promoted, retire, or die. At least 200,000 skilled workers may be needed each year to replace just those who retire or die.

By the mid-1970's, employment in skilled occupations is expected to exceed 11 million, because of industrial growth and technological advances that increase the need for skilled workers. As in the past, rates of employment growth will differ among the skilled occupational groups. Employment of mechanics and repairmen, for example, should continue to grow more rapidly than the skilled work force as a whole. Likewise, the number of skilled workers in the building trades also is expected to increase at a faster rate than the skilled work force. Another large area of expanding employment opportunities for skilled workers will be the major skilled machining occupations. On the other hand, the printing trades, also one of the large groups of skilled workers, probably will increase at a slower rate than the skilled work force as a whole. (Detailed discus-

ship gives the worker a recognized status which is an advantage in finding and holding jobs. Many firms select foremen from among their former apprentices, because they are usually familiar with all aspects of the work being performed.

Many companies have other kinds of training programs which also provide systematic on-the-job training and, frequently, supplementary classroom instruction. In these programs, new workers begin on the simplest tasks under the direction of a foreman or an experienced worker and gradually progress to more difficult work.

Many young persons, in moving from one semi-skilled job to another among different employers

sion of the employment outlook for mechanics and repairmen, building trades craftsmen, machining occupations, printing trades craftsmen, and other skilled occupations are presented in later sections. See index for page numbers.)

Young people who do not expect to go to college should consider seriously the definite advantages which the skilled trades offer, compared with semiskilled and unskilled occupations. Skilled workers have higher earnings, more job security, better chances for promotions, and more opportunities to open their own business, than most of the workers with lesser skill. Of the 11 occupational groups which make up our labor force, only the professional and managerial worker groups had higher average annual earnings than craftsmen in 1962.

The greater job security of skilled workers compared with semiskilled and unskilled workers was clearly evident during the 1960-61 recession. Their rate of unemployment was substantially less than that for semiskilled workers, and less than half the rate for unskilled workers. Employers were reluctant to lay off skilled main-

tenance workers. With training and experience in a skilled craft, a worker can handle not only a skilled job but also, if necessary, one requiring less skill.

Many supervisors and men in high administrative positions in industry have come from the ranks of craftsmen. Employers have long reorganized the value of executives who have both industrial know-how and administrative ability, and thus have drawn many of them from the ranks of skilled workers—especially from among those who have received apprenticeship or other well-rounded training.

In the years ahead, applicants for skilled jobs will have to meet increasingly higher standards. Industry will need craftsmen with higher levels of skill to do the complex work involved in rapidly advancing fields such as electronics, spacecraft, and guided missiles. Young men who acquire a good basic education (including courses in mathematics and the sciences), as well as thorough job training, will be better able to compete for the higher paying skilled jobs than applicants without this training.

Other Manual Workers

Semiskilled Workers

Semiskilled workers, also called operatives, make up the largest occupational group in the Nation's labor force. More than 12 million workers—about 1 in every 6—were employed in semiskilled jobs in early 1963. About 7 million of these semiskilled workers were employed in manufacturing industries (for example, men's and women's clothing, automobiles, automobile parts, food, cotton and wool textiles, machinery, and electrical and electronic equipment). Nearly one-third of all semiskilled workers were women. Semiskilled jobs, such as sewing machine operator and assembler, were by far the largest source of employment for women in manufacturing industries. The number of women operatives employed in the different manufacturing industries varies considerably. For example, in 1962, the more than 750,000 women accounted for more than 8 out of 10 operatives in the apparel indus-

try. Other manufacturing industries with large numbers of women operatives were textiles and food. On the other hand, plants which produce iron and steel and petroleum products employed relatively few women. The broad field of semiskilled jobs will provide hundreds of thousands of employment opportunities for young people looking for jobs in the years ahead.

Truckdrivers are the largest single group of semiskilled workers. Millions of other semiskilled workers operate powerdriven machines in factories. Many use sewing machines which join fabrics to produce clothing, awnings, and other items. Others operate machines to stamp out metal parts; still others use machine tools, such as engine lathes and milling machines, to shape metal to precise sizes. A considerable number of these workers operate material moving equipment, such as powered forklift trucks, to move heavy

and large amounts of raw materials and manufactured products and parts from place to place in the factory.

Large numbers of semiskilled workers are employed as assemblers and inspectors. Assemblers fit parts together to make units such as a section or subsection of a radio or television set. Inspectors examine and test products to find out whether their quality is satisfactory. Many semiskilled workers in factories are employed as helpers or assistants to more skilled workers. For example, stationary firemen help skilled stationary engineers operate and maintain steam boilers.

In general, operatives work with their hands. Many of these workers use a variety of handtools and equipment, such as screwdrivers, pliers, files, soldering irons, measuring devices, and cutting tools. Many of these workers also make elementary adjustments and do minor maintenance work on the machines they use. Some are required to keep simple records of their work. (A detailed discussion of workers in selected semiskilled factory jobs is included in a later section. Other information on semiskilled jobs is available in other parts of the *Handbook*.)

Training, Other Qualifications, and Advancement

Semiskilled workers ordinarily receive only brief on-the-job training. Usually they are told exactly what to do and how to do it, and their work is supervised closely. They often repeat the same motions or the same jobs throughout the working day.

Semiskilled workers do not need to invest many years in learning their jobs. The simplest repetitive and routine semiskilled jobs can be learned in a day and mastered in a few weeks. Even those jobs which require a higher degree of skill, such as truckdriver, can be learned in a few months. At the same time, adaptability—the ability to learn new jobs quickly, including the operation of new machines—is an important qualification for semiskilled workers.

New employees starting out in semiskilled jobs are not expected to be highly proficient, but only to be physically able to perform the work. After a short training period, however, they must work at a standard, fast, and steady pace. A semiskilled worker must be dependable—come to work regularly, pay attention, and follow instruc-

tions carefully. Frequently, good eyesight and good coordination are required.

Employment Outlook

The employment of semiskilled workers will increase moderately in the next 10 to 15 years, continuing the long term trend, although it is expected that this group will decrease somewhat as a proportion of the working population. The most important source of job opportunities for semiskilled workers will result from the need to replace the thousands of workers in this very large occupational group who are promoted, transfer out of semiskilled jobs, retire, or die. About 350,000 semiskilled workers will be needed each year to replace just those who die or retire. Transfer rates for semiskilled workers are high because a fairly large proportion of this group are young workers, who tend to change jobs frequently, and women workers who leave jobs to marry, raise families, or to move to other areas when their husbands change jobs.

The continued growth in the use of commercial motor vehicles will result in some increase in employment opportunities for truck and bus drivers. Continuing substitution of power equipment for unskilled manual labor in lifting, hauling, digging, and similar heavy physical work will create other employment openings for semiskilled workers, as power equipment operators. Opportunities for employment in manufacturing will be limited by increasing automation of production processes. There are many industrial processes, however, to which automation is not likely to be applied in the next 10 to 15 years, and many industries in which the impact of automation will be limited.

Semiskilled workers are more likely to lose their jobs during a business recession, and to remain unemployed for longer periods of time, than craftsmen or white-collar employees. On the other hand, semiskilled workers can move to different jobs at the same level of pay more easily than can highly specialized workers. Semiskilled jobs often pay well. Some operatives who are paid on an incentive basis are among the highest paid workers in manufacturing. The average annual earnings of operatives, however, are about \$1,000 less than those of skilled workers.

Young men and women who have no training beyond high school will continue to find a major area of job opportunities in factory operative and other semiskilled jobs. The most rapid gains in the Nation's employment, however, will be in professional, technical, and other white-collar occupations and in skilled occupations. If possible, young people with ability should obtain the

additional training and education which these occupations require. Young people who take semiskilled jobs, however, are not cut off permanently from advancement if they take advantage of the many educational opportunities available in their communities. They may take courses in evening schools, or enter apprentice training programs, and eventually qualify for better jobs.

Unskilled Workers

Unskilled laborers work in manual occupations which generally require no special training. Frequently, these jobs involve handling and moving materials, for example, loading or unloading, digging, hauling, hoisting, wood chopping, wrapping, and mixing. Some of these unskilled jobs involve heavy physical work. Unskilled manual laborers are employed mainly in manufacturing establishments, on construction work, in wholesale and retail trade, and in transportation jobs.

The longrun decline in employment of unskilled workers has occurred largely because mechanized equipment has replaced manual labor. In early 1963, employment of unskilled laborers was approximately 3½ million—about 5 percent of the Nation's work force. In the future, total employment in this occupational group is expected to show little change. Nevertheless, there will be thousands of opportunities for new workers to get jobs as unskilled laborers because of the need to replace workers who transfer to other fields

of work, retire, or die. Deaths and retirements alone will result in more than 70,000 job openings each year.

The replacement of unskilled workers by machinery, which does excavating, ditchdigging, and similar work, will continue in the next 10 to 15 years. Power-driven equipment such as fork lift trucks, derricks, cranes, hoists, and conveyor belts will take over more and more materials-handling work in factories, at freight terminals, and in warehouses. Integrated systems of processing and materials-handling equipment, a more advanced step in automation, will be installed in an increasing number of plants in the years ahead. Anticipated industrial expansion, however, is expected to create a need for unskilled laborers which will about offset reduced requirements for these workers resulting from continuing substitution of mechanical equipment for manual labor.

BUILDING TRADES

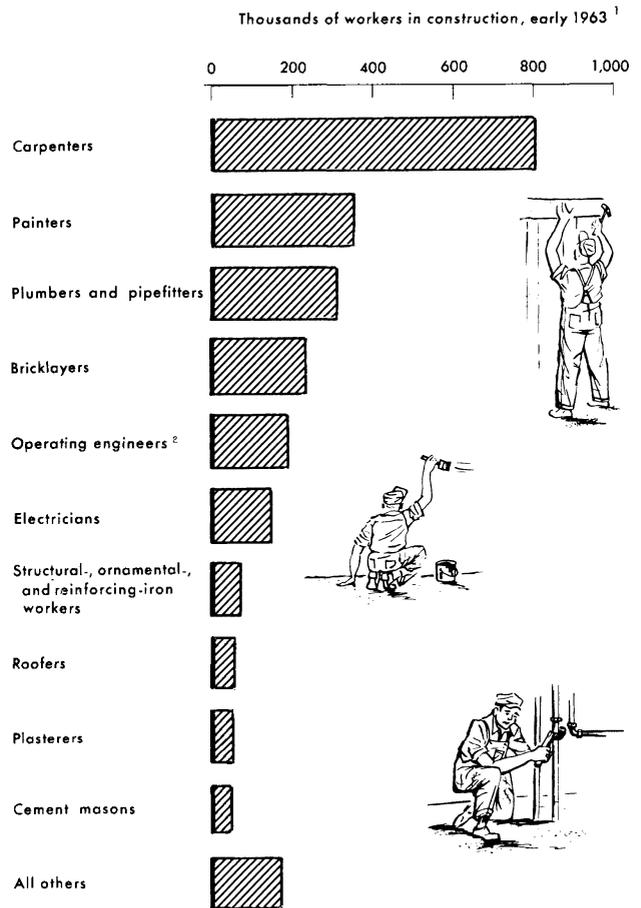
Building trades craftsmen make up one of the largest groups of skilled workers in the Nation's labor force. Altogether, there were nearly 2½ million such craftsmen in early 1963—more than a fourth of all the skilled workers. The more than two dozen skilled building trades vary greatly in size. Several major trades—carpenter, painter, plumber, pipefitter, bricklayer, operating engineer (construction machinery operator), and construction electrician—each comprised more than a hundred thousand workers. (See chart 26.) There were about 800,000 carpenters—about a third of all building craftsmen. By contrast, only a few thousand workers were employed in each of several trades, such as marble setter, asbestos and insulating worker, and stonemason.

There are several reasons why young men may wish to consider one of the building trades as a career. These trades offer especially good opportunities for those who are not planning to go to college, but who are willing to spend several years in learning a skilled occupation. Well-trained building trades craftsmen can find job opportunities in all parts of the country. Their hourly wage rates generally are much higher than those of most other manual workers. Building trades craftsmen with business ability have greater opportunities to establish their own businesses than workers in many other skilled occupations. Moreover, employment in most building trades is expected to expand over the next 10 to 15 years despite advances in technology.

A principal disadvantage of work in the building trades is the sharp employment fluctuations that result from changes in general business conditions. Another disadvantage is that even during years of high levels of construction activity, annual earnings of workers in the building trades are somewhat limited by the seasonal nature of construction work. Worktime is lost as a result of bad weather and other interruptions.

CHART 26

EMPLOYMENT IN SKILLED BUILDING TRADES



¹ Estimated.
² Construction machinery operators.

Continuous advances in techniques and materials, however, have steadily reduced lost time in construction due to adverse weather conditions. In addition, construction jobs generally are of short duration and building craftsmen may spend time in finding their next job.

What Are the Building Trades?

Building trades craftsmen are employed mainly in the construction, maintenance, repair, and alteration of homes and other types of buildings, highways, airports, and other structures, including substantial work involved in the Nation's missile and space programs. The wide range of materials and skills used in construction work has resulted in specialization of various work operations. Thus, building trades workers who use essentially the same materials or skills have tended to become identified with distinct trades. For example, bricklayers and stonemasons both work with masonry materials. Although operating engineers do not work with particular materials, they have a group of related skills which enables them to handle various types of excavating, grading, hoisting, and other equipment.

The building trades consist primarily of journeymen who generally must have a high level of skill and a sound knowledge of assembly and construction operations. They are often assisted in their work by apprentices, tenders, and laborers.

The work of journeymen may be grouped into three broad classifications—structural, finishing, and mechanical. However, some craftsmen—for example, carpenters—may do finishing as well as structural work. Generally, each building trade is classified in one of these three categories, as follows:

Occupations mainly concerned with structural work: Carpenter, bricklayer, stonemason, cement or concrete mason, structural-iron worker, ornamental-iron worker, reinforcing-iron worker (rodman), rigger, boilermaker, and operating engineer.

Occupations mainly concerned with finishing work: Lather, plasterer, marble setter, tile setter, terrazzo worker, painter, paperhanger, glazier, roofer, floor covering installer, and asbestos worker.

Occupations mainly concerned with mechanical work: Plumber, pipefitter, millwright, construction electrician, sheet-metal worker, and elevator constructor.

Most of the skilled building trades are described individually later in this chapter. These descriptions are necessarily brief and incomplete. They do not apply fully to all localities because of local differences in the scope of the various trades. Also, they are not statements or recommendations concerning the work jurisdiction of these trades and are inappropriate for use in jurisdictional negotiations or the settlement of jurisdictional questions.

(Detailed descriptions of the nature of the work, training, employment outlook, and other information concerning boilermakers and millwrights appear elsewhere in this *Handbook*. See index for page numbers.)

Where Building Trades Workers Are Employed

Building trades workers are employed mainly by contractors in the contract construction industry. Many others are employed to do maintenance work in industries other than construction, particularly manufacturing. Some building trades craftsmen work directly for business firms or government agencies which have their own construction work force; others are self-employed.

The building trades craftsmen who work in the contract construction industry are employed by general and special-trade contractors. General contractors may be classified as building (residential, commercial, or industrial), highway, or heavy construction contractors, since most general contractors limit their operations to one of these activities. They construct buildings and other structures, such as dams, bridges, and roads, taking full responsibility for the complete job, except for any specified portions of the work that may be omitted from the general contract. General contractors may do a large part of the work with their own crews, but they often subcontract particular phases of the construction job to special-trade contractors.

Special-trade contractors usually do the work of only one trade, such as painting, carpentry, or electrical work, or of two or more closely related trades, such as plumbing and heating, or plastering and lathing. Beyond fitting their work to that of other trades, they have no responsibility for the structure as a whole. The special-trade con-

tractors obtain orders for their work from general contractors, architects, or from property owners. Repair work is almost always done on direct order from the owners, occupants, architects, or rental agents.

There are several hundred thousand contractors (both general and special-trade); most of them operate within a limited geographical area. The great majority are small—generally employing fewer than 10 workers. Some firms employ several thousand workers each.

Many building trades workers are self-employed. Self-employed journeymen work directly for property owners on small jobs. They may be paid by the hour or the day, or they may be paid an agreed price for the job, either providing the materials and including them in the price or using materials provided by the owner. Self-employment is most common in carpentry and painting, but is found also in other skilled building trades.

In some of the trades, work may be performed away from the construction site. For example, sheet-metal workers may be employed in shops where ducts are fabricated for installation in a building. Many building trades craftsmen are also employed to do maintenance work in factories, stores, mines, hotels, and almost every other type of large business establishment.

The work of skilled building craftsmen is identified with a specific trade, such as carpentry or bricklaying, rather than with an individual contractor or even a broad group of contractors. Thus, a carpenter may be employed mainly by a particular builder but, in the course of a year, he may be employed also by a concrete contractor to build forms for a concrete bridge; by an electrical or plumbing contractor to build a temporary structure at a large construction site; or he may contract to do a small repair job on his own.

The fact that building trades craftsmen are employed in almost every community is an important consideration for young persons interested in a career in the skilled building trades. Once they learn one of the trades, they can find jobs not only in their own community but in almost any part of the country. Employment of these workers is distributed geographically, however, in much the same way as the Nation's

population. Thus, their employment is concentrated generally in the industrialized and highly populated States, such as California, New York, Illinois, Pennsylvania, Ohio, and Texas.

Training, Other Qualifications, and Advancement

Most training authorities, including national joint labor-management apprenticeship committees established for most of the building trades, recommend formal apprentice training as the best way to acquire the all-round proficiency of craftsmen in the building trades. Apprenticeship is a prescribed period of on-the-job training, supplemented by related classroom instruction, which is designed to develop skill by making the apprentice familiar with the materials, tools, and principles of his trade. This type of training provides the apprentice with a balanced knowledge of his field of work and enables him to perform its operations competently. Formal apprenticeship agreements are registered with a State apprenticeship agency or the U.S. Department of Labor's Bureau of Apprenticeship and Training.

Many building trades workers have acquired the skills of their trades informally, by working for many years as laborers and helpers, observing or being taught by experienced craftsmen. Some building trades craftsmen have acquired their skills, or part of their skills, by attending vocational or trade schools, or by taking correspondence school courses.

Apprentices in the building trades generally are required to be between the ages of 18 and 25, and in good physical condition. (The maximum age limit may be waived for veterans or others with experience or special qualifications.) A high school education, or its equivalent, with courses in mathematics and the sciences, is desirable. Often, applicants are given tests to determine their aptitude for a particular occupation. For some skilled building trades, it is important to have considerable manual dexterity, mechanical aptitude, a discerning color sense, and an eye for quickly determining proper alinement of materials.

The formal registered apprenticeship agreement generally stipulates a training period of

2 to 5 years of relatively continuous employment and training, in addition to a minimum of 144 hours a year of related classroom instruction. The journeymen on the job and the foreman explain to the apprentice how the work is done and show him how different operations are performed and how different tools are used. Ordinarily, most of this instruction is given by a particular journeyman to whom the apprentice is assigned. The apprentice is required to do work of progressively increasing difficulty and with progressively less supervision.

Related classroom instruction varies among the skilled building trades, but usually includes courses such as: History of the trade; characteristics of the materials used; shop mathematics as related to the work of the trade; some basic principles of engineering, where appropriate (particularly for pipework, work on ventilating systems, and electrical work); sketching, elementary drafting, and interpretation of drawings; safety practices; and special-trade theory such as color harmony for painters and elementary sanitation for plumbers. Such related instruction is seldom offered in small communities where there may be only a few apprentices and a small number of journeymen in a particular trade. In these areas, apprentices receive instruction through courses offered in the local high school or by visiting instructors, generally furnished by the State. Other subject matter requirements are met through personal instruction by local journeymen and contractors or, sometimes, through correspondence courses.

The formal registered apprenticeship agreements also stipulate the length of time the apprentice is to be required to work in each major operation of the trade as well as his rate of pay at successive intervals of advancement. The apprentice is paid at an advancing rate, usually starting at 50 percent of the journeyman's pay. The apprentice's rate increases at 6-month or 1-year intervals until a rate of about 90 percent of the journeyman's rate is reached in the final months of training. Often, advanced apprenticeship standing and pay are given to apprentices who have acquired trade skills in the Armed Forces, or through trade school instruction. Ad-

vanced standing is granted on an individual basis and is usually determined by a demonstration of trade skill and knowledge.

In most communities, the apprenticeship programs are supervised by joint apprenticeship committees composed of representatives of the local employers or employer groups and the local union. The apprentices sign their apprenticeship agreements with these committees. The committee determines the need for apprentices in the locality and establishes minimum apprenticeship standards of education, experience, and training. Whenever employers cannot provide the variety of experience necessary to give an apprentice all-round instruction in the various branches of the trade, or relatively continuous employment over the entire period of apprenticeship, the committee transfers the apprentice to another employer. Where specialization by contractors is extensive—for instance, in electrical work—it is customary for the joint committee to rotate apprentices among several contractors in the trade at intervals of about 6 months. In some large cities, the local joint apprenticeship committee employs an apprenticeship program coordinator.

In areas where these committees have not been established, the apprenticeship agreement is solely between the apprentice and an employer or employer group. Many journeymen have received worthwhile training under this type of apprenticeship program, but such a program may involve some element of risk for the apprentice. In such instances, there is no joint committee to supervise the training offered, to settle differences over the terms and conditions of apprentice training, or to arrange a transfer in cases of personal disagreements between the apprentice and the employer. The apprentice's training depends principally on his employer's business prospects and policies. If the employer lacks continuous work or does only a restricted type of work, he cannot provide the apprentice with the all-round training needed to develop journeyman skills.

In many localities, craftsmen, most commonly construction electricians and plumbers, are required to have a journeyman's license to work

at their trade. To qualify for such licenses, they must pass an examination, showing a well-rounded knowledge of the job and of State and local regulations.

Building trades craftsmen may advance in a number of ways. For example, a journeyman may become a foreman in charge of a crew. In most localities, small jobs are run by "working foremen" who work at the trade along with members of their crews. On very large jobs, the foremen do supervisory work only. A craftsman can also become an estimator for a contractor. In this job, he estimates material requirements and labor costs to enable the contractor to bid on the work of a particular construction project. Some craftsmen advance to jobs as superintendents on large projects. Others become instructors in trade and vocational schools, or salesmen for building supply companies.

In addition, many thousands of journeymen have become contractors, particularly in the homebuilding field. Sound journeyman knowledge is a great help in assuring success as a contractor. However, the successful contractor must also have the ability to plan work, to foresee needs and problems, to direct others, and to estimate material and time requirements for jobs on which he is bidding. He also must have a sound knowledge of business practices and financing.

Although the contract construction field is highly competitive, it is easier to start a small contracting business in the construction industry than it is to start a small business in other industries. For example, only relatively moderate financial investment is needed, liberal credit arrangements make it easier to buy materials, and it is possible to conduct a fairly substantial business from the proprietor's home. For larger jobs, considerable working capital and investment in equipment are necessary. Some States or municipalities require contractors to be licensed.

Employment Outlook

A substantial increase in the employment of skilled building trades workers is expected during the remainder of the 1960's and in the longer run. The rate of employment increase for these

craftsmen is expected to be greater than that anticipated for the Nation's total working population. (The rise in employment anticipated over the long run in the building trades as a whole and for the individual trades described later in this chapter, assumes realization of high rates of economic growth. If these high levels of economic activity are not realized, future employment in the building trades will fall short of the anticipated level.) In addition to openings resulting from employment growth, many thousands of job opportunities for new workers to enter the building trades will result each year from the need to replace skilled workers who transfer to other fields of work, are promoted to other jobs, or who retire or die.

The favorable employment prospects for nearly all skilled building trades workers will result primarily from the large increase anticipated in the level of construction activity, continuing the upward trend of the 1950's. The factors which will stimulate construction activity include anticipated large increases in population and in the number of households; a continuing shift of families from the cities to the suburbs; increases in government expenditures for highways, schools, and national defense; a rise in expenditures for new industrial plant capacity; higher levels of personal and corporate income; and expanding demand for maintenance, repair, and modernization work.

The large rise in construction activity is expected to result in a substantial increase in the employment of craftsmen in the construction industry. However, employment will increase at a slower rate than construction activity because continued technological developments in construction methods and equipment will permit greater output per construction worker. Employment of building trades craftsmen in maintenance jobs in factories, commercial establishments, schools, and large residential projects is also expected to increase substantially.

The rates of employment growth will differ among the various building trades. They are likely to be most rapid for asbestos and insulating workers; lathers; cement masons; glaziers; operating engineers; sheet-metal workers; and structural-, ornamental-, and reinforcing-iron

workers. Among the building trades which will have much slower growth are stonemasons, tile and marble setters, and elevator constructors.

(A more complete statement covering training, other qualifications, advancement, and employment opportunities in each building trade is given in the discussions of individual occupations later in this chapter.)

One of the principal sources of job opportunities for new building trades workers will result from replacement needs. Retirements and deaths alone will provide from 55,000 to 65,000 job openings each year. Other openings will result from the need to replace experienced craftsmen who leave the building trades for other fields of work.

In 1962, more than 100,000 men were registered in apprentice training programs in the construction trades and perhaps more than 20,000 other apprentices were in unregistered programs. Opportunities for many young men to receive apprentice training will be available in all parts of the country. In addition, thousands of other workers will be able to learn construction trades informally.

Some indication of the location of future apprenticeship opportunities in the building trades is available from the latest data showing the geographical distribution of registered apprentices in these trades. The following eight States accounted for more than half of the number of registered apprentices in training for selected building trades in mid-1962: California, New York, Illinois, Ohio, Pennsylvania, Texas, Michigan, and Florida.

Earnings and Working Conditions

Hourly wage rates paid to building trades craftsmen generally are higher than those paid to many other skilled workers. However, because construction work is seasonal and time is lost for other reasons, average annual earnings are not as high as the hourly rates of pay would indicate.

The hourly rates of pay for skilled workers in the building trades vary by trade and locality. Generally, the highest hourly rates are paid in the larger communities. Union minimum hourly rates for journeymen and for helpers and laborers in selected building trades in 53 large cities, as of July 1, 1962, averaged as follows:

	<i>Union minimum average hourly rate</i>
All building trades.....	\$3. 95
Journeymen.....	4. 15
Asbestos workers.....	4. 18
Bricklayers.....	4. 46
Carpenters.....	4. 07
Cement masons (finishers).....	4. 01
Electricians (inside wiremen).....	4. 37
Elevator constructors.....	4. 26
Glaziers.....	3. 77
Lathers.....	4. 25
Marble setters.....	4. 17
Terrazzo workers.....	4. 18
Tile setters.....	4. 12
Painters.....	3. 80
Paperhangers.....	3. 77
Pipefitters.....	4. 29
Plasterers.....	4. 28
Plumbers.....	4. 31
Roofers, composition.....	3. 85
Roofers, slate and tile.....	3. 80
Sheet-metal workers.....	4. 17
Stonemasons.....	4. 28
Structural-iron workers.....	4. 29
Rodmen.....	4. 18
Helpers and laborers.....	3. 15
Bricklayers' tenders.....	3. 38
Building laborers.....	3. 05
Composition roofers' helpers.....	2. 56
Elevator constructors' helpers.....	3. 16
Marble setters' helpers.....	3. 35
Terrazzo workers' helpers.....	3. 50
Tile setters' helpers.....	3. 38
Plasterers' laborers.....	3. 45
Plumbers' laborers.....	3. 10

Union rates for these occupations are negotiated between trade unions and employers. They do not include overtime, bonuses, or payments for special qualifications or for other reasons.

Construction work frequently requires prolonged standing, bending, stooping, and working in cramped quarters. Exposure to cold, hot, and inclement weather is common, as much of the work is done outdoors or in partially enclosed structures. During the winter, when the buildings are sufficiently enclosed, heat is commonly provided. Many persons prefer construction work to other skilled occupations, because they can work outdoors.

Construction work is generally more dangerous than work in manufacturing, but the risk of injury is lessened considerably when proper work practices are followed. In recent years, the safety record of construction workers in contract con-

struction work has improved as a result of safety programs established by employers and unions.

Forty hours was the standard workweek for a vast majority of union building trades workers in 1962. Time and one-half was generally paid for hours worked beyond the standard workday of 8 hours. Time and one-half or double-time rates were usually paid for work on Saturdays and Sundays or on holidays.

A substantial proportion of organized building trades workers are included in health, insurance, and pension programs negotiated between unions and employers, and financed entirely by employer contributions.

A large proportion of skilled building trades workers are members of trade unions affiliated with the Building and Construction Trades Department of the American Federation of Labor and Congress of Industrial Organizations.

Where To Go for More Information

Information on opportunities for apprenticeship or other types of construction employment in a particular locality should be obtained from individual construction firms, employer associations, locals of the building trades unions, or the

local office of the Bureau of Apprenticeship and Training, U.S. Department of Labor. Many apprenticeship programs are supervised by local joint union-management apprenticeship committees. In these instances, an apprentice applicant may apply directly to the coordinator of the joint apprenticeship committee, if there is one in his locality. In recent years, there has been a trend toward increased use of the local office of the State employment service as a source of information about apprenticeship openings.

For more information on jobs in the building trades, a young man should write to the organizations listed below:

American Federation of Labor and Congress of Industrial Organizations, Building and Construction Trades Department,
815 16th St. NW., Washington, D.C., 20006.

Associated General Contractors of America, Inc.,
1957 E St. NW., Washington, D.C., 20006.

National Association of Home Builders,
1625 L St. NW., Washington, D.C., 20036.

For the names of labor organizations and trade associations concerned with specific building trades, see the discussions of individual building trades later in this chapter.

Carpenters

(D.O.T. 5-25.110 through .840)

Nature of Work

Carpenters, the largest single group of building trades workers, are employed in almost every type of construction activity. They erect the wood framework in buildings, including subflooring, sheathing, partitions, floor joists, studding, and rafters. When the building is ready for trimming, they install molding, wood paneling, cabinets, window sash, doorframes, doors, and hardware, as well as build stairs and lay floors. Carpenters who do finish work must consider the appearance as well as the structural accuracy of the work.

Carpenters also install heavy timbers used in the building of docks, railroad trestles, and similar heavy installations. Carpentry work includes the building of forms to enclose concrete until it is hardened, for the making of

bridges, buildings, and other structures. Carpentry work also involves the erection of scaffolding and temporary buildings on the construction site.

As part of their job, carpenters also saw, fit, and assemble plywood, wallboard, and other materials. They use nails, bolts, wood screws, or glue to fasten materials. They may also install linoleum, asphalt tile, and similar soft-floor coverings. Carpenters use handtools such as hammers, saws, chisels, and planes, and power tools such as portable power saws, drills, and rivet guns.

Because of the wide scope of the work performed in the trade, some carpenters tend to specialize in a particular type of carpentry work. For example, some carpenters specialize in installing acoustic panels on ceilings and walls; others specialize in the installation of millwork



Journeyman carpenter shows apprentice how to line up doorframe

and finish hardware (trimming), laying hardwood floors, or building stairs. Specialization is more common in the large cities; in small communities, carpenters ordinarily do all types of carpentry work. In rural areas, carpenters may do the work of other craftsmen, particularly painting, glazing, or roofing. Carpenters generally stay in a particular field of construction, such as home, bridge, or highway construction, or in industrial maintenance.

Where Employed

Most carpenters work in the construction industry and are employed mainly by contractors and homebuilders at the construction site. Carpenters are mostly employed in new construction. A large number, however, are employed on alteration or modernization work. Some carpenters alternate between wage employment for contractors and self-employment on small jobs. Some work for

government agencies or nonconstruction firms which employ a separate work force for their own construction work. A large number of carpenters do maintenance work in factories, hotels, office buildings, and other large establishments. They are also employed in shipbuilding, in mining, and in the production of many kinds of display materials.

Training, Other Qualifications, and Advancement

Most training authorities, including the national joint labor-management apprenticeship committee for the carpentry trade, recommend the completion of a 4-year apprenticeship program as the best way to learn carpentry. A substantial number of workers in this trade, however, have acquired some carpentry skills informally, for example, by working around a farm. Many of these men have also gained some of the knowledge of the trade by taking correspondence or trade school courses.

Apprenticeship applicants are generally required to be at least 17 years of age; a high school education or its equivalent is desirable. Good physical condition, a good sense of balance, and lack of fear of working on structures high off the ground are important assets. Aptitudes which the apprentice should have include manual dexterity and the ability to solve arithmetic problems quickly and accurately.

The apprenticeship program usually consists of 8,000 hours (4 years) of on-the-job training, in addition to a minimum of 576 hours of related classroom instruction. During the apprenticeship period, the apprentice learns elementary structural design and becomes familiar with the common systems of frame and form construction, and to use, care for, and handle safely the tools, machines, equipment, and materials used in the trade. He also learns, among other things, how to build forms for holding concrete, framing, outside and inside finishing work, how to fit hardware, how to hang doors and set windows, and how to lay out work.

The apprentice receives related classroom instruction in drafting and blueprint reading, mathematics applicable to layout work, and the use of woodworking machines. Both in the class-

room and on the job he learns the relationship between carpentry and the other building trades, because the work of the carpenter is basic to the construction process.

Hourly wage rates for apprentices usually start at about 50 percent of the journeyman rate and increase by about 5 percent in each 6-month period until a rate of 85 to 90 percent is reached during the last period of apprenticeship.

Carpenters may advance to the position of carpenter foremen, or they may become general construction foremen. Carpenters usually have greater opportunities than most building craftsmen to become general construction foremen, since carpenters are familiar with the entire construction process. The proportion of self-employed among carpenters is higher than among most other skilled building trades. Some self-employed carpenters are able to become contractors—hiring other journeymen.

Employment Outlook

Tens of thousands of job openings will be available each year during the remainder of the 1960's and in the longer run for young men who wish to enter the carpentry trade. Most of these job openings will arise from the need to replace experienced workers who transfer to other fields of work, retire, or die. The large rise expected in construction activity (see discussion, p. 333) will also result in many job openings for new workers, but the number and skill requirements of carpenters will continue to be affected by technological developments. In addition, a growing number of carpenters will be needed in the maintenance departments of factories, commercial establishments, large residential projects, and government agencies. Construction materials that are processed off the site and materials designed for easier and faster installations have become progressively more important. There has also been a continued trend toward a greater use of factory prefabrication of structural building components as well as entire structures.

Carpenters comprise the largest single group of skilled workers in the country and account for approximately a third of all building trades craftsmen. About 800,000 carpenters were em-

ployed in early 1963. Because of the large size of this occupation, replacement needs are great. Retirements and deaths alone will provide from 20,000 to 25,000 job openings annually. Many other openings will result from the need to replace workers who transfer to other fields of work.

Young men who obtain all-round training of the kind given in apprenticeship programs will have especially favorable long-range job prospects. They are in much greater demand and have better opportunities for advancement than the many men in the trade who can do only the simpler and more routine types of carpentry work.

Earnings and Working Conditions

Union minimum hourly wage rates, as of July 1, 1962, for carpenters averaged \$4.07, compared with \$4.15 for all journeymen in the building trades, according to a national survey of building trades workers in 53 large cities. Among individual cities surveyed, the minimum hourly rates for carpenters ranged from \$2.50 in Charlotte, N.C., to \$5.05 in New York City.

A large proportion of carpenters are members of the United Brotherhood of Carpenters and Joiners of America.

Like other building trades, the work of the carpenter is active and is sometimes strenuous, but exceptional physical strength is not required. However, prolonged standing, as well as climbing and squatting, is often necessary. Carpenters risk injury from slips or falls, from contact with sharp or rough materials, and from the use of sharp tools and power equipment. Many young persons like carpentry because they are able to work out of doors.

Where To Go for More Information

A young man who wishes to obtain further information regarding carpentry apprenticeships or work opportunities in this trade should direct his inquiry to the carpentry contractors or general contractors in his area; a local of the United Brotherhood of Carpenters and Joiners of America; a local joint union-management apprenticeship committee, if there is one in his

locality; or the local office of the Bureau of Apprenticeship and Training, U. S. Department of Labor. In addition, the local office of the State employment service may be a source of information about apprenticeship opportunities. Some local employment services screen applicants and give aptitude tests.

General information on apprenticeship in this trade is also available from:

Associated General Contractors of America, Inc.,
1957 E St. NW., Washington, D.C., 20006.

United Brotherhood of Carpenters and Joiners of America,
101 Constitution Ave. NW., Washington, D.C., 20001.

Painters and Paperhangers

(D.O.T. 5-27.010 through .920 and 5-28.100)

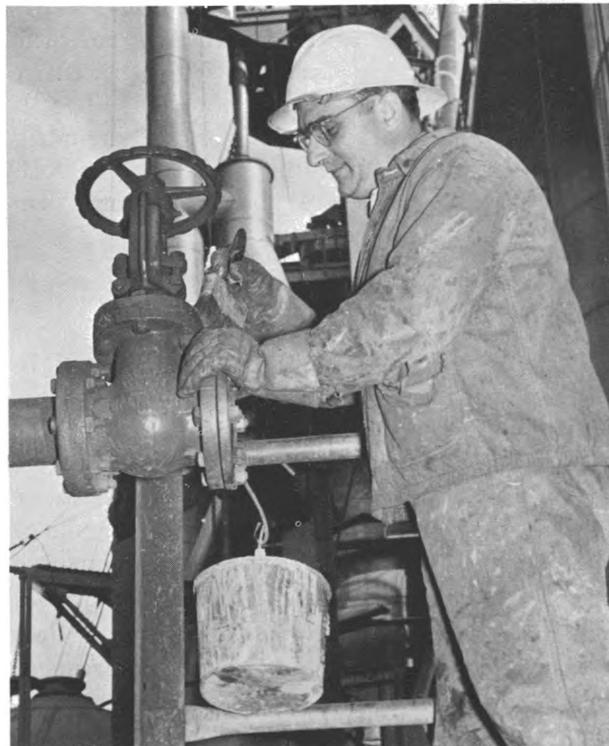
Nature of Work

Painting and paperhanging are separate skilled building trades, although many craftsmen in these trades do both types of work. Painters prepare the surfaces of buildings and other structures and then apply paint, varnish, enamel, lacquer, and similar materials to these surfaces. Paperhangers cover room interiors with paper, fabric, vinyls, or other materials.

One of the important duties of the painter—especially in repainting—is to prepare the surface. Loose paint must be removed by scraping or by heating with a blowtorch and then scraping. Grease must be removed, nail holes and cracks filled, rough spots sandpapered, and dust brushed off. Often, surfaces must be covered with a prime coat or sealer to provide a suitable surface or base on which to apply the new paint. Paint is applied to many kinds of materials, including wood, structural steel, and clay products, generally by a brush, spray gun, or roller.

A painter must be skilled in handling brushes and other painting tools, in order to apply paint thoroughly, uniformly, and rapidly to any type of surface. He must be able to mix paints, match colors, and must have a knowledge of paint composition and color harmony. He must also know the characteristics of common types of paints and finishes from the standpoints of durability, suitability for different purposes, and ease of handling and application.

Painters must know how to erect the scaffolding from which they often work, including "swing stages" (scaffolds suspended by ropes or cables attached to roof hooks) and "bosun chairs" which they use when working on tall buildings and other structures.



Painter applies paint to safety valve on overhead gas main

Painters use spray guns to paint surfaces or objects which are difficult to paint with a brush, such as lattices, cinder and concrete block, and radiators. They also use spray guns on large areas which can be sprayed with a minimum of preparation. When using a roller (a rotating applicator covered with soft material), the painter rolls the applicator over the surface to be covered.

The paperhanger first prepares the surface to be covered. In new work, he applies "sizing," a prepared material which makes the plaster less

porous and assures better sticking of the paper to the surface. In redecorating work, it may be necessary to remove old paper by soaking or, if there are many layers, by steaming. Frequently, it is also necessary for paperhangers to do minor plaster patching in order to get a smooth surface for the covering material.

When the surface has been prepared, the paperhanger measures the area to be covered and cuts the paper to size. He mixes a paste and applies it to the reverse side of the paper. The pastecoated paper is then placed on the wall or ceiling in strips and smoothed into place with a dry brush. The paperhanger matches the adjacent edges of strips of figured paper, cuts overlapping ends, and smooths the seams between strips with a roller or other special tool. When working with wall coverings other than paper, the paperhanger follows the same general procedure, except that he applies an adhesive other than paste.

Where Employed

Most painters and paperhangers work for contractors engaged in new building construction work. Substantial numbers of painters and paperhangers are also employed by contractors to do repair, alteration, or modernization work. Hotels, office buildings, shipyards, utility companies, manufacturing firms, schools and other government units, and other organizations that own extensive property commonly employ maintenance painters. When interior redecorating involves papering, as in hotels or apartment buildings, maintenance painters may also do the paperhanging.

Training, Other Qualifications, and Advancement

Most training authorities, including the national joint labor-management apprenticeship committee for the painting and decorating industry, recommend the completion of a 3-year formal apprenticeship as the best way to become a journeyman painter or paperhanger. A substantial proportion of painters and paperhangers, however, have learned the trade informally. They have picked up the trade by working for many years as helpers or handymen, observing or being taught by experienced craftsmen. Workers without formal apprentice training have gained

acceptance as journeymen more easily in these crafts than in most of the other building trades.

Apprentice applicants are generally required to be between the ages of 16 and 25 and in good physical condition. A high school education is preferred although not essential. Applicants should have manual dexterity and a discerning color sense. They should not be allergic to paint fumes or to the various materials used in these trades.

The apprenticeship for painters and paperhangers generally consist of 6,000 hours (3 years) of on-the-job training, in addition to related classroom instruction. Many apprenticeships combine painting and paperhanging. In a typical 3-year training program, the apprentice learns, among other things, to use, care for, and handle safely the tools, machines, equipment, and materials commonly used in the trade; prepare surfaces, including sizing, sandpapering, and puttying walls; match and mix colors; apply various types of interior and exterior materials, including stain, lacquer, enamel, oil, and varnish; and erect scaffolding.

In addition, the apprentice receives related classroom instruction in color harmony; paint



Paperhanger removes excess wall covering around window frame

chemistry; estimating costs; and making, mixing, and matching paints. He also learns the relationship between painting and paperhanging work and the work performed by the other building trades craftsmen.

Hourly wage rates for apprentices usually start at 50 percent of the journeyman rate and increase periodically until the journeyman rate of pay is reached upon completion of apprenticeship.

Painters and paperhangers may advance to the position of foreman. They may also advance to jobs as estimators for painting and decorating contractors—computing material requirements and labor costs. Some may become superintendents on large contract painting jobs, or they may establish their own business as painting and decorating contractors.

Employment Outlook

The employment of painters—who numbered about 350,000 in early 1963—is expected to increase moderately during the remainder of the 1960's and in the longer run. Employment of paperhangers—who numbered more than 9,000 in early 1963—is expected to decline slightly despite the anticipated large expansion in construction activity. (See discussion, p. 333.) Most job opportunities will arise from the need to replace experienced workers who retire, transfer to other fields of work, or die.

Technological developments have limited and are expected to continue to limit the employment of painters and affect their skill requirements. New types of paint which are more easily applied and have improved "covering power" have made it easier for inexperienced workers to do work which is acceptable to some customers. Spray painting requires fewer painters to do the same amount of work. Moreover, many items formerly painted at the building site now come from a factory with a prime coat and often with a final coat. Aluminum building products which often require no painting have become increasingly common in recent years.

Employment of paperhangers is likely to continue to decline. Although the use of fabrics, plastics, and other types of wall coverings has become more widespread, the large scale substitution of

paint for wallpaper as a covering for interior walls in residential and commercial buildings is expected to limit employment opportunities for paperhangers.

Because of the large size of the painter group, replacement needs are great. Retirements and deaths will result in about 10,000 job openings annually. Many other openings will result from the need to replace painters who transfer to other fields of work. Replacement needs for paperhangers will number only a few hundred annually.

Earnings and Working Conditions

Union minimum hourly wage rates for painters and paperhangers in 53 large cities averaged \$3.80 and \$3.77, respectively, as of July 1, 1962, according to a national survey of building trades workers. In comparison, the average rate for all journeymen in the building trades was \$4.15 an hour. Among individual cities surveyed, the minimum hourly rates for painters ranged from \$2.55 in Richmond, Va., to \$4.50 in New York City. The rates for paperhangers ranged from \$2.50 in Louisville, Ky., to \$4.36 in Los Angeles, Calif.

A large proportion of painters and paperhangers are members of the Brotherhood of Painters, Decorators and Paperhangers of America. A few are members of other unions.

Painters and paperhangers are often required to stand for long periods of time, to climb, and to bend at their work. A painter must have strong arms because much of the work is done with arms raised overhead. Painters and paperhangers risk injury from slips or falls from ladders and scaffolds. The number of injuries per million man-hours worked by employees of painting and paperhanging contractors in the contract construction industry has been lower than that for contract construction as a whole, but higher than for all manufacturing industries.

Where To Go for More Information

A young man who wishes to obtain further information concerning painting and paperhanging apprenticeships or work opportunities in these trades should apply to a painting and decorator contractor in his area; a local of the

Brotherhood of Painters, Decorators and Paperhangers of America; a local joint union-management apprenticeship committee, if there is one in his locality; or the local office of the Bureau of Apprenticeship and Training, U.S. Department of Labor. In addition, the local office of the State employment service may be a source of information about apprenticeship opportunities.

General information about the work of painters and paperhangers may be obtained from:

Brotherhood of Painters, Decorators and Paperhangers of America,
217-219 North Sixth St., Lafayette, Ind., 47901.

Painting and Decorating Contractors Association of America,
2625 West Peterson Ave., Chicago, Ill., 60605.

Plumbers and Pipefitters

(D.O.T. 5-30.010, .026, .210, and .410)

Nature of Work

Plumbers and pipefitters are craftsmen who install pipe systems which carry water, steam, air, or other liquids or gases needed for sanitation, industrial production, or other uses. They also alter and repair existing pipe systems and install plumbing fixtures, appliances, and heating and refrigerating units.

Although plumbing and pipefitting are sometimes considered to be a single trade, journeymen in this field can specialize in either one craft or the other, particularly in large cities. Water, gas, and waste disposal systems, especially those which must be connected to public utility systems, are installed by plumbers. Such installations are made in residential and commercial buildings, schools, industrial plants, and other structures. Pipefitters install both high- and low-pressure pipes that carry hot water, steam, and other liquids and gases, especially those in industrial and commercial buildings and defense establishments, such as missile launching and testing sites. Pipefitters, for example, install ammonia-carrying pipelines in refrigeration plants, complex pipe systems in oil refineries and chemical and food-processing plants, automatic sprinkler systems, and pipelines for carrying compressed air and industrial gases in many types of industrial establishments.

Some plumbers and pipefitters specialize in either gas fitting or steam fitting. Gas fitters install and maintain the gas fittings and the central gas main extensions which connect the main gas line with those leading to homes. Steamfitters assemble and install steam or hot water systems for commercial and industrial uses.

Plumbers and pipefitters use a variety of skills when installing pipe systems. For example, they bend pipe and make welded, brazed, calked, soldered, or threaded joints. After a pipe system is installed, the plumber or pipefitter tests for leaks by filling the pipes with liquid or gas under pressure.

Plumbers and pipefitters use wrenches, reamers, drills, braces and bits, hammers, chisels, saws, and other handtools. Power machines are often used to cut, bend, and thread pipes. Hand-operated hydraulic pipe benders are also used. In addition, plumbers and pipefitters use gas or gasoline torches and welding, soldering, and brazing equipment in their work.

Where Employed

Most plumbers and pipefitters are employed by plumbing and pipefitting contractors in new building construction, mainly at the construction site. A substantial proportion of plumbers are self-employed or work for plumbing contractors doing repair, alteration, or modernization work. Some plumbers install and maintain pipe systems for government agencies and public utilities, and some work on the construction of ships and aircraft. Others do maintenance work in industrial and commercial establishments. Pipefitters, in particular, are employed as maintenance personnel in the petroleum, chemical, and food-processing industries where the industrial operations include the processing of fluids through pipes.



Pipefitter bends pipe with hydraulic pipe bender

Training, Other Qualifications, and Advancement

Most training authorities, including the national joint labor-management apprenticeship committees for the plumbing and pipefitting industries, recommend a formal 5-year apprenticeship for plumbers or for pipefitters as the best way to learn all the aspects of these trades. A large number of plumbers and pipefitters, however, have acquired plumbing and pipefitting skills informally, by working for several years with craftsmen, receiving instruction from them and watching them work. Many of these persons have gained some of their knowledge of their trade by taking trade or correspondence school courses.

Apprentice applicants generally are required to be between the ages of 16 and 25, and in good physical condition. A high school education or its equivalent, including courses in mathematics, physics, and chemistry, is desirable. Applicants are often required to take aptitude tests, particularly to determine whether they have the high degree of mechanical aptitude required in this field.

Most apprentice training programs for plumbers and pipefitters are conducted under written

agreements between the apprentices and local joint apprenticeship committees, composed of union and management representatives, who supervise the training. The apprenticeship committee determines the need for apprentices in the locality, establishes minimum apprenticeship standards of training, and, if necessary, schedules a rotating work program. This program is designed to give the apprentice diversified training by having him work for several plumbing or pipefitting contractors.

The apprenticeship program for plumbers or for pipefitters usually consists of 10,000 hours of on-the-job training, in addition to at least 720 hours of related classroom instruction. In a typical 5-year training program, the plumber or pipefitter apprentice learns, among other things, how to use, care for, and handle safely the tools, machines, equipment, and materials used in the trades. They also learn welding and soldering techniques and general repair work; the use of ladders and the erection and dismantling of scaffolding; and the proper use of plastic and glass piping. The plumber apprenticeship program includes training in the installation of waste, vent, and domestic hot and cold water pipes, and the piping in septic tanks, cesspools, and sewers; the testing of plumbing installations; and in estimating jobs and costs of materials required. The pipefitter apprenticeship program includes training in the installation of radiators, pumps, boilers, stokers, oil burners, and gas furnaces; hot water, steam panel, and radiant-heating systems; air-conditioning and powerplant piping systems; and pneumatic control systems and instrumentation. They may also learn boiler replacement.

The apprentice receives related classroom instruction in subjects such as drafting and blueprint reading, mathematics applicable to layout work, applied physics and chemistry, and local building codes and regulations which apply to the trade.

Hourly wage rates of apprentices in this trade usually start at 50 percent of the journeyman rate and increase by about 5 percent in each 6-month period until a rate of 95 percent is reached during the last period of the apprenticeship.

In some localities, a journeyman's license is required for plumbers. To obtain this license,

a person must pass a special examination to demonstrate his knowledge of the local building codes. The examination also tests his all-round knowledge of the trade.

Some journeymen plumbers and pipefitters may become foremen for plumbing or pipefitting contractors. Many journeymen go into business for themselves. As they expand their activities, they may employ other workers and become plumbing and pipefitting contractors. In most localities, contractors are required to obtain a master plumber's license.

Employment Outlook

Employment of plumbers and pipefitters is expected to rise rapidly during the remainder of the 1960's and in the longer run. In addition to openings resulting from the increase in employment, many job opportunities for new workers will arise as a result of replacement needs.

The most important factor which will contribute to the rapid rise in employment is the large increase anticipated in construction activity. (See discussion, p. 333.) Furthermore, plumbing and heating work is expected to become more important in many types of construction. For example, the trend toward more bathrooms per dwelling unit is likely to continue. The installation of appliances such as washing machines and waste disposals will become more widespread. The number of automatic heating system installations probably will increase. Also, in industry generally, pipework is becoming more important and plumbers and pipefitters will be needed for installation and maintenance work. For example, the chemical industry, which uses extensive pipework in its processing activities, is expected to expand its facilities. Those industries which are automating their production activities will require more pipefitting work. The increasing industrial activities related to atomic energy and the greater use of refrigeration and air-conditioning equipment will also result in more work for plumbers and pipefitters. On the other hand, technological developments, such as the growing use of factory prefabricated plumbing assemblies, may limit, somewhat, the growth in the number of jobs for plumbers and pipefitters.

More than 300,000 plumbers and pipefitters were employed in early 1963. Because of the large size of this occupational group, the need to replace experienced workers who transfer to other fields of work, retire, or die will provide thousands of job openings for new workers each year. Retirements and deaths alone will result in approximately 7,000 to 8,000 job openings annually.

Earnings and Working Conditions

Union minimum hourly wage rates for plumbers and for pipefitters averaged \$4.31 and \$4.29, respectively, as of July 1, 1962, according to a national survey of building trades workers in 53 large cities. At the same time, all journeymen in the building trades had an average hourly rate of \$4.15. Among individual cities surveyed, the union minimum hourly wage rates for plumbers ranged from \$3.45 in Charlotte, N.C., to \$5.21 in Oakland, Calif.; pipefitters' rates ranged from \$3.45 in Charlotte, N.C., to \$5.16 in Oakland.

Young people contemplating plumbing and pipefitting as a career should consider the fact that annual earnings of workers in this field are among the highest in the building trades. This is so because plumbing and pipefitting are affected less by seasonal factors than are most other building crafts.

A large proportion of plumbers and pipefitters are members of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada.

The work of plumbers and pipefitters is active and sometimes strenuous, as is the work in the other building trades. They frequently must stand for prolonged periods and occasionally work in cramped or uncomfortable positions because much of their work is done in relatively inaccessible places.

Workers in this trade risk the danger of falls from ladders, cuts from sharp tools, and burns from hot pipes or steam. The number of injuries per million man-hours worked by employees of plumbing, heating, and air-conditioning contractors in the contract construction industry has been lower than that for contract construction as a whole, but higher than the average for production workers in manufacturing industries.

Where To Go for More Information

A young man who wishes to obtain further information concerning enrollment in a local plumber or pipefitter apprenticeship program or to locate work opportunities in the field should apply to a plumbing, heating, and air-conditioning contractor in his area; a local union of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada; a local joint union-management apprenticeship committee, if there is one in his area; or the local office of the Bureau of Apprenticeship and Training, U.S. Department of Labor. In addition, the local office

of the State employment service may be a source of information about apprenticeship opportunities. Some local employment service offices provide such services as screening applicants and giving aptitude tests.

General information about the work of plumbers and pipefitters may be obtained from:

National Association of Plumbing-Heating-Cooling Contractors,
1016 20th St. NW., Washington, D.C., 20036.

United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada,
901 Massachusetts Ave. NW., Washington, D.C., 20001.

Bricklayers

(D.O.T. 5-24.000 through .199)

Nature of Work

Bricklayers (or brickmasons) are craftsmen who construct walls, partitions, fireplaces, chimneys, and other structures from brick. They also use other masonry materials, such as concrete, cinder, gypsum block or precast panels made of brick, cement, tile, stone, or marble; structural tile, or terra cotta (a hard-baked brick used for ornamental purposes). They also install the brick linings of industrial kilns and furnaces.

In laying brick, a bricklayer first spreads a layer or "bed" of soft mortar. He applies mortar to the end of the last brick laid or to one end of a brick to be laid. He places the brick on the bed of mortar and works it into the desired position with his hand. Then he cuts off the excess mortar. When necessary, he breaks bricks with a trowel or brick hammer to fit spaces too small for whole bricks. He keeps the courses (rows) of brick level by using a tightly stretched horizontal cord (gauge line) as a guide. At fixed points along the wall he checks the surface with a mason's level to make sure the bricks are lined up. A plumb line is also used to check vertical alignment. Using the point of a trowel or a special finishing tool, he trims the mortar between the bricks to achieve a neat appearance. If two or more thicknesses of brick are being laid, the brickmason lays a "bond" course at regular intervals, that is, he arranges a row of bricks crosswise

or in another "bond" pattern in order to tie the bricks together. Whether the bricklayer works with brick, concrete block, structural tile, or other masonry material, the work is essentially the same.

Bricklaying requires careful, accurate work so that the brick structure will have a neat and uniform appearance and the rows of brick will line up with windows, doors, or other openings without excessive cutting of brick. Craftsmen in this trade mainly use handtools, including chisels, trowels, jointers, and tuck pointers (a special finishing tool used to shape mortar joints), bricklayer's hammers, gauge lines, plumb bobs, and mason's levels. Powersaws are sometimes used for cutting masonry materials. Journeymen bricklayers are usually assisted by hod carriers or helpers who supply them with bricks and other materials, mix mortar, and set up and move scaffolding.

Where Employed

The great majority of bricklayers work mainly on new building construction. Some are employed in sewer construction work in which they construct manholes and catch basins. Bricklayers do a considerable amount of alteration work, especially in the larger cities where construction of fire-resistant partitions, store front remodeling,



Journeyman bricklayer teaches apprentice how to form a corner

and similar modernization work, are often done. They also do a substantial amount of maintenance and repair work.

Bricklayers also work for such industrial establishments as factories making glass or steel, where furnaces and kilns require special fire brick and refractory brick linings. For example, in a steel manufacturing plant, the bricklayer lines converters, cupolas, and ladles which hold molten metal. Bricklayers must have additional training to do refractory brick work.

Training, Other Qualifications, and Advancement

Most training authorities, including the national joint labor-management apprenticeship committee for the bricklaying trade, recommend the completion of a 3-year apprenticeship program as the best way to learn this trade. Many workers in this trade have acquired bricklaying skills informally, by working for many years as helpers or hod carriers, observing or being taught by experienced bricklayers. Many of these persons have gained additional knowledge of their trade by taking trade school courses.

Apprenticeship applicants are generally required to be between the ages of 17 and 24. A high school education or its equivalent is desirable.

The apprenticeship program generally consists of 6,000 hours (3 years) of on-the-job training, in addition to related classroom instruction. In a typical 3-year bricklayer training program, the apprentice learns, among other things, to use, care for, and handle safely the tools, machines, equipment, and materials commonly used in the trade; lay brick (including mixing and spreading mortar), bond and tie, build footings and foundations; do plain exterior brickwork such as straight wall work; build arches, columns, piers, and corners; plan and build chimneys, fireplaces, and floors; lay stone; point brick and stone; clean stone, brick, and tile with water and acid, and by sandblasting; cut, set, and point cement blocks, artificial stone, glass blocks, and cork; and fireproof. The apprentice receives related classroom instruction in blueprint reading, welding, layout work, and measurements and sketches. In addition, he learns the relationship between bricklaying and other building trades.

A bricklayer must have an eye for straight lines and proportions. Good physical condition and manual dexterity are important assets. Since the other building craftsmen must usually fit their work to his, he should know how the parts of a structure fit together.

Hourly wage rates for bricklayer apprentices generally start at 50 percent of the journeyman rate and increase periodically until 95 percent of the journeyman's rate is reached during the last period of the apprenticeship.

In some areas, formal apprentice training for bricklayers includes brief, preliminary instruction at a vocational school or some other type of prejob training which is designed to give the apprentice sufficient skill in the handling of tools and materials to make him productive at the start of his on-the-job training.

Bricklayers may advance to jobs as foremen. They may also become estimators for bricklaying contractors. Estimators compute material requirements and labor costs. Some journeymen advance to the position of bricklaying superintendent on large construction projects, while others may start their own bricklaying contracting business.

Employment Outlook

The number of bricklayers—estimated at more than 150,000 in early 1963—is expected to rise rapidly over the next 10 to 15 years. In addition to job openings that will result from growth of the trade, many job opportunities for new workers will arise from replacement needs.

Much of the expected growth in this trade will result from the large increase anticipated in construction activity. (See discussion, p. 333.) The job outlook for bricklayers also will be favorably affected by technological developments in construction techniques and materials. For example, more bricklayers may be needed to install the precast panels made of brick and other masonry materials that are being used increasingly in building construction. Structural clay tile for fire-resistant partitions and glass blocks for exterior walls are expected to be used increasingly. Ornamental brickwork is growing in popularity for structures such as exterior screenwalls and interior lobbies and foyers. Brickmasonry load-bearing walls are growing in use, particularly in apartment buildings. These favorable developments, however, will be offset to some extent by construction techniques that reduce the amount of brickwork per structure. For example, the use of steel framework and reinforced concrete in structures permits the elimination of load-bearing exterior brick walls. Also, the use of metal and glass wall panels in buildings results in less masonry work.

The need to replace experienced craftsmen who retire or die will result in about 3,000 job openings annually. Replacement of workers who leave the trade for other reasons will provide additional job openings.

Earnings and Working Conditions

Union minimum hourly wage rates for bricklayers, as of July 1, 1962, averaged \$4.46, com-

pared with an average of \$4.15 for all journeymen in the building trades, according to a national survey of building trades workers in 53 large cities. Among individual cities surveyed, the minimum hourly rates for bricklayers ranged from \$3.30 in Charlotte, N.C., to \$5.35 in New York City.

A large proportion of bricklayers are members of the Bricklayers, Masons and Plasterers' International Union of America.

The work of the bricklayer is active and sometimes strenuous, like the work in other building trades. It involves stooping to pick up materials, moderately heavy lifting, and prolonged standing. Most of the work is done outdoors.

Where To Go for More Information

A young man who wishes to obtain further information regarding bricklaying apprenticeships or work opportunities in the trade should apply to a bricklaying contractor in his area; a local of the Bricklayers, Masons and Plasterers' International Union of America; the local joint union-management apprenticeship committee, if there is one in his area; or the local office of the Bureau of Apprenticeship and Training, U.S. Department of Labor. In addition, the local office of the State employment service may be a source of information about apprenticeship opportunities. Some local employment service offices provide services such as screening applicants and giving aptitude tests.

General information about the work of bricklayers may be obtained from:

Associated General Contractors of America, Inc.,
1957 E St. N.W., Washington, D.C., 20006.

Bricklayers, Masons and Plasterers' International
Union of America,
815 15th St. NW., Washington, D.C., 20005.

Structural Clay Products Institute,
1520 18th St. NW., Washington, D.C., 20036.

Operating Engineers (Construction Machinery Operators)

(D.O.T. 5-23.000 through .999 and 7-23.000 through .999)

Nature of Work

Operating engineers operate, maintain, and repair various types of power-driven construc-

tion machinery. These machines include power shovels, cranes, derricks, hoists, pile drivers, concrete mixers, paving machines, trench ex-

cavators, bulldozers, tractors, and pumps. Operating engineers are often identified by the types of machines they operate—for example, crane-man, bulldozer operator, or derrick operator. Because operating engineers work with many different types of machines—some complex and others relatively simple—the range of skills among these workers is broader than among journeymen in any other building trade. This range of skills may be illustrated by describing the work performed by an engineer who operates a crane and one who operates an earth-boring machine.

The crane operator manipulates various pedals and levers to rotate the crane on its chassis and to raise and lower the crane boom and the loadline. The operator also manipulates a number of different attachments to the crane boom for various construction purposes. For example, he manipulates buckets for excavation work; pile drivers to drive steel beams, wood, and concrete piling into the ground; and wrecking balls for demolition work. Good eye-hand-foot coordination, skill in precision handling of heavy equipment, and judgment in estimating proper load size are among the essential aptitudes needed to do the crane operator's job. In contrast, the operation of earth-boring machines that dig holes for poles or posts is one of the less skilled tasks performed by operating engineers. The operator sets the proper auger (drill) in the spindle, starts the machine, and stops it when the auger has penetrated to the proper depth.

While the skills required of an operating engineer vary, there is an increasing trend toward more versatility in this field, and an individual who desires steady employment, particularly in the construction field, should know how to operate several different types of equipment. Operators prefer to work on the more complex types of machines when jobs requiring such equipment are available, because higher wage rates are paid for the operation of such machines.

Where Employed

Most operating engineers are employed on construction work. They work for contractors engaged in highway, dam, airport, and other



Bulldozer operator levels terrain for road

large-scale engineering projects. On building projects, they are employed in excavating, grading, landscaping and in hoisting concrete, steel, and other building materials. Others are employed by utility companies, manufacturers, and other business firms which do their own construction work, as well as by State and local public works and highway departments. Relatively few operating engineers are self-employed. Those who are self-employed are owner-operators of construction equipment, such as bulldozers and cranes.

In addition to employment in construction work, operating engineers operate cranes, hoists, and other power-driven machinery in factories and mines. In some cases, the duties of operating engineers in nonconstruction jobs are about the same as those in construction work. For example, operation of a crane to unload cars of coal at a factory is very similar to operation of a crane to unload cars of sand and gravel for a street paving job. On the other hand, the nature of the work of a steel pourer (craneman) in a steel mill differs considerably from that of a crane operator in the construction industry.

Construction machinery operators—who numbered about 225,000 in early 1963—are employed in every section of the country. Their work, however, may take them to remote locations where highway construction and heavy engineering construction, such as dams, are being done.

Training, Other Qualifications, and Advancement

Most training authorities, including the National Joint Apprenticeship and Training Committee for Operating Engineers, recommend the completion of a 3-year apprenticeship as the best way to qualify for journeyman status as an operating engineer. Many men with mechanical aptitude, however, enter this occupation by obtaining jobs as oilers (operating engineer's assistants) or as helpers to heavy equipment repairmen. Workers on these jobs gain a knowledge of the machinery, how to keep it in good working order, and how to make repairs. Oilers and helpers must perform their work well and demonstrate initiative before they are given the instruction from experienced operators which is necessary for advancement. They must also demonstrate interest in and ability to learn the correct methods of handling equipment, and be able to recognize hazards which must be avoided.

Some men with mechanical experience, such as that obtained from operating farm equipment or air compressors, may get jobs operating the simpler construction machines. Operating knowledge of a broad range of related equipment and attachments, however, is ordinarily necessary to obtain continuous employment. This all-round knowledge is best obtained through a formal apprenticeship program or by working as a oiler or helper, usually for a much longer period of time than it takes to complete an apprenticeship.

Apprenticeship standards provide training in the operation of each of the following types of equipment: (1) Universal equipment (hoists, shovels, cranes, and related equipment), (2) grading and paving equipment, and (3) plant equipment (such as material mixing and crushing machines). These standards also provide for the training of heavy-duty repairmen. The apprenticeship program for each training classification consists of at least 6,000 hours (3 years) of on-the-job training. Training is given either by a lead engineer, a journeyman, or a master mechanic. In a typical universal equipment training program, the apprentice learns, among other things, to use, care for, and handle safely the equipment and tools used in the trade; set grade stakes; and read plans and instructions. He

also learns to use welding and cutting equipment and the different types of greases and oils. In addition to on-the-job training, the apprenticeship program includes a minimum of 144 hours a year of related classroom instruction in subjects such as blueprint reading, elements of electricity, physics, welding, and automotive servicing.

Apprenticeship applicants generally must be between the ages of 18 and 25 and must be physically able to perform the work of the trade. A high school education or its equivalent is required to complete satisfactorily the related theoretical instruction. Applicants must also demonstrate the ability and aptitude necessary to master the rudiments of the trade.

Hourly wage rates for apprentices start at a stipulated proportion of the journeyman rate (at least 65 percent in most cases) and increase periodically until the journeyman rate is reached at the completion of the apprenticeship.

Employment Outlook

Employment of construction machinery operators is expected to continue to rise more rapidly than employment in most other building trades during the remainder of the 1960's and in the longer run, primarily as a result of the anticipated large increases in construction activity. (See discussion, p. 333.) The growing volume of highway construction, resulting from the Federal Government's long-range multibillion dollar highway development program, will be especially important in providing thousands of job opportunities for operating engineers.

Moreover, the trend toward the increasing use of construction machinery shows every indication of continuing. More specialized and more complex machines, particularly those used in earth moving, as well as smaller machines suitable for small construction projects, are continually being developed and are expected to be used to a greater extent. The increasing mechanization of material movement in factories and mines should also result in growing employment of operating engineers outside of construction.

In addition to job openings resulting from the expected growth of employment in this occupation, the need to replace experienced construction

machine operators who transfer to other fields of work, retire, or die will result in many job opportunities for new workers. Retirements and deaths alone will provide from about 5,000 to 6,000 job openings annually.

Earnings and Working Conditions

The wage rate structure for operating engineers is more complicated than for any other construction trade. Hourly rates are established not only for operators of different types of machines, but often for operators of machines of the same type but of different capacity. Moreover, in some cases there are different rates for the same machine, depending upon the type of construction for which it is used. The wage scale also varies among different parts of the country and the operators of machines having the top wage rates in one area do not necessarily receive the top wage rates in other areas.

Shovel operators, who generally are among the highest paid construction machinery operators, had union minimum hourly rates ranging from \$3.20 in Charlotte, N.C., to \$5.70 in Newark, N.J., as of July 1, 1962, according to a national survey of building trades workers in 53 large cities. The

rates for bulldozer operators ranged from \$2.77 in Richmond, Va., to \$4.63 in Pittsburgh, Pa.

A large proportion of operating engineers are members of the International Union of Operating Engineers.

The operating engineer's work is performed outdoors. The work is active and sometimes strenuous. The operation of some machines, particularly bulldozers and some types of scrapers, is physically tiring because the constant movement of the machine shakes or jolts the operator.

Where To Go for More Information

A young man who wishes to obtain further information regarding qualifications and training for the job of operating engineer, and the location of apprenticeship programs, should direct his inquiry to the International Union of Operating Engineers, 1125 17th St. NW., Washington, D.C., 20036. For information regarding work opportunities, he should apply to general contractors in his area. The local office of the State employment service also is a source of information about employment opportunities.

General information about the work of operating engineers may be obtained from the Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C., 20006.

Electricians (Construction)

(D.O.T. 4-97.010)

Nature of Work

Construction electricians perform the various tasks related to electrical work on construction projects. They lay out, assemble, install, and test electrical fixtures, apparatus, and wiring used in electrical systems. These systems are used to provide heat, light, power, air conditioning, and refrigeration in residences, office buildings, factories, hospitals, schools, and other structures. They also install and connect electrical machinery, equipment, and controls. (Maintenance electricians do work which is similar in many respects to that performed by construction electricians. A discussion of maintenance electricians is presented elsewhere in this *Handbook*. See index for page numbers.)

Construction electricians install many types of switches, conduits, controls, circuit breakers, wires, lights, signal devices, and other electrical components, following blueprints and specifications. If there is no electrical drawing, the electrician terminates the incoming electrical service into a central fuse box and installs interior circuits and outlets according to the amount of electrical current expected to be used in the various sections of the building. The incoming service and interior circuits are protected by fuses or circuit breakers of the proper rating to prevent overheating of wire, appliances, and motors. The construction electrician should know and follow national electrical code regulations and, in addition, must fulfill State, county, and municipal regulations.

In installing wiring, the construction electrician uses a mechanical or hydraulic bender to shape conduit (pipe or tubing) so that the conduit will fit the contours of the surface to which it is attached, or within the space allotted. The electrician then pulls insulated wires or cables through the conduit. The wire or cable sizes vary from those smaller than the lead in a pencil to those about 3 inches thick. The electrician then connects the ends of the wires or cables to circuit breakers, switch-gear motors, transformers, or other components. When these operations are completed, the electrician tests the electrical circuits to make sure that the entire system is properly grounded, the connections properly made, and the circuits do not carry excessive current. Wires are spliced (joined) by soldering or other methods.

The electrician furnishes his own handtools, such as pliers, screwdrivers, brace and bits, knives, and hacksaws. The employer furnishes test meters and heavier tools and equipment, such as pipe threaders, conduit benders, chain hoists, electric drills, power fasteners, and ladders. In



Construction electrician installs conduit and terminal boxes

residential electrical construction work, heavier tools are not usually required.

Electrical work in installations with unusually high electrical power requirements, such as are needed at powerplants, steel mills, and other establishments, may be done by journeymen electricians who specialize in this type of work. However, most construction electricians can do all types of electrical work.

Where Employed

Most construction electricians work for electrical contractors. Substantial numbers are self-employed. Others work for government agencies or business establishments which do their own construction electrical work rather than hire electrical contractors. Although many construction electricians work for the same electrical contractor for several years, job transfers are fairly common. During a single year, a construction electrician may work for an electrical contractor in the construction of new homes or office buildings, for a manufacturing firm in remodeling its plant or offices, or he may do electrical repairs for homeowners or business firms.

Training, Other Qualifications, and Advancement

Most training authorities, including the national joint labor-management apprenticeship committee for the electrical contracting industry, recommend the completion of a 4- or 5-year apprenticeship program for construction electricians as the best way to learn all the aspects of this trade. Some construction electricians, however, have learned the trade informally. They have acquired skills of the trade by working for many years as helpers, observing or being taught by experienced craftsmen. Many of these persons have gained some knowledge of the trade by taking trade school or correspondence courses, or through special training while in the Armed Forces.

Apprenticeship applicants generally are required to be between the ages of 18 and 24. A high school education or its equivalent, including courses in mathematics and physics, is desirable. Applicants are required to take tests to determine their aptitude for the trade.

All apprenticeship programs are conducted under written agreement between the apprentice and the local joint union-management apprenticeship committee, which also supervises the training. The committee determines the need for apprentices in the locality, establishes minimum apprenticeship standards and pay, and schedules a diversified, rotating work program. This program is designed to give the apprentice all-round training by having him work for several electrical contractors who engage in particular types of work.

The International Brotherhood of Electrical Workers and the National Electrical Contractors Association have jointly developed an extensive apprenticeship program. They have a national director of apprenticeship who assists the local joint apprenticeship committees.

The apprenticeship program usually requires 8,000 or 10,000 hours (4 or 5 years) of on-the-job training, in addition to a minimum of 144 hours of related classroom instruction each year. In a typical 4-year training program, the construction electrician apprentice learns, among other things, to use, care for, and handle safely the tools, equipment, and materials commonly used in the trade; do residential, commercial, and industrial electrical installations; and maintain and repair installations. In addition, he receives related classroom instruction in such subjects as drafting and electrical layout, blueprint reading, mathematics, and electrical theory, including electronics. Even after completing their apprenticeship programs, many journeymen electricians enroll in union-sponsored courses in advanced electronics to keep abreast of the latest developments in this rapidly changing field.

Hourly wage rates of apprentices often start at about 50 percent of the journeyman rate and increase by 5 percent in each 6-month period until 85 or 90 percent of the journeyman rate is reached during the last period of the apprenticeship.

An experienced construction electrician who has learned all the aspects of the craft through apprenticeship can transfer readily to other types of electrical work. For example, many take jobs as maintenance electricians in factories or in commercial establishments and others work as

electricians in shipbuilding and aircraft manufacturing.

Because improperly installed electrical work is hazardous, most cities require electricians to be licensed. To obtain a license, the electrician must pass an examination which requires a thorough knowledge of the craft and of State and local building codes.

Many journeymen electricians become foremen or superintendents for electrical contractors on particular construction jobs. These craftsmen may also become estimators for electrical contractors, computing material requirements and labor costs.

Many construction electricians go into business for themselves. As they expand their activities, they may employ other workers and become contractors. In most large urban areas, a master electrician's license is required in order to engage in an electrical contracting business.

Employment Outlook

The number of construction electricians is expected to rise substantially during the remainder of the 1960's and in the longer run primarily because of the large increase anticipated in construction activity. (See discussion, p. 333.) Other factors which are expected to contribute to the growth of this trade are greater requirements for electric outlets, switches, and wiring in homes to accommodate the increasing use of appliances and air-conditioning systems; and the extensive wiring systems needed for the installation of electronic data-processing equipment and electrical control devices being used increasingly in commerce and industry. On the other hand, technological developments, such as the increasing use of factory-assembled electrical devices, will limit employment growth in this field.

Because this is a large occupation—more than 140,000 construction electricians were employed in early 1963—many additional job opportunities for new workers will result from the need to replace experienced electricians who transfer to other types of electrical work, leave the field for other reasons, retire, or die. Retirements and deaths alone will result in about 3,000 to 3,500 job openings annually.

Earnings and Working Conditions

Hourly wage rates of construction electricians are among the highest in the skilled building trades. Furthermore, because the seasonal nature of construction work affects electricians to a lesser extent than most other construction workers, their annual earnings generally are among the highest in the building trades.

Union minimum hourly wage rates for electricians averaged \$4.37, compared with \$4.15 for all journeymen in the building trades, as of July 1, 1962, according to a national survey of building trades workers in 53 large cities. Among individual cities surveyed, the union minimum hourly rates for construction electricians ranged from \$3.30 in Charlotte, N.C., to \$5.02 in Los Angeles, Calif.

A large proportion of construction electricians are members of the International Brotherhood of Electrical Workers. Some are members of other unions.

The work of the construction electrician, like that of other building trades, is active but does not require great physical strength. Frequently, the construction electrician stands for prolonged periods; sometimes he works in cramped quarters. Because most of his work is indoors, the construction electrician is less exposed to unfavorable weather conditions than most other skilled building trades workers. Electricians risk the danger of falls from ladders and scaffolds, cuts from sharp tools, electrical shock, blows from falling objects, and burns from "live" wires. However, safety practices learned during appren-

ticeship and other types of training have helped to reduce the injury rate for these workers. The number of injuries per million man-hours worked by employees in contract electrical work has been less than for contract construction work as a whole, but higher than that for production workers in manufacturing industries.

Where To Go for More Information

A young man who wishes to obtain further information regarding electrician apprenticeships or work opportunities in the trade should apply to one of the electrical contractors in his area; to a local union of the International Brotherhood of Electrical Workers; to a local joint union-management apprenticeship committee, if there is one in his locality; or the local office of the Bureau of Apprenticeship and Training, U.S. Department of Labor. In addition, the local office of the State employment service may be a source of information about apprenticeship opportunities. Some local employment service offices provide such services as screening applicants and giving aptitude tests.

General information about the work of electricians may be obtained from:

International Brotherhood of Electrical Workers,
1200 15th St. NW., Washington, D.C., 20005.

National Electrical Contractors Association,
1220 18th St. NW., Washington, D.C., 20036.

National Joint Apprenticeship and Training
Committee for the Electrical Industry,
1200 18th St. NW., Washington, D.C., 20036.

Structural-, Ornamental-, and Reinforcing-Iron (Rodmen) Workers

(D.O.T. 4-84.010, .020, 030, .040, .060, and 7-32.251)

Nature of Work

Structural- and ornamental-iron workers and reinforcing-iron workers (rodmen) erect, assemble, or install fabricated structural metal products in the construction of industrial, commercial, and large residential buildings. Although these are distinct trades, many craftsmen are skilled in, and do the work of, two or all three of the trades.

Structural-iron workers erect the steel framework of bridges, buildings, and other structures

including metal storage tanks, and overhead crane runways that support heavy equipment. They install steel floor decking and the doors and frames of vaults.

In erecting a steel framework or structure, structural-iron workers take the steel shapes already fabricated in shops by other workers and hoist them into place in the proper order. Next, they temporarily connect all the steel shapes with bolts, accurately align the structure, and then rivet or weld the parts. In the con-

struction of a large building, workers generally do not perform all of these operations. Instead, separate gangs perform a particular operation, such as riveting.

Ornamental-iron workers install metal stairways, catwalks, floor gratings, iron ladders (such as those used extensively in powerhouses and chemical plants), metal window sash and doors, grilles and screens (such as those used in bank tellers' compartments, and elevators), metal cabinets, and safety deposit boxes. They also install lampposts, gates, and fences, and decorative iron-work on balconies.

In addition to iron and steel, ornamental-iron workers work with aluminum, brass, and bronze metal shapes, frames, and panels. The metal products which they may install have usually been fabricated in a factory or a shop. Examples of products in this category are the recently developed curtain wall and window wall, and the many types and designs of ornamental and functional building facades. Ironworkers fasten these metal products permanently to a building or other structure by bolting, setting in concrete, or welding. The growing use of curtain wall and other types of metal products in buildings has greatly

increased the need for highly skilled ornamental-iron workers.

Reinforcing-iron workers (rodmen) set steel bars in concrete forms to reinforce concrete structures. They place the steel bars on suitable supports in the concrete form and tie the bars together at intersections, so that each bar receives its intended structural load. The bars are placed in the concrete form according to blueprints, specifications, or verbal instructions. The rodmen use steel pliers and other tying tools to wire the rods securely in place. Some concrete reinforcing is in the form of coarse mesh made of heavy steel wires. When using mesh, the rodmen measure the surface to be covered, cut and bend the mesh to the desired shape, place the mesh over the area to be reinforced, and hammer it into place.

Where Employed

Structural-, ornamental-, and reinforcing-iron workers (rodmen)—who numbered nearly 60,000 in early 1963—work mainly on new industrial and commercial construction. They do some alteration work. For example, they may install steel stairs in an old building or add window guards to an existing building. In addition, they remodel existing structures and do repair work, such as replacement of metal bridge parts.

A large proportion of these craftsmen are employed by general contractors on large building projects, by steel erection contractors, or ornamental-iron contractors. Many are employed by large steel companies or their subsidiaries engaged in the construction of bridges, dams, and large buildings. Some work for government agencies, public utilities, or large industrial establishments which do their own construction work. Few of these craftsmen are self-employed.

Training and Other Qualifications

Most training authorities recommend the completion of a 3-year apprenticeship as the best way to learn these trades.

Apprenticeship applicants are required to be between the ages of 18 and 30. Good physical condition is required. A high school education or its equivalent is desirable.



Structural-iron workers prepare for steel erection by tying safety line to framework

The apprenticeship program for these trades usually consists of 6,000 hours (3 years), of on-the-job training. On-the-job instruction is given either by the foreman or an experienced journeyman. In a typical combined structural- and ornamental-iron worker's training program, the apprentice learns, among other things, to use, care for, and handle safely the tools, machines, equipment, and materials commonly used in the trade; read blueprints and working drawings; form, shape, drill, tap, and erect and assemble various metal structures; and lay out and assemble steel stairs, fire escapes, grilles, railings, fences, doors, and related metal structures. He also learns arc and gas welding; gas cutting, bolting, and riveting; and how to repair and alter metal structures.

The apprenticeship program generally includes a minimum of 144 hours a year of related classroom instruction in subjects such as drafting, blueprint reading, and mathematics applicable to layout work.

Areawide apprenticeship programs, sometimes covering an entire State or region, are found extensively in this trade. They are supervised by joint apprenticeship committees composed of representatives of the International Association of Bridge, Structural and Ornamental Iron Workers' local unions and local management groups.

Hourly wage rates for apprentices start at not less than 60 percent of the journeyman rate and increase periodically until the journeyman rate is reached at the completion of the apprenticeship. In some localities, the starting rate may be as high as 75 percent of the journeyman rate.

Employment Outlook

Employment in these trades is expected to increase rapidly during the remainder of the 1960's and in the longer run. In addition to job openings resulting from the growth of employment in these occupations, the need to replace experienced workers who retire, leave the trade for other reasons, or die, will provide a few thousand job opportunities for new workers each year. Retirements and deaths alone will result in about 1,000 job openings annually.

A continued rise in employment of these workers is expected, principally because of the large

increase anticipated in construction activity. (See discussion, p. 333.) The job outlook in these trades will also be favorably affected by the increased use of structural steel in smaller buildings. Work opportunities for ornamental-iron workers will result from the growing use of ornamental panels of aluminum, porcelainized steel, or other metals, which are attached to the exterior walls of large buildings, and by the use of metal frames to hold large exterior glass installations.

Earnings and Working Conditions

Union minimum hourly wage rates for structural-iron workers and rodmen averaged \$4.29 and \$4.18, respectively, as of July 1, 1962, according to a national survey of building trades workers in 53 large cities. The average rate for all journeymen in the building trades surveyed was \$4.15 an hour. Among individual cities, the minimum hourly rates for structural-iron workers ranged from \$3.45 in Charlotte, N.C., to \$5.45 in New York City. The rates for rodmen ranged



Ornamental-iron workers install stainless steel wall panels to building framework

from \$3.40 in Richmond, Va., to \$5.40 in Newark, N.J. The rates for ornamental-iron workers generally are about the same as those for structural-iron workers. The earnings of ironworkers are often increased by considerable overtime work at premium pay.

A large proportion of workers in these trades are members of the International Association of Bridge, Structural and Ornamental Iron Workers.

Since the materials used in the structural metal trades are heavy and bulky, above average physical strength and agility are necessary. A good sense of balance is also required because some of the structural work is done at great heights and on narrow footings. Structural-iron work often involves considerable travel. In most localities, the demand for structural-iron work is insufficient to keep local crews constantly employed. Consequently, workers must be brought in from outside the area to handle the occasional large construction projects, such as a steel frame office or factory building. Large contractors may keep a small structural-iron worker crew continually employed, moving them from job to job and city to city.

The use of many safety devices, such as nets and scaffolding, has reduced the frequency of

accidents in recent years. The number of injuries per million man-hours worked by employees of contractors doing structural- and ornamental-iron work has been slightly lower than for contract construction work as a whole.

Where To Go for More Information

A young man who wishes to obtain further information concerning apprenticeships or work opportunities in these trades should apply to the large general contractors in his area; to a local of the International Association of Bridge, Structural and Ornamental Iron Workers; or the local office of the Bureau of Apprenticeship and Training, U.S. Department of Labor. In addition, the local office of the State employment service may be a source of information about apprenticeship opportunities.

General information about the work of structural-, ornamental-, and reinforcing-iron workers may be obtained from:

Associated General Contractors of America, Inc.,
1957 E St. NW., Washington, D.C., 20006.

International Association of Bridge, Structural and
Ornamental Iron Workers,
Continental Bldg., Suite 300, 3615 Olive St.,
St. Louis, Mo., 63108.

Plasterers

(D.O.T. 5-29.100, .200, and .300)

Nature of Work

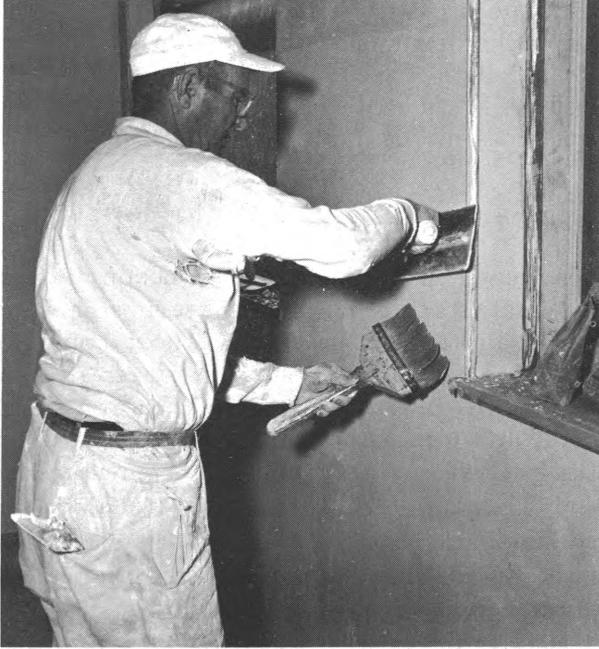
The plasterer is the building craftsman who applies plaster to interior walls and ceilings to form fire-resistant and relatively soundproof surfaces which may then be decorated. They also apply stucco to exterior walls, and form and cast ornamental designs in plaster.

In interior work, plaster is applied to gypsum lath or wire lath (backing to which plaster adheres) or directly to masonry. The plasterer uses a hawk (a square plate of wood or metal) to hold small amounts of wet plaster, and a trowel to apply it to the lath. To obtain a uniform surface of plaster, the craftsman applies a border of plaster of the desired thickness to the top and bottom of the wall section to be

covered. When these borders have hardened sufficiently, he fills in the area between them with one or two base coats of plaster. The surface of this area is then leveled to the exact thickness of the borders with a straight-edged tool. A long, flat tool, called a darby, is used to smooth this surface.

Applying the finish coat of plaster is the last operation before painting or paperhanging. This coat is relatively thin and must be applied carefully if the surface is to be smooth. Plaster wall surfaces may be finished in a number of ways, by using different tools and methods, to obtain a variety of decorative textures, such as stipple or swirl finishes.

A plasterer can do more complex types of plastering work, such as decorative and orna-



Plasterer finishes wall, using trowel and brush

mental plastering. For example, he may be called upon to mold or form intricate ornamental designs such as cornices, paneling, or recesses for indirect lighting. Plasterers who do this type of work must be able to follow blueprints and other specifications furnished by the architect.

In exterior stucco work, the plasterer applies a mixture of portland cement and sand to masonry, expanded metal, or metal wire lath in the same manner as in interior plastering. The finish coat usually consists of a mixture of white cement and sand or a patented finish material which may be applied in a variety of colors and textures.

Apprentices work with journeymen plasterers so that they may acquire a full knowledge of the craft and develop the necessary skills. Laborers (hod carriers) mix base coat materials and some finish materials and carry them to the plasterer; they also erect scaffolding when needed.

In recent years, plasterers have been making increasing use of machines which spray plaster on walls, ceilings, and structural sections of buildings. These machines are particularly desirable when used to apply the newly developed lightweight plasters. Machines used to mix plaster have been in general use for many years.

Where Employed

Most plasterers work on new building construction. In addition, plasterers work on extensive building alterations, particularly where special architectural and lighting effects are part of the building modernization. There is a relatively small amount of work for plasterers in the repair and maintenance of older buildings.

Training, Other Qualifications, and Advancement

Most training authorities, including the national joint labor-management apprenticeship committee for the plastering trade, recommend completion of a 3- or 4-year apprenticeship as the best way to learn plastering. However, many workers in this trade have acquired some plastering skills by working for many years as helpers or laborers, observing or being taught by experienced plasterers.

Apprentice applicants in this trade are generally required to be between the ages of 18 and 25. Good physical condition and manual dexterity are important assets.

Apprenticeship programs generally consist of 6,000 to 8,000 hours (3 or 4 years) of on-the-job training, in addition to at least 144 hours of related classroom instruction annually. In a typical 4-year training program, the apprentice learns, among other things, to use and handle the tools of the trade, and the properties and appropriate handling of the different kinds of materials and mixtures used in plastering. In addition, he learns how to apply scratch (first) coat and brown (second) coat; align walls and beams to given measurements; apply white coat and sand finish; install acoustical plaster and stucco, and acoustical tile, cork, and similar materials; use machines to apply and finish plaster; and lay out arches and ceilings. He also learns texture finishing.

The apprentice receives classroom instruction in such subjects as drafting, blueprint reading, and mathematics applicable to layout work. In the classroom and on the job, the apprentice becomes familiar with the work of other trades so that he may determine, for example, whether lathing or other preparatory work is satisfactory.

Although advancement opportunities for plasterers are limited, some may become foremen or

estimators. Many plasterers are self-employed. Some self-employed plasterers may expand their activities to contracting, and then employ other journeymen.

Employment Outlook

A continued increase in the employment of plasterers—who numbered about 45,000 in early 1963—is expected during the remainder of the 1960's and in the longer run, but the increase will not be as rapid as for the skilled building trades generally. In addition to job openings that will result from the expected growth of employment, the need to replace experienced plasterers who transfer to other fields of work or who retire or die, will provide many job openings for new workers. Retirements and deaths alone will result in about 1,000 job openings annually.

The growth in employment of these workers will result primarily from the anticipated large increase in construction activity. (See discussion, p. 333.) In addition, recent changes in plastering materials and improved methods of applying these materials are increasing the scope of the craft and creating work opportunities for plasterers. For example, improved lightweight plasters are being used increasingly because of their excellent soundproofing, acoustical, and fireproofing qualities. Another development that is expanding job opportunities for plasterers is the marked style trend toward the greater use of curved surfaces and ceilings made of plaster, both as a form of architectural treatment and to achieve special lighting and acoustical effects. Machine plastering and fireproofing have become widespread. Still other developments are the increasing use of "plaster veneer" or "high density" plaster, a thin, extremely hard material used to create a finished surface, and "marblecrete," a type of stucco in which varicolored marble chips have been imbedded by machine or by hand.

These favorable developments will be offset to some extent by the continuing trend toward wider use of nonplaster (dry-wall) construction.

Earnings and Working Conditions

Hourly pay rates for plasterers rank among the highest in the skilled building trades. Union

minimum hourly rates, as of July 1, 1962, for plasterers averaged \$4.28, as compared with \$4.15 for all journeymen in the building trades, according to a national survey of building trades workers in 53 large cities. Among individual cities surveyed, the minimum hourly rates for plasterers ranged from \$2.75 in Charlotte, N.C., to \$5.25 in New York City.

A large proportion of plasterers are members of unions. They are represented by either the Operative Plasterers' and Cement Masons' International Association of the United States and Canada, or the Bricklayers, Masons and Plasterers' International Union of America.

Plastering requires considerable standing, stooping, and lifting. Plasterers work both outdoors, doing stucco work, and indoors, plastering walls and ceilings and forming and casting ornamental designs.

Where To Go for More Information

A young man who wishes to obtain further information regarding plastering apprenticeships or work opportunities in the trade should apply to a plastering contractor in his area; locals of the unions previously mentioned; a local joint union-management apprenticeship committee, if there is one in his area; or the local office of the Bureau of Apprenticeship and Training, U.S. Department of Labor. In addition, the local office of the State employment service may be a source of information about apprenticeship opportunities.

General information about the work of plasterers may be obtained from:

Bricklayers, Masons and Plasterers' International Union of America,
815 15th St. NW., Washington, D.C., 20005.

Contracting Plasterers' and Lathers' International Association,
304 Landmark Bldg., 1343 H St. NW.,
Washington, D.C., 20005.

National Bureau for Lathing and Plastering,
755 NADA Bldg., 2000 K St. NW.,
Washington, D.C., 20006.

Operative Plasterers' and Cement Masons' International Association of the United States and Canada,
1125 17th St. NW., Washington, D.C., 20036.

Roofers

(D.O.T. 5-25.220, 7-31.100 through .500, and 7-32.611)

Nature of Work

Roofers apply composition roofing and other materials, such as tile and slate, to the roofs of buildings. They also waterproof and dampproof walls and other building surfaces.

In applying composition roofing, the roofer first places overlapping strips of asphalt and impregnated felt over the entire surface. He then applies a coating of coal tar pitch, asphalt, or other bituminous material. This process is repeated until at least three layers of felt are in place. Finally, he applies a surfacing of coal tar pitch or asphalt and gravel or a smooth surface asphalt, to protect the roofing materials from the weather.

In applying other types of composition roofing, such as roll roofing and asphalt shingles, the roofer overlaps the roofing material and then fastens it to the roof base with nails or asphalt cement. If necessary, he cuts the material to fit corners, pipes, and chimneys. The roofer then cements or nails flashing (strips of felt or metal) wherever two roof surfaces intersect. Flashing is installed to make the intersections (joints) watertight. In another method of applying roofing, the roofer mops a layer of hot asphalt over the entire surface and rakes pebbles over the asphalt.

Roofers also use metal, tile, and slate for the more expensive types of roofs. Metal roofs are constructed by soldering metal sheets together and nailing them to the wood sheathing. In installing tile and slate roofs, the roofer places a covering of roofing felt over the wood sheathing. He punches holes in the slate or tile which he nails to the sheathing. Each row of slate or tile is placed so as to overlap the preceding row. Finally, the roofer covers the exposed nailheads with roofing cement to avoid rusting and water leakage around the nailheads. Handtools usually are used in applying roof surfaces—for example, hammers, roofing knives, mops, pincers, and calking guns.

Roofers also do waterproofing and damp-proofing work on parts of structures other than roofs, such as masonry or concrete walls or swimming pools and other tanks. The roofer prepares surfaces to be waterproofed by remov-



Roofers install composition roofing material on barrel-shaped roof

ing rough projections and roughing glazed surfaces, using a hammer and chisel. He then applies a coat of liquid compound with a brush. He may also paint or spray surfaces with a waterproofing material or nail waterproofing fabric to surfaces. In damproofing work, he usually sprays a coating of tar or asphalt on interior or exterior surfaces to avoid the penetration of moisture.

Where Employed

Roofers work for roofing contractors on new building construction. They also do maintenance and repair work, especially on composition roofing. A few roofers are self-employed, doing either roofing on small, new building work or repairs and alterations. Roofers also work for

government agencies or business establishments that do their own construction and repair work.

Training, Other Qualifications, and Advancement

Most training authorities, including the national joint labor-management apprenticeship and training committee for the roofing industry, recommend completion of a 3-year apprenticeship program, covering all types of roofing work, as the superior way to learn this trade. A substantial proportion of workers, however, have acquired roofing skills informally, by working for many years as helpers or handymen, observing or being taught by experienced roofers.

Apprenticeship applicants generally are required to be at least 18 years old; a high school education or its equivalent is desirable. Good physical condition and a good sense of balance are important assets.

The 3-year apprenticeship program generally consists of a minimum of 1,400 hours of on-the-job training annually, in addition to related classroom instruction. In a typical training program, the apprentice learns, among other things, to use, care for, and handle safely the tools, equipment, and materials commonly used in the trade; work with composition, tar, and asphalt; prepare roof surfaces for covering; apply pitch and other materials; spread gravel; do slate, tile, and terra cotta work; and do dampproofing and waterproofing work.

The trainee receives related classroom instruction in such subjects as blueprint reading and mathematics applicable to layout work.

Hourly wage rates for apprentices usually start at 65 percent of the journeyman rate and increase periodically until 90 percent of the journeyman rate is reached in the final 6 months of the training period.

Roofers may advance to the job of foreman for a roofing contractor. Also, they may enter business for themselves.

Employment Outlook

A few thousand new job opportunities for roofers—who numbered nearly 50,000 in early 1963—will arise annually during the remainder of the 1960's and in the longer run. Most of the new jobs will result from the large increase

anticipated in construction activity. (See discussion, p. 333.) Replacement needs will also provide hundreds of job openings each year. Retirements and deaths alone will result in more than a thousand job openings annually. Other openings will result from the transfer of roofers to other fields of work.

New construction and repair jobs on old structures will provide most of the work for these craftsmen. However, dampproofing and waterproofing are expected to provide an increasing proportion of roofers' work.

Earnings and Working Conditions

Union minimum hourly wage rates, as of July 1, 1962, for composition roofers, averaged \$3.85, according to a national survey of building trades workers in 53 large cities. For slate and tile roofers, the rate was \$3.80. By comparison, the average for all journeymen in the building trades was \$4.15 an hour. Among individual cities surveyed, the minimum hourly rates for composition roofers ranged from \$2.73 in Atlanta, Ga., to \$4.80 in Newark, N.J. Slate and tile roofers had hourly rates ranging from \$2.80 in Little Rock, Ark., to \$4.75 in Newark.

A large proportion of roofers are members of the United Slate, Tile and Composition Roofers, Damp and Waterproof Workers Association.

Roofers' work, like that of other building tradesmen, is sometimes strenuous. It involves prolonged standing, as well as climbing, bending, and squatting. These workers risk injuries from slips or falls from scaffolds or roofs. They may have to work outdoors in all types of weather, particularly when doing repair work.

Where To Go for More Information

A young man who wishes to obtain further information concerning roofing apprenticeships or work opportunities in this trade should apply to roofing contractors in his area; a local of the United Slate, Tile and Composition Roofers, Damp and Waterproof Workers Association; a local joint union-management apprenticeship committee, if there is one in his area; or the local office of the Bureau of Apprenticeship and Training, U.S. Department of Labor. In addi-

tion, the local office of the State employment service may be a source of information about apprenticeship opportunities.

General information about the work of roofers, may be obtained from:

National Roofing Contractors Association,
300 West Washington St., Chicago, Ill., 60606.

United Slate, Tile and Composition Roofers, Damp
and Waterproof Workers Association,
1125 17th St. NW., Washington, D.C., 20036.

Cement Masons (Cement and Concrete Finishers)

(D.O.T. 5-26.100 and .200)

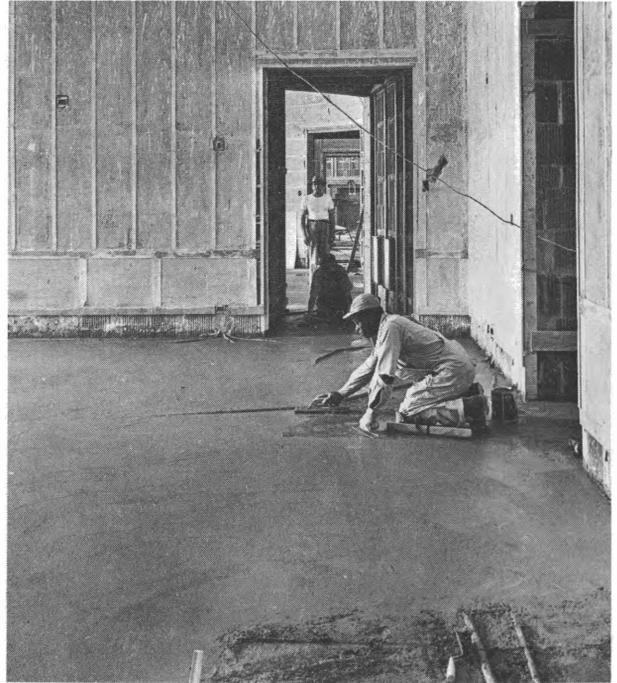
Nature of Work

The principal work of cement masons is finishing the exposed concrete surfaces on many types of construction projects. These projects range from small jobs, such as the finishing of patios, floors, and sidewalks, to work on huge dams, miles of concrete highways, foundations and walls of large buildings, airport runways, and missile launching sites. On small projects, a cement mason, assisted by one or two helpers, may do all the concrete work; on large projects, crews of several cement masons and many helpers may be employed.

In preparing the site for pouring the concrete mixture (cement plus stones of various sizes and water), the cement mason makes sure that forms, which hold the concrete, are set for the desired slope and depth of the concrete mixture and are properly aligned. Materials, such as stone and gravel, may be provided as a foundation for the concrete.

The cement mason pours or directs the pouring of the concrete mixture. He usually supervises laborers who level and settle the mixture by tamping it, or by vibrating it with a special machine. The mason levels the surface further with a "straightedge" (a flat tool long enough to extend across the poured concrete mixture). He then works it with a "float" (a rectangular, flat-surfaced handtool) and other handtools to fill depressions and remove high spots and to draw cement to the surface of the mixture in preparation for final finishing operations.

Final finishing is often delayed for several hours until the concrete has hardened sufficiently. While the concrete is still workable, the cement mason uses a trowel to bring the concrete to the proper consistency and obtain a smooth finish. The final finishing may also be done with power-operated trowels.



Cement mason uses float and trowel to smooth cement surface

On most building projects, concrete finishing work generally involves hand operations. On highways and other large-scale projects, however, power-operated floats and cement finishing machines are used extensively, but supplementary hand operations are also necessary, particularly to finish curved surfaces.

Cement masons also do patching work to correct surface defects on concrete structures. Some cement masons specialize in laying a mastic coating (a fine asphalt mixture) over concrete, particularly in buildings where sound-insulated or acid-resistant floors are specified. The mastic is applied while hot, then smoothed with heavy hand tools.

On large jobs, cement masons work in gangs or crews. In such instances, masons perform fin-

ishing operations while laborers do routine and heavy work.

The cement mason's knowledge of his materials is essential to the quality of his work. He must be familiar with the working characteristics of various cement and concrete mixes, such as those containing substances to speed or slow the setting time, and those which are used to construct weight-supporting walls or surfaces of specified strengths. In addition, because of the effects that heat, cold, and wind have on the curing of cement, the skilled mason must recognize by sight and touch what is occurring in the cement mixture so that he may be able to prevent defects.

Where Employed

Cement masons work principally on large buildings, but many are employed on highway or other nonbuilding construction. Cement masons work directly for general contractors who are responsible for constructing entire projects such as highways, or large industrial, commercial, and residential buildings. They also work for cement contractors who do only the concrete work on a large construction project or who work on smaller projects such as sidewalks, driveways, and basement floors. A small number work for municipal public works departments, public utilities, and manufacturing firms which do their own construction work. Some cement masons are self-employed and do small cement jobs, such as sidewalks and steps.

Training and Other Qualifications

Most training authorities, including the National Cement Masonry, Asphalt, and Composition Joint (labor-management) Apprenticeship and Training Committee, recommend the completion of a 3-year apprenticeship program as the best way to learn this trade. A substantial number of workers, however, have acquired some cement masonry skills informally by working for many years on building and road construction jobs as laborers assisting cement masons. Others have worked with specialty contractors constructing sidewalks and doing other masonry work. These workers have learned their skills by ob-

serving or being taught by experienced cement masons. In the past, when there have been shortages of skilled masons, a number of men with informal training have been given some credit for this experience toward completion of the apprenticeship program. In the future, such credit may depend upon the demand for skilled cement masons in local areas.

Apprenticeship applicants generally are required to be between the ages of 18 and 25. Good physical condition and manual dexterity are important assets.

The apprenticeship program usually consists of 6,000 hours (3 years) of on-the-job training, in addition to related classroom instruction. During the apprenticeship period, the apprentice learns, among other things, to use and handle the tools, equipment, and materials of the trade. He also learns finishing, layout work, and safety techniques. The apprentice receives related classroom instruction in subjects such as applied mathematics and related sciences, blueprint reading, architectural drawing, estimating materials and costs, and local building regulations. Although a high school education is not required, education above the grade school level, preferably including mathematics, is needed to understand the classroom instruction.

Employment Outlook

A rapid increase in the employment of cement masons—who numbered more than 40,000 in early 1963—is expected during the remainder of the 1960's and in the longer run. In addition to openings resulting from the growth of the trade, replacement needs will result in hundreds of other job opportunities for new workers each year. Retirements and deaths alone will result in about 1,000 job openings annually.

The anticipated large expansion of construction activity is expected to result in continued rapid growth in this occupation. (See discussion, p. 333.) Moreover, the relatively greater use of concrete in construction in recent years is likely to continue. Recent technological developments, such as cement finishing machines, will have some adverse effect on employment prospects in the cement finishing trade. However, the expected increase in the total amount of cement finishing work will be sufficiently great to result

in a substantial employment increase in this relatively small building trade.

Earnings and Working Conditions

Union minimum hourly wage rates for cement masons averaged \$4.01, compared with \$4.15 for all journeymen in the building trades, as of July 1, 1962, according to a national survey of building trades workers in 53 large cities. Among individual cities surveyed, the minimum hourly rates for cement masons ranged from \$2.45 in Charlotte, N.C., to \$5.15 in New York City.

Cement masons usually receive premium pay for hours worked in excess of the regularly scheduled workday or workweek. Overtime work for these craftsmen often arises, because once concrete has been poured for a job the work must be completed.

The work of the cement mason is active and strenuous, like the work of skilled building tradesmen generally. Since most cement finishing is done on floors or at ground level, the cement mason is required to stoop, bend, or kneel. Much of his work is done outdoors.

A large proportion of cement masons are union members. They belong either to the Operative Plasterers' and Cement Masons' Interna-

tional Association of the United States and Canada or to the Bricklayers, Masons and Plasterers' International Union of America.

Where To Go for More Information

A young man who wishes to obtain further information regarding cement mason apprenticeships or work opportunities in the trade should apply to cement finishing contractors in his area; locals of unions previously mentioned; a local joint union-management apprenticeship committee, if there is one in his area; or the local office of the Bureau of Apprenticeship and Training, U.S. Department of Labor. In addition, the local office of the State employment service may be a source of information about apprenticeship opportunities.

General information about the work of cement masons may be obtained from:

Associated General Contractors of America, Inc.,
1957 E St. NW., Washington, D.C., 20006.

Bricklayers, Masons and Plasterers' International
Union of America,
815 15th St. NW., Washington, D.C., 20005.

Operative Plasterers' and Cement Masons' Interna-
tional Association of the United States and
Canada,
1125 17th St. NW., Washington, D.C., 20036.

Floor Covering Installers

(D.O.T. 5-32.752 and 7-59.220)

Nature of Work

Floor covering installers (also called floor covering mechanics and floor layers) install, replace, and repair resilient tile, linoleum and other sheet goods, and carpeting on floors in residential, commercial, and industrial buildings. The mechanic installs these coverings on wood, concrete, metal, and stone floors which may vary in size from a small kitchen or hallway to a large supermarket floor or hotel lobby.

In installing resilient floor covering, such as asphalt tile or vinyl sheet goods, the floor covering mechanic first inspects the floor to be covered to make sure that it is firm, dry, smooth, and free of loose dust or dirt. He may sand a rough or painted floor; cover cracks, indentations, or other irregularities with a filler material; or, if a floor

is extremely uneven, resurface it with plywood, hardboard, or mastic cement.

The installer may also test for moisture content in newly poured concrete floors or floors laid over earthwork at ground level or below. If the moisture in the floor is too great, he may suggest postponing installation of floor covering or recommend a type of adhesive or covering particularly suited to the condition of the floor. For this reason, the mechanic should be familiar with the many types of adhesives and floor coverings recommended by manufacturers for specific subfloor conditions.

The floor covering installer prepares to install resilient floor covering by carefully measuring and marking off the floor in accordance with the floor covering plan. The plan may be in the form



Installer marks floor covering along irregular wall before trimming

of architectural drawings specifying every detail of the floor covering design, or it may be a simple, verbal description by the customer. When the floor layout is completed, the mechanic, assisted, when necessary, by an apprentice or other worker, applies the adhesive and lays the floor covering. He must be careful in cutting, matching, and fitting floor covering, particularly at door openings, along other irregular wall surfaces, and around permanent floor fixtures, such as columns or piping. Special care must be taken in cutting out and setting in decorative designs in sheet flooring. After sheet flooring is laid, a roller is run over it to insure good adhesion to the floor.

Before installing carpet, the carpet mechanic, like the installer of resilient floor covering, first inspects the floor to be covered to determine its condition. Then he plans his layout carefully to minimize waste of materials. He also allows for expected foot-traffic patterns so that best appearance and long wear will be obtained, and that carpet sections expected to receive heavy traffic can be replaced easily.

In installing the carpet, the mechanic may anchor "tackless strip," with adhesive or nails, along the borders of the installation. (The strip secures the carpet when it is installed.) Instead of using strip, the floor layer may use tacks to secure carpeting. Padding, which is placed under the carpet, is cut and placed within the framework of the strip and the carpet is then placed approximately into position. If the carpet has not been precut and seamed in the workroom of the floor covering firm, the mechanic will do this work before stretching the carpet into place. He then trims the edge of the carpet so that it will be held securely and smoothly by tacks, or by nails protruding from the border strip. Finishing touches may include the use of a special roller to obscure seam markings that may result when carpet sections are joined.

Floor covering mechanics generally specialize either in carpet installations or resilient floor installations, although some mechanics can install both types of coverings. Some may specialize even further. For example, the most skilled installers generally are employed by commercial floor covering firms who install the more expensive carpeting, and resilient sheet flooring with intricate designs. Many floor mechanics specialize in the installation of resilient tile. Some also install resilient wall and counter coverings.

The tools used by floor covering installers include hammers, pry bars, and knives, shears, and other cutting devices; measuring and marking tools, such as tape measures, compasses, straight-edges, chalk, and chalk lines; and a variety of specialized tools, such as notched adhesive spreaders, carpet stretching devices, and floor rollers.

Where Employed

Most floor covering installers are employed by floor covering contractors who may specialize in commercial and industrial flooring work, in residential floor covering, or in specific types of installations, such as resilient tile. Many others work for retailers specializing in floor covering who provide installation service. Floor covering mechanics also are employed by furniture and department stores that sell and install floor cover-

ings, and by home alteration and repair contractors.

Employment of floor covering installers is distributed geographically in much the same way as the population. Heavy concentrations of these workers are found in large business centers where high levels of commercial construction as well as residential building prevail.

Training, Other Qualifications, and Advancement

In considering applicants for floor covering installation jobs, employers are particularly interested in those with manual abilities. They prefer applicants with a high school education, but this qualification is not generally required. Most employers want applicants between 17 and 30 years of age and with at least average physical strength. A neat appearance and a pleasant business-like manner are important attributes because the work is performed on the customer's premises.

Most workers in this trade have acquired their skills through informal training methods, such as working as a trainee or laborer, and observing or being taught by experienced floor covering mechanics. Many of these men have also gained some knowledge of floor covering work by attending trade school or floor covering manufacturers' training courses, and through home study.

Training authorities generally recommend a 3- or 4-year apprenticeship program as the best way to learn the floor covering trade. Most apprenticeship programs include 6,000 hours (3 years) or 8,000 hours (4 years) of on-the-job training in addition to related classroom instruction. In these training programs, the trainee learns the techniques of floor installation and how to handle the tools of the trade. Through work assignments with skilled craftsmen on a wide variety of floor covering jobs, he learns to plan and execute different types of jobs in a minimum of time and with the most efficient and decorative use of materials. Most apprentices are required to attend class twice a week to learn about the nature of the materials they will be using, the use and care of tools and equipment, mathematics of layout work, interpretation of architectural drawings, and planning and layout of floor covering installations.

Some apprenticeship programs may combine training in the installation of resilient floor and wall covering with training in laying of carpets. Other programs may be limited to the installation of resilient coverings.

Skilled floor covering installers may advance to the position of foreman or installation manager for a large floor laying firm. Some become salesmen or estimators for floor covering firms. Floor covering mechanics with business ability may form their own firms and employ their own mechanics.

Employment Outlook

Employment of floor covering installers—estimated at about 30,000 in early 1963—is expected to increase moderately during the remainder of the 1960's and in the longer run, continuing the upward trend since the end of World War II. The postwar rise in employment resulted primarily from a high level of building construction and an increasing use of resilient floor coverings and wall-to-wall carpeting. Building construction is expected to grow rapidly in the years ahead. (See discussion, p. 333.) Also, greater use of floor coverings is anticipated because of the more versatile materials and colorful patterns that will be available. As a result, there will be many new job opportunities for floor covering mechanics. In addition to opportunities resulting from the growth of the trade, several hundred job openings will arise each year from the need to replace experienced mechanics who transfer to other lines of work, retire, or die.

The best job opportunities will be for floor mechanics with all-round training in the installation of resilient tile and sheet goods or carpeting. Such training is provided in apprenticeship programs. Many informal training programs limit the trainee's work experience to installation of resilient tile, or to residential floor covering work of limited complexity. This lack of all-round experience, however, may be partially offset by trade school and home-study courses and manufacturers' training programs. A young man interested in becoming a floor covering mechanic should direct inquiries to several firms about their training programs before accepting employment as a trainee.

Earnings and Working Conditions

No national wage data on floor covering installers are available. However, wage information from a limited number of firms indicates that, in early 1963, most experienced floor layers were paid between \$3.00 and \$4.25 per hour, although wage rates for skilled workers ranged from \$2.50 an hour in some areas to as much as \$5.35 per hour in others. Wage rates for such workers may also vary within an area because of differences in level of skill or degree of work specialization. Starting wage rates for apprentices and other trainees usually are about half of the mechanic's rate.

Most floor covering mechanics, including those under union-management agreements, are paid on an hourly basis. In some nonunion shops, part of the mechanic's pay may be in the form of bonuses for work performed within a specified time period. In others, mechanics receive a monthly salary or are paid on the basis of the number of square feet or square yards of floor covering they install.

Floor covering installers generally work regular daytime hours. Particular circumstances, however, such as installing a floor in an occupied home, store, or office, may require work during evening hours or on weekends when families are at home or stores and offices are not open for business.

Floor covering installation work is not affected by weather conditions, since it is performed

indoors. During the winter months most work is done in heated buildings. Job hazards are not numerous, but mechanics frequently experience knee injuries because they do much of their work while kneeling; back injuries occur occasionally as a result of twisting and lifting on the job. Most of these injuries can be avoided, however, if proper work procedures are followed. Generally, a mechanic is assisted by a helper in heavy lifting, and usually has proper equipment available to move heavy objects.

Where To Go for More Information

Information on floor covering jobs may be obtained from local floor covering contractors or floor covering retailers. Local unions of the United Brotherhood of Carpenters and Joiners of America in the eastern portion of the country and the Brotherhood of Painters, Decorators and Paperhangers of America in the western part can also provide information about job and apprenticeship opportunities for floor covering mechanics.

Publications providing detailed information about training for this trade are available from:

American Carpet Institute,
Empire State Bldg., New York, N.Y., 10001.
Armstrong Cork Co.,
Lancaster, Pa., 17600.
Congoleum-Nairn, Inc.,
195 Belgrove Dr., Kearny, N.J., 07032.

Sheet-Metal Workers

(D.O.T. 4-80.010)

Nature of Work

Sheet-metal workers fabricate and install ducts which are used in ventilating, air-conditioning, and heating systems. They also fabricate and install a wide variety of other products made from thin metal sheets, such as roofing and siding, commercial stainless steel kitchen equipment, partitions, sheet-metal shelves, store fronts, metal framework for neon signs, and chutes used for materials movement. Skilled sheet-metal workers should not be confused with assembly-line factory operatives who also make sheet-metal products, but are trained in only a few specific operations.

In heating or air-conditioning duct work, the sheet-metal worker lays out and plans the job, determining the size and type of sheet metal to be used. The ducts are often fabricated at the sheet-metal shop. Sheet-metal workers cut the metal with hand snips, power-driven shears, and other cutting tools. They form the metal with a variety of machines, hammers, and anvils; then weld, bolt, rivet, solder, or cement the seams and joints. However, factory fabricated ducts in standard sizes are often available and these require little additional fabrication by sheet-



Journeyman sheet-metal worker teaches apprentice how to install heating ducts

metal workers. Some duct fabrication is done at the work site. In the installation of ducts, the component parts are fitted together. Hangers and braces are installed to support ducts, and joints may be soldered, connected, or welded. Some journeymen workers specialize in shopwork or on-site installation work. However, it is essential that skilled workers know all aspects of the trade.

Where Employed

Sheet-metal workers are employed mainly by plants fabricating and installing heating, refrigeration, and air-conditioning equipment and by contractors engaged in residential, industrial, and commercial building work. In residential construction, these workers may also work for roofing contractors who specialize in metal roofing work.

In addition, many of these craftsmen work for government agencies or business establishments which do their own construction and alteration work. Others are self-employed, mainly on repair work or on smaller types of installations. Some craftsmen are employed in small shops manufacturing specialty products, such as custom kitchen equipment for hotels and restaurants.

Many skilled sheet-metal workers are also employed by railroad, aircraft, or shipbuilding companies. Firms making blowers, exhausts, electrical generating and distributing equipment, food products machinery, steam engines, and turbines also employ skilled sheet-metal workers.

Training, Other Qualifications, and Advancement

Most training authorities, including the national joint management-labor apprenticeship committee for the sheet metal industry, recommend the completion of a 4-year apprenticeship program as the best way to learn this trade. Some sheet-metal workers, however, have acquired skills of the trade informally, by working for many years as helpers or handymen, observing or being taught by experienced craftsmen. Many of these persons have gained some knowledge of the trade by taking correspondence or trade school courses.

Apprenticeship applicants generally are required to be between the ages of 16 and 23; a high school education or its equivalent is desirable. Good physical condition and mechanical aptitude are necessary assets.

The apprenticeship program usually consists of 8,000 hours (4 years) of on-the-job training, in addition to related classroom instruction. In a typical training program, the apprentice learns, among other things, to use, care for, and handle safely the tools, machines, equipment, and materials commonly used in the trade; solder; do air-conditioning, heating, and ventilating work; do residential installations such as roofing, gutters, and downspouts; and do architectural and industrial sheet-metal work. He also learns general work processes such as cutting, forming, folding, grooving metal material and bending edges, and punching and drilling holes.

The trainee receives related classroom instruction in subjects such as drafting, blueprint reading, and mathematics applicable to layout work. In addition, he learns the relationship between sheet-metal work and other building trades.

Hourly wage rates for sheet-metal apprentices generally start at 50 percent of the journeyman rate and increase periodically until 90 percent of the journeyman rate is reached during

the final portion of the apprentice training period.

Experienced sheet-metal workers have more job mobility than many other building trades workers because they can transfer their skills from the construction industry to the metal manufacturing industries. Also, they may advance to the job of foreman for a contractor, become superintendents of large projects, or go into business for themselves as sheet-metal contractors.

Employment Outlook

Employment of sheet-metal workers—who numbered about 45,000 in early 1963—is expected to increase rapidly during the remainder of the 1960's and in the longer run. However, there will be only a few thousand job opportunities each year in this relatively small occupation. In addition to job openings arising from the growth of the trade, opportunities for new workers will result from the need to replace experienced sheet-metal workers who transfer to other fields of work, retire, or die. Deaths and retirements alone will result in several hundred job openings annually.

The increase in the employment of sheet-metal workers is expected mainly as a result of the anticipated large expansion in new residential, commercial, and industrial construction. (See discussion, p. 333.) The expected large increase in the number of permanently installed air-conditioning systems in residential, commercial, and factory buildings will provide more work for them. In addition, the manufacturing industries which employ skilled sheet-metal workers generally have favorable long-range prospects. The shops which fabricate sheet-metal products used in construction are also expected to require more of these skilled craftsmen.

Prefabrication is not likely to affect the growth of employment in this occupation as much as in most other building trades, because of the custom nature of much of the work. The prefabrication of ducts and fittings for ventilating installations is limited by the need to tailor these installations to meet a wide variety of structural conditions, such as the dimensions of the building and the space allowed for ducts, and also by the cost of

storage space needed to store prefabricated ducts and fittings.

Earnings and Working Conditions

Union minimum hourly wage rates for sheet-metal workers averaged \$4.17 compared with \$4.15 for all journeymen in the building trades, as of July 1, 1962, according to a national survey of building trades workers in 53 large cities. Among individual cities surveyed, the minimum hourly rates for sheet-metal workers ranged from \$3.30 in Charlotte, N.C., to \$5.15 in New York City.

A large proportion of sheet-metal workers are members of the Sheet Metal Workers' International Association.

Many sheet-metal workers spend considerable time at the construction site, where they may work either indoors or outdoors. Other sheet-metal workers may work primarily indoors, doing fabricating and layout work.

When installing gutters, skylights, and cornices they may work high above the ground level. When installing ventilating and air-conditioning systems, they may work in awkward and relatively inaccessible places. Sheet-metal workers run the risks of cuts and burns from the materials, tools, and equipment used in their trade.

Where To Go for More Information

A young man who wishes to obtain information regarding sheet-metal apprenticeships or work opportunities in this trade should direct his inquiry to sheet-metal contractors or heating, refrigeration, or air-conditioning contractors; a local of the Sheet Metal Workers' International Association; a local joint union-management apprenticeship committee, if there is one in his locality; or the local office of the Bureau of Apprenticeship and Training, U.S. Department of Labor. In addition, the local office of the State employment service may be a source of information about apprenticeship opportunities.

General information about the work of sheet-metal workers may be obtained from:

Sheet Metal and Air Conditioning Contractors'

National Association, Inc.,

107 Center St., Elgin, Ill., 60120.

Sheet Metal Workers' International Association,

1000 Connecticut Ave. NW., Washington, D.C., 20036.

Asbestos and Insulating Workers

(D.O.T. 5-33.110 and .210)

Nature of Work

The principal work of asbestos and insulating workers is to cover pipes, boilers, and other equipment with insulating materials, such as cork, felt, asbestos, fiberglass, polyurethane, and magnesia. These materials are installed by pasting, wiring, taping, stud-welding, spraying, or other methods. Asbestos and insulating workers use handtools, such as trowels, brushes, scissors, hammers, saws, pliers, and stud-welding guns. Power-saws are also used to cut insulating materials.

The insulating materials which these workers install serve many purposes. For example, the insulation of pipes, ducts, tanks, vats, boilers, and furnaces retains heat and thus saves fuel. Insulation of the piping in refrigeration systems prevents the absorption of heat.

Where Employed

Most asbestos workers—who numbered more than 20,000 in early 1963—are employed by insulation contractors in new industrial and commercial construction. A substantial number are also employed in the alteration and maintenance of insulated pipework in chemical plants, petroleum refineries, atomic energy installations, and other industrial establishments which have extensive steam installations for power and heating. Similarly, some large establishments which have cold storage facilities employ asbestos workers for maintenance work.

Training, Other Qualifications, and Advancement

Most asbestos workers learn their trade through a 4-year "improvership" program that is similar in many respects to apprenticeship programs in other building trades. The improvership program consists of a specified period of on-the-job training in which the new worker learns how to handle the tools of the trade and to work with insulating materials.

Applicants for improvership programs are generally required to be between the ages of 18 and 30 and in good physical condition. Hourly wage rates under the improvership programs start at about 50 percent of the journeyman's rate and,



Insulation worker installs insulating panel in framework of building

if the trainee's work progresses satisfactorily, increase by 10 percent each year until 80 percent of the journeyman rate is reached during the final stage of the program. At the end of the improvership program, trainees are required to pass an examination which demonstrates their knowledge of the trade.

A skilled asbestos worker may advance to the job of foreman, shop superintendent, or estimator, or he may open his own insulation contracting business.

Employment Outlook

Employment in this relatively small building trade is expected to increase rapidly during the remainder of the 1960's and in the longer run as a result of the anticipated large rise in the volume of construction and commercial and industrial building. (See discussion, p. 333.) The increasing use of industrial pipe for numerous manufacturing processes and where air conditioning and refrigeration are required, will increase the need for asbestos workers for installation and maintenance work. In addition to job openings resulting from the growth of the trade, other opportunities will arise from the need to replace workers who transfer to other fields of work, retire, or

die. Deaths and retirements in this relatively small field of work alone will result in about 500 to 600 job openings annually.

Earnings and Working Conditions

Union minimum hourly wage rates for asbestos workers, as of July 1, 1962, averaged \$4.18, compared with \$4.15 for all journeymen in the building trades, according to a national survey of building trades workers in 53 large cities. Among individual cities, the minimum hourly rates for asbestos workers ranged from \$3.50 in Charlotte, N.C., to \$5.25 in New York City.

A large proportion of the workers in this trade are members of the International Association of Heat and Frost Insulators and Asbestos Workers.

Where To Go for More Information

A young man who wishes to obtain further information regarding asbestos workers' improvement programs or work opportunities in this trade should apply to an asbestos contractor in his area or to a local of the International Association of Heat and Frost Insulators and Asbestos Workers.

General information about the work of asbestos and insulating workers may be obtained from:

Insulation Distributor-Contractors National Association, Inc.,
1425 Chestnut St., Philadelphia, Pa., 19102.

International Association of Heat and Frost Insulators and Asbestos Workers,
1300 Connecticut Ave. NW., Washington, D.C., 20036.

Lathers

(D.O.T. 5-32.761, .762, and .763)

Nature of Work

Lathers install the supporting backings on ceilings or walls on which plaster or other materials are applied. These supports are usually metal lath (strips of expanded metal or metal wire mesh), or large pieces of perforated or unperforated gypsum lath.

When installing metal lath, the lathers first build a light metal framework (furring) which is fastened securely to the structural framework of the building. The lath is then attached to the furring by nailing, clipping, tying, or machine stapling. After the lath has been installed, the lathers cut openings in them for electrical outlets and piping.

The method of installation varies somewhat in other lath work. For example, for plaster cornices, the lather builds a framework that approximates the desired shape or form. He then attaches metal lath to the framework. Gypsum lath is nailed on studs, or clipped or stapled to the metal furring. Lathers also install metal reinforcements, known as corner beads, used as guides by the plasterer and as protection for the finished corner.

When stucco (a mixture of portland cement and sand) is to be applied over wood framework, the lather installs two layers of wire mesh separated by a layer of felt, to act as a base.



Lather installs metal furring used to support lath

The tools of the trade include measuring rules and tapes, drills, hammers, chisels, hacksaws, shears, wirecutters, boltcutters, punches, pliers, hatchets, and stapling machines.

Where Employed

Most lathers—who numbered about 25,000 in early 1963—work for lathing and plastering contractors on new residential, commercial, or industrial construction. They also work on modernization and alteration jobs. Some lathers are also employed outside the construction industry; for example, they make the lath backing for plaster display materials or scenery.

Training and Other Qualifications

The national joint labor-management apprenticeship committee for this trade and many other training authorities recommend the completion of a 2-year apprenticeship program as the best way to learn lathing. However, many lathers, particularly in small communities, have acquired skills informally, by working for many years as helpers, observing or being taught by experienced lathers.

Apprenticeship applicants generally are required to be between the ages of 16 and 26, and in good physical condition. Aptitude tests are often given to applicants to determine their manual dexterity as well as the other qualifications required. Apprentices generally must pass examinations which are given at the end of each 6-month period.

During the apprenticeship period, the apprentice learns to use and handle the tools and materials of the trade. For example, he installs gypsum and composition lath, wall furring, and metal lathing. In addition, he generally receives related classroom instruction in subjects such as applied mathematics, geometry, reading of blueprints and sketches, welding, estimating, and safety practices. Although a high school education is not required, education above grade school level, particularly courses in mathematics, is needed to understand the classroom instruction.

Hourly wage rates for lather apprentices usually start at 50 percent of the journeyman rate. The rate is increased periodically by 5 percent every third or fourth month until a rate of 85 percent is reached in the final quarter of the second year of training.

Employment Outlook

Employment of lathers is expected to increase rapidly during the remainder of the 1960's and in the longer run. Since lathers are a small occupational group, however, only a few hundred new job openings will arise annually. The growth of the trade will result principally from the anticipated large expansion in construction activity. (See discussion, p. 333.) Moreover, there will be a growing need for lathing work because of the increased use of acoustical tile for sound insulation, the trend toward suspended and other decorative ceilings, and the increased use of lightweight plaster as a fireproofing material for structural steel. These developments are expected to more than offset the loss of lathing work resulting from the increasing use of dry walls, particularly in residential construction where these materials are often installed by carpenters.

In addition to the expected employment increase, many job openings will result from the need to replace workers who transfer out of the trade, retire, or die. Deaths and retirements alone will result in several hundred job openings annually.

Earnings and Working Conditions

The average hourly wage rates for lathers are among the highest in the skilled building trades. Union minimum hourly wage rates for lathers, as of July 1, 1962, averaged \$4.25 compared with \$4.15 for all journeymen in the building trades, according to a national survey of building trades workers in 53 large cities. Among individual cities surveyed, the minimum hourly rates for lathers ranged from \$3.10 in Memphis, Tenn., to \$5.00 in New York City.

A large proportion of lathers are members of The Wood, Wire and Metal Lathers International Union.

Where To Go for More Information

For further information regarding lathers' apprenticeships or work opportunities in the trade, a young man should apply to a lathing contractor in his area; a local of The Wood, Wire and Metal Lathers International Union; a local

joint labor-management apprenticeship committee, if there is one in his area; or the local office of the Bureau of Apprenticeship and Training, U.S. Department of Labor. In addition, the local office of the State employment service may be a source of information about apprenticeship opportunities.

General information about the work of lathers may be obtained from:

Contracting Plasterers' and Lathers' International Association,

304 Landmark Bldg., 1343 H St. NW.,
Washington, D.C., 20005.

The National Bureau for Lathing and Plastering,
755 NADA Bldg., 2000 K St. NW.,
Washington, D.C., 20006.

The Wood, Wire and Metal Lathers International Union,

6530 New Hampshire Ave., Takoma Park, Md., 20012.

Marble Setters, Tile Setters, and Terrazzo Workers

(D.O.T. 5-24.310, .410, and .510)

Nature of Work

Marble setters, tile setters, and terrazzo workers cover interior or exterior walls, floors, or other surfaces with marble, tile, or terrazzo. Craftsmen in each of these distinct trades work primarily with the material indicated by their title.

Marble setters install marble, shop-made terrazzo panels and artificial marble, and structural glass when it is used in a building interior. The marble setter does little fabrication work because the marble and other materials are cut to size and polished before they are delivered to the work site. However, he may do some minor cutting to make the materials fit exactly. In setting marble, he lays out the work, then applies a special plaster mixture to the backing material and sets the marble pieces in place. When necessary, he braces them until the setting plaster has hardened. Special plaster is poured into the joints between the marble pieces, and the joints are "pointed up" (slightly indented) with a trowel or wooden paddle. Bolt holes may have to be drilled if attachments to the marble are necessary. Each marble setter has a helper to prepare plaster, carry marble slabs, and clean the surface of the completed work.

The tile setter attaches tile (a thin slab of baked clay, stone, or other material) on walls, floors, or ceilings according to blueprints or other instructions. For walls and ceilings, the tile setter applies a setting bed to the surface or other supporting backing. This setting bed consists of a float coat of sand and cement, plus a thin coat of pure cement mixed with water, or one of a



Marble setter and helpers install marble panel

number of patented portland cement mixtures. The tiles are then tapped into place with a trowel handle. In laying tile floors, the tile setter adds cement to the fresh concrete subfloor and then lays the tile. He chips the tile with a hammer and chisel or cuts it with pincers to make it fit into irregular areas, into corners, or around pipes.

Small tiles, such as those laid in bathrooms, are available in paperbacked strips and sheets that can be fastened to the floor as a unit, using cement or various adhesives. This eliminates the setting of individual tiles. The tile setter is usually assisted by a helper who mixes mortar, sets up scaffolds, supplies the setter with materials,

grouts (fills) the joints after the tile setting is completed, and cleans the completed work.

Terrazzo is a type of ornamental concrete used mainly for floors. Marble chips are used as the coarsest concrete ingredient. After the terrazzo hardens, it is ground and polished to give a smooth surface in which the marble chips are exposed against the background of other materials.

A terrazzo worker starts his work by laying a base (first course) of fine, fairly dry concrete, leveling this base accurately with a long, flat tool called a straightedge, and tamping it. He then places metal strips wherever there is to be a joint, or a change of color between panels, and imbeds their bottom edges into the first course. If there is to be lettering or an ornamental figure, he also imbeds a shop-made mold. Then he mixes the top course of concrete and marble chips, pours it onto the base course, and rolls and levels it. There is a separate mixture for each color. After the concrete has hardened for a few days, a semiskilled worker grinds and polishes the floor with an electric-powered grinding machine.

The terrazzo worker is assisted by helpers in the mixing and placing of the base course, but he alone does the leveling and placing of the metal strips. Helpers handle sand, cement, marble chips, and all other materials used by the terrazzo worker. They rub and clean all marble, mosaic, and terrazzo floors and perform other work required in helping a terrazzo craftsman. The terrazzo worker generally supervises mixing of the top course which, along with the grinding, governs its final appearance.

Where Employed

Marble setters, tile setters, and terrazzo workers are employed mainly in new building construction and in the larger urban areas. Substantial numbers of terrazzo workers are employed in Florida and California.

Training, Other Qualifications, and Advancement

Most training authorities, including the national joint labor-management apprenticeship committees that set the training standards in these trades, recommend the completion of a

3-year apprenticeship program as the best way to learn each of these trades. A substantial proportion of tile setters, terrazzo workers, and marble setters, however, have acquired skills of these trades informally by working for many years as helpers, observing or being taught by experienced craftsmen.

Apprenticeship applicants generally are required to be between the ages of 17 and 22; a high school education or its equivalent is desirable. Good physical condition and manual dexterity are important assets. Applicants should have an eye for quickly determining proper alignments of tile, terrazzo, and marble, and have a good sense of color harmony.

The apprenticeship programs in each of these trades generally consist of 6,000 hours of on-the-job training, in addition to related classroom instruction. In a typical 3-year training program for terrazzo workers, apprentices learn, among other things, to use, care for, and handle safely the tools, equipment, and materials commonly used in the trade; mix, place, tamp, and level terrazzo material and concrete; and select, set, and level metal dividing strips. The apprentice also learns the selection and placement of materials according to the design of the job; the rough and final finishing of bases and coves; and hand and machine rubbing.

The apprentice receives related classroom instruction in blueprint reading, layout work, basic mathematics, and shop practice.

Hourly wage rates for apprentices in each of these trades start at about 50 or 60 percent of the journeyman rate and increase periodically until 95 percent of the journeyman rate is reached during the last period of apprentice training.

Skilled and experienced tile, terrazzo, or marble setters may become foremen. Others may be able to start their own small contracting businesses.

Employment Outlook

Employment in these small trades is expected to increase slightly during the remainder of the 1960's and in the longer run, primarily because of the anticipated large growth in new building construction. (See discussion, p. 333.) The need to replace experienced workers who transfer to other

fields of work, retire, or die will also provide a few hundred job opportunities for new workers.

Job openings for terrazzo workers are expected to increase faster than for marble setters and tile setters. Because terrazzo is durable and attractive, the number of terrazzo installations, particularly for floors, expanded over the past decade or so, and is expected to continue to grow. A small number of skilled terrazzo workers have been recruited from abroad to meet shortages of these workers in some areas.

The anticipated growth in employment of tile setters will be limited by the increased use of competing materials, such as asphalt floor tile, structural glass, plastic tile, and plastic-coated wallboard.

Little change in the employment of marble setters is expected. Despite the relatively higher costs of marble compared with competitive materials, the excellent properties of marble as a building material will insure its continued use and provide work for marble setters, although the supply of quality marble is gradually being depleted.

Earnings and Working Conditions

Union minimum hourly wage rates for terrazzo workers, as of July 1, 1962, averaged \$4.18; for marble setters, \$4.17; and for tile setters, \$4.12, according to a national survey of building trades workers in 53 large cities. These rates compared with the average of \$4.15 for all journeymen in the building trades. Among individual cities surveyed, the minimum hourly rates for terrazzo workers ranged from \$3.35 in Little Rock, Ark., and New Orleans, La., to \$5.05 in Newark, N.J., and New York City. For marble setters, the rates ranged from \$3.35 in Little Rock, Ark., to \$4.57 in Los Angeles, Calif. The rates for tile setters ranged from \$3.25 in San Antonio, Tex., to \$4.50 in San Francisco and Los Angeles.

A large proportion of the workers in each of these trades are members of one of the following unions—Bricklayers, Masons and Plasterers' International Union of America; International Association of Marble, Slate and Stone Polishers, Rubbers and Sawyers, Tile and Marble Setters' Helpers and Marble Mosaic and Terrazzo Workers' Helpers; and Operative Plasterers' and Cement Masons' International Association of the United States and Canada.

Marble setters and terrazzo workers work both indoors and outdoors, depending on the type of installation. Tile setters work mostly indoors.

Where To Go for More Information

To obtain further information regarding apprenticeships or work opportunities in these trades, a young man should apply to tile, terrazzo, and marble setting contractors in his area or to locals of the unions previously mentioned. In addition, the local office of the State employment service may be a source of information about apprenticeship opportunities.

General information about the work of marble setters, tile setters, and terrazzo workers may be obtained from:

Bricklayers, Masons and Plasterers' International Union of America,
815 15th St. NW., Washington, D.C., 20005.

International Association of Marble, Slate and Stone Polishers, Rubbers and Sawyers, Tile and Marble Setters' Helpers and Marble Mosaic and Terrazzo Workers' Helpers,
821 15th St. NW., Washington, D.C., 20005.

National Terrazzo and Mosaic Association, Inc.,
2000 K St. NW., Washington, D.C., 20006.

Operative Plasterers' and Cement Masons' International Association of the United States and Canada,
1125 17th St. NW., Washington, D.C., 20036.

Tile Contractors' Association of America,
1420 New York Ave., Washington, D.C., 20005.

Glaziers

(D.O.T. 5-77.010)

Nature of Work

Glaziers cut, fit, and install plate glass, ordinary window glass, mirrors, and special items such as leaded glass panels. In making a glass

installation, the glazier cuts the glass to size or uses precut glass. The glazier puts a bed of putty into the wood or metal sash and presses the glass into place. He fastens the glass with wire clips



Glaziers place large glass panel in new office building

or triangular metal points and then places and smooths another strip of putty on the outside edges of the glass to keep out moisture.

When installing structural glass, which is used to decorate building fronts, walls, ceilings, and partitions, the glazier (and sometimes the marble setter, see discussion, p. 371) applies mastic cement to the supporting backing and presses the glass into it. The glass may have to be trimmed with a glass cutter if it is not precut to specifications. Glaziers (as well as bricklayers, see discussion, p. 344), install glass blocks for building exteriors, interior partitions, and walls.

In addition to handtools, such as glass cutters and putty knives, glaziers use power cutting tools and grinders.

Where Employed

In early 1963, only about 5,000 glaziers were employed by glazing contractors on new construction, alterations and modernizations, and on replacement of broken glass, particularly for store windows. Others were employed by government agencies or business establishments which do their own construction work.

More than 10,000 glaziers work outside the construction industry. Many are employed in factories where they install glass in sash, doors, mirror frames, and partitions. Other workers, using skills similar to those used by glaziers, install glass or mirrors in furniture and ships, or replace glass in automobiles.

Training and Other Qualifications

Most training authorities, including the national joint labor-management apprenticeship committee for the glass and glazing industry, recommend the completion of a 3-year apprenticeship program as the best way to learn this trade. A substantial proportion of glaziers, however, have learned the trade informally. They have acquired glazing skills by working for many years with glaziers and observing or being taught by experienced craftsmen. In smaller communities, many journeymen painters and paperhangers have learned to do glazier work as part of the apprentice training for their trade.

Apprenticeship applicants generally are required to be at least 18 years of age; a high school education or its equivalent is desirable.

The apprenticeship program usually consists of 6,000 hours (3 years) of on-the-job training, in addition to a minimum of 144 hours a year of related classroom instruction. During the apprenticeship, the apprentice learns how to use and handle the tools, machines, and materials of the trade. The program also includes on-the-job training in the glazing of wood and metal sash (frame) in doors, windows, and partitions and other openings; setting of store front openings, structural glass, mirrors, showcases, automobile glass, shower doors, and tub enclosures; replacement of glass; and scaffolding.

Hourly wage rates for glazier apprentices usually start at 50 percent of the journeyman rate and increase periodically until the journeyman rate is reached at the completion of training.

Employment Outlook

A rapid increase in employment of glaziers is expected during the remainder of the 1960's and in the longer run. New jobs in this small occupational group are expected to number about 1,000 a year. The large increase anticipated in

construction activity (see discussion, p. 333) and the increasing use of glass in building construction are expected to result in more glazing work. Replacement and modernization work, frequently involving large glass installations, will provide additional job opportunities. The need to replace experienced glaziers who transfer to other fields of work, retire, or die will also provide a few hundred job opportunities annually for new workers.

Earnings and Working Conditions

Union minimum hourly wage rates for glaziers averaged \$3.77, compared with \$4.15 for all journeymen in the building trade, as of July 1, 1962, according to a national survey of building trades workers in 53 large cities. Among individual cities surveyed, the union minimum hourly wage rates for glaziers ranged from \$2.55 in Richmond, Va., to \$4.60 in Newark, N.J.

A large proportion of glaziers employed in construction work are members of the Brother-

hood of Painters, Decorators and Paperhangers of America.

Where To Go for More Information

A young man who wishes to obtain further information regarding glazier apprenticeships or work opportunities in this trade should direct his inquiry to a glazing contractor or general contractor in his area; a local of the Brotherhood of Painters, Decorators and Paperhangers of America; a local joint union-management apprenticeship committee, if there is one in his locality; or the local office of the Bureau of Apprenticeship and Training, U.S. Department of Labor. In addition, the local office of the State employment service may be a source of information about apprenticeship opportunities.

General information about the work of glaziers may be obtained from the Brotherhood of Painters, Decorators and Paperhangers of America, 217-219 North Sixth St., Lafayette, Ind., 47901.

Elevator Constructors

(D.O.T. 5-83.350 through .359)

Nature of Work

Elevator constructors (also called elevator mechanics) assemble and install elevators, escalators, dumb waiters, and similar equipment. They also do considerable modernization, maintenance, and repair work. The work is done by small crews consisting of skilled mechanics and their helpers.

In elevator construction work, the crew first installs the guide rails of the car in the elevator shaft of the building. Then they install the hoisting machine, the car frame and platform, the counterweight, the elevator chassis, and the control apparatus. Next, the car frame is connected to the counterweight with cables, the cab body and roof are installed, and the control system is wired. Finally, the entire assembly, including cables, wire, and electrical control apparatus, is carefully adjusted and tested.

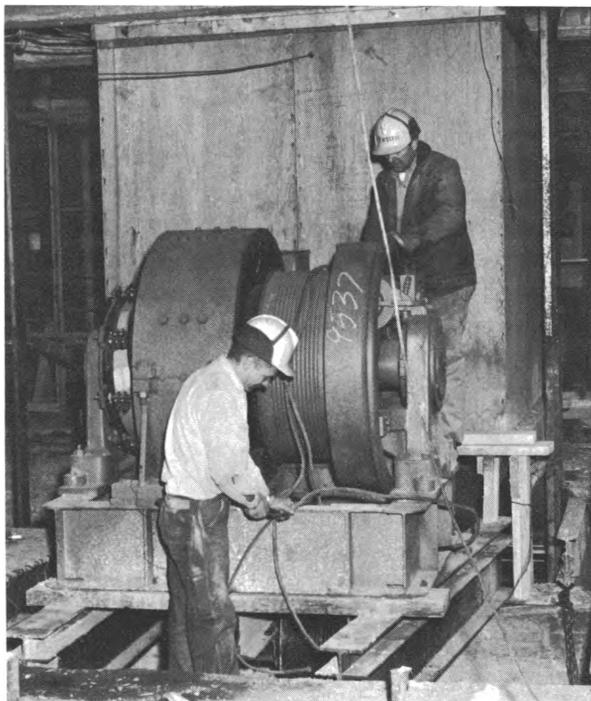
In maintenance and repair work, elevator mechanics inspect elevator and escalator installations periodically and, when necessary, adjust cables and parts and lubricate or replace parts.

Alteration work on elevators is important because of the rapid rate of innovation and improvement in elevator engineering. This work is similar to new installation work because all elevator equipment except the old rail, car frame, platform, and counterweight is generally replaced.

To install and repair modern elevators, most of which are electrically controlled, elevator constructors must have a working knowledge of electricity, electronics, and hydraulics. They must also be able to repair electric motors, as well as control and signal systems. Because of the variety of their work, they use many different handtools, power tools, and mechanical and electrical testing meters and gages.

Where Employed

Most of the estimated 12,000 journeymen elevator constructors employed in early 1963 worked for elevator manufacturers, doing new installation and modernization work and elevator servicing. Some elevator constructors are employed



Elevator constructors set hoisting equipment in place

by small, local contractors who specialize in elevator maintenance and repair. Others work for government agencies or business establishments which do their own elevator maintenance and repair. Elevator constructors are also employed as elevator inspectors for municipal or other government licensing and regulatory agencies.

Training and Other Qualifications

Although elevator constructors are among the more highly skilled building craftsmen, training is comparatively informal and is obtained through employment as a helper for a number of years. The helper-trainee must be at least 18 years of age, in good physical condition, and have a high school education or its equivalent, preferably including courses in mathematics and physics. Mechanical aptitude and an interest in machines are important assets.

To become a skilled elevator mechanic, at least 2 years of continuous job experience, including 6 months' on-the-job training at the factory of a major elevator firm, is usually necessary. During this period, the helper learns

to perform all of the operations involved in the installation, maintenance, and repair of elevators, escalators, and similar equipment. The helper-trainee generally attends evening classes in vocational schools. Among the subjects studied are mathematics, physics, electrical and electronic theory, and proper safety techniques.

Opportunities for establishing an individually owned small contracting business in this field are very limited.

Employment Outlook

A moderate increase in employment of elevator constructors is expected during the remainder of the 1960's and in the longer run. Several hundred new job openings will be created annually in this small occupation.

More elevator constructors will be needed as the result of the anticipated large expansion in new industrial, commercial, and large residential building. (See discussion, p. 333.) In addition, technological developments in elevator and escalator construction will spur modernization of older installations and thus will contribute to the growing need for these craftsmen. For example, the modern high speed elevators with automatic control systems require more work and higher skill for the installation and adjustment of electrical and electronic controls.

Earnings and Working Conditions

Both the hourly wage rates and the annual earnings of elevator constructors are among the highest in the skilled building trades. These craftsmen lose less worktime because of seasonal factors than do most other building trades workers.

Union minimum hourly wage rates, as of July 1, 1962, for elevator constructors averaged \$4.26, compared with \$4.15 for all journeymen in the building trades, according to a national survey of building trades workers in 53 large cities. Among individual cities surveyed, the minimum hourly rates for elevator constructors ranged from \$3.56 in Richmond, Va., to \$5.11 in Newark, N.J., and New York City. Helpers' rates generally are 70 percent of the journeyman rate.

Most elevator constructors are members of the International Union of Elevator Constructors.

Some work operations in elevator construction involve lifting and carrying heavy equipment and elevator parts, but this is usually done by helpers. Some of the work must be done in cramped or awkward positions. Most of the work is done indoors.

Where To Go for More Information

A young man who wishes to obtain further information regarding work opportunities as a

helper in this trade should direct his inquiry to an elevator manufacturer, an elevator contractor, or a local of the International Union of Elevator Constructors, if there is one in his locality. In addition, the local office of the State employment service may be a source of information about work opportunities in this trade.

General information about the work of elevator constructors may be obtained from the International Union of Elevator Constructors, 12 South 12th St., Philadelphia, Pa., 19107.

Stonemasons

(D.O.T. 5-24.210)

Nature of Work

Stonemasons build the stone exteriors of structures. They work primarily with two types of stones—natural cut stone, such as marble, granite, limestone, or sandstone; and artificial stone which is made to order from cement, marble chips, or other types of masonry materials. Much of the work of these craftsmen is the setting of cut stone for comparatively high-cost buildings, such as office buildings, hotels, churches, and public buildings.

The stonemason works from a set of drawings in which each stone has been numbered for identification, except where all pieces are identical. A helper or, in some cases, a derrickman, locates the pieces needed and brings them to the mason; large stones are set in place with a hoist. The stonemason sets the stone in mortar and moves it into final position with a mallet, hammer, or crowbar. He alines the stone with a plumb line and finishes the joints between the stones with a pointing trowel. He may fasten the stone to supports with metal ties, anchors, or by welding.

Occasionally, the stonemason may have to cut stone to size. To do this, he must determine the grain of the stone selected and strike blows along a predetermined line with a stonemason's hammer. Valuable stones are cut with an abrasive saw to make them fit.

Stonemasons also do some stone veneer work, in which a thin covering of cut stone is applied in various patterns to the exterior surfaces of a building. In some sections of the country, a great deal of stone is used to veneer homes. In one

specialized branch of the trade known as alberene stone setting, stonemasons set acid-resistant soap-stone linings for vats, tanks, and floors.

The principal handtools of the stonemason are heavy hammers, wooden mallets, and chisels. For rapid stone cutting, pneumatic tools are used, such as hammers, drills and brushing tools. Special power tools are used for smoothing the surface of large stones. An abrasive saw is used for fine cutting.

Where Employed

Most stonemasons work on new building construction, particularly on the more expensive residential and commercial buildings. A few work for government agencies or business establishments that do their own construction and alteration work. Journeymen stonemasons are employed mainly in the larger urban areas. In many areas where there are no stonemasons, the work is performed by those bricklayers who can do stone masonry work.

Training and Other Qualifications

Most training authorities, including the National Joint (labor-management) Bricklaying Apprenticeship Committee, recommend the completion of a 3-year apprenticeship program as the best way to learn the stonemason's trade. A substantial proportion of stonemasons, however, have picked up the trade by working many years as helpers, observing or being taught by experienced stonemasons.

Apprenticeship applicants generally are required to be between the ages of 17 and 24; a high school education or its equivalent is desirable. Good physical condition is an important asset.

The apprentice training program for stonemasons generally requires 6,000 hours (3 years) of on-the-job training, in addition to related classroom instruction. During the apprenticeship, the trainee learns to use, care for, and handle safely the tools, machines, and materials of the trade, and to lay out and install walls, floors, stairs, and arches. The apprenticeship program in this occupation is similar to that for bricklayer. (See discussion, p. 345.)

Employment Outlook

Little increase in the employment of stonemasons is expected in the next 10 to 15 years, despite the anticipated large expansion in new building construction. (See discussion, p. 333.) Less use of stone masonry work is expected, because modern architectural design has emphasized simple lines, little ornamentation, and large window areas. Replacement needs will provide a small number of job opportunities for new workers each year in this relatively small building trade.

Earnings and Working Conditions

Hourly wage rates for stonemasons are among the highest in the skilled building trades. Union minimum hourly wage rates for stonemasons, as of July 1, 1962, averaged \$4.28 compared with

\$4.15 for all journeymen in the building trades, according to a national survey of building trades workers in 53 large cities. Among individual cities surveyed, the minimum hourly rates for stonemasons ranged from \$3.75 in Richmond, Va., to \$5.20 in New York City.

A large proportion of stonemasons are members of the Bricklayers, Masons and Plasterers' International Union of America.

Most stonemasonry work is done outdoors. The work of the stonemason is active and sometimes strenuous, as it involves lifting moderately heavy materials.

Where To Go for More Information

A young man who wishes to obtain further information regarding apprenticeships for stonemasons or work opportunities in this trade should apply to bricklaying contractors in his area; to a local of the Bricklayers, Masons and Plasterers' International Union of America; to a local joint union-management apprenticeship committee, if there is one in his locality; or the local office of the Bureau of Apprenticeship and Training, U.S. Department of Labor. In addition, the local office of the State employment service serves as a source of information about apprenticeship openings.

General information about the work of stonemasons may be obtained from:

Associated General Contractors of America, Inc.,
1957 E St. NW., Washington, D.C., 20006.
Bricklayers, Masons and Plasterers' International
Union of America,
815 15th St. NW., Washington, D.C., 20005.

Construction Laborers and Hod Carriers

(D.O.T. 9-32.01)

Nature of Work

Construction laborers work on all types of building construction and on other types of construction projects, such as highways, dams, pipelines, and water and sewer projects. Their work includes the loading and unloading of construction materials at the worksite and the shoveling and grading of earth. Laborers stack and carry materials, including small units of machinery

and equipment, and do other work that aids building craftsmen. They also erect and dismantle scaffolding, set braces to support the sides of excavations, and clean up rubble at various stages of construction to provide a clear work area and to reduce hazards.

On alteration and modernization jobs, laborers tear out the old work. They perform much of the work done by wrecking and salvage crews during the demolition of buildings.

When concrete is mixed at the worksite, laborers fill the mixer with ingredients. Whether the concrete is mixed on-site or hauled in by truck, laborers pour and spread the concrete, and spade it to prevent air pockets. In highway paving, they handle and place the forms into which wet concrete is poured and cover new pavement with straw, burlap, or other materials to prevent excessive drying.

Bricklayers' tenders and plasterers' laborers, both commonly known as hod carriers, serve journeymen in their respective trades, supplying them with materials, setting up and moving portable scaffolding, and providing the other services needed. Hod carriers must be familiar with the work of the journeymen, have some knowledge of the materials used, and have some degree of judgment. It is customary practice in the building trades for hod carriers to be transferred with the journeymen from one construction project to another.

Building and construction laborers are commonly classified as unskilled workers, but this term can be misleading. Their work covers a wide range of requirements. Some types of construction-laborer and hod-carrier jobs often require experience as well as a broad knowledge of construction methods, materials, and operations. Rock blasting is an example of a type of work in which "know-how" is important. Construction laborers who work with explosives

drill holes in rock, handle explosives, and set charges. These workers must know the effects of different explosive charges under varying rock conditions so that proper measures can be taken to prevent injury and property damage. Construction laborers learn how to handle and use blasting materials through job experience and instruction from foremen in charge of blasting work. Also, in the construction of tunnels, and dam and bridge foundations, construction laborers must have specific on-the-job experience. They do all the work in the pressurized area of a tunnel, including operations which would be done by journeymen if the job were located elsewhere.

Where Employed

Laborers are employed by all types of construction contractors. A large number of these workers are also employed by State and municipal public works and highway departments and by public utility companies in road repairing and maintenance, and excavating.

Training and Other Qualifications

No formal training is required to obtain a job as a building or construction laborer. Generally, to be employed in these jobs, a young man must be at least 16 years of age and in good physical condition. A laborer's first job is usually on the simplest type of work, but as he gains experience he does more difficult work. Although laborers work with skilled building craftsmen, they rarely have a chance to work with the journeyman's tools or equipment and, therefore, generally have little opportunity to pick up the skills of a building trade.

Employment Outlook

Employment of construction laborers—who numbered more than 700,000 in early 1963—is expected to increase only moderately during the remainder of the 1960's and in the longer run despite the anticipated large growth in the volume of construction activity. (See discussion, p. 333.) Increased mechanization and improved methods of materials handling are expected to limit the rate of growth in the employment of



Construction laborers haul and pour concrete

these workers. For example, the employment of laborers is being affected by the increasing use of new types of more efficient grading machinery and mechanical lifting devices.

The need to replace laborers who transfer to other lines of work, retire, or die will provide thousands of job openings for new workers each year in this large occupational group. Retirements and deaths alone will result in approximately 15,000 job openings annually.

Earnings and Working Conditions

Union minimum hourly wage rates for bricklayers' tenders and building laborers averaged \$3.38 and \$3.05, respectively, as of July 1, 1962, according to a national survey of building trades workers in 53 large cities. Among individual cities surveyed, the minimum hourly rates for bricklayers' tenders ranged from \$1.65 in Charlotte, N.C., to \$4.30 in New York City. The rates for building laborers ranged from \$1.55 in Charlotte to \$4.30 in New York City.

Construction work is generally physically strenuous and requires bending, stooping, and heavy lifting. Much of the work is performed outdoors. Many laborers are members of the International Hod Carriers', Building and Common Laborers' Union of America.

Where To Go for More Information

A young man who wishes to obtain further information regarding work opportunities as a laborer should direct his inquiry to a building or construction contractor in his area, or a local office of the International Hod Carriers', Building and Common Laborers' Union of America, if there is one in his area. In addition, the local office of the State employment service is a source of information about work opportunities.

General information about the work of construction laborers may be obtained from:

International Hod Carriers', Building and Common
Laborers' Union of America,
905 16th St. NW., Washington, D.C., 20006.

PRINTING (GRAPHIC ARTS) OCCUPATIONS

Printing is an art, a leading industry, and one of our chief means of communication. It provides employment for more than 900,000 workers in a wide variety of occupations. These occupations are found principally in the printing and publishing industry, but also in government agencies and in private firms that do their own printing, such as manufacturers of paper products, banks, and insurance companies. About a third of all printing employees work in printing craft occupations. These occupations are described in detail later in this chapter. Among other employees in printing occupations are executives, salesmen, accountants, engineers, stenographers, clerks, maintenance mechanics, mailers, and laborers.

Nature and Location of the Industry

The printing process is basically a means of transferring ink impressions of words, numerals, symbols, and photographs or other illustrations to paper, metal, or other materials. The most commonly used methods of printing are letterpress, lithography, gravure, and screen printing. Each method has special advantages and requires some special skills.

Major divisions of the printing industry are the printing and publishing of newspapers, magazines, and books; the production of business forms; the production of greeting cards and gift wrappings; commercial or job printing; bookbinding; and the provision of typesetting, photoengraving, platemaking, and other printing services, primarily for printing establishments.

The largest division in terms of employment is newspaper printing and publishing, with about 340,000 employees in the more than 8,000 establishments. Most daily and weekly newspapers throughout the Nation do their own printing. Although some major newspapers employ several hundred workers, many smaller dailies and weeklies have fewer than 20 employees.

Commercial or job printing establishments, the second largest division, employ about 280,000

workers in about 17,000 establishments, including lithographic shops. Establishments in this division produce a great variety of materials such as advertising matter, business cards, calendars, labels, and pamphlets. They also print limited-run newspapers, books, and magazines. More than half of all workers in commercial shops are in establishments with fewer than 100 workers. A few large plants that employ a thousand workers or more each account for about 10 percent of all commercial printing employees.

Printing jobs are found throughout the country. Almost every town has at least one printing shop of some kind—frequently, a small newspaper plant which also may do other printing. However, more than half of the Nation's printing employees are in five States—New York, Illinois, California, Pennsylvania, and Ohio. Within these States, most printing activities are in or near manufacturing, commercial, or financial areas such as New York City, Chicago, Los Angeles, San Francisco, Philadelphia, Cincinnati, and Cleveland. Other leading centers are Boston, Detroit, St. Louis, Minneapolis—St. Paul, Milwaukee, and Washington, D.C. Employment in book and magazine printing is highly concentrated in these major urban areas. A much larger proportion of employment in newspaper plants, however, is found outside these centers because of the great number of small local newspapers.

Printing Methods

All methods of printing have certain common characteristics. A surface of metal, stone, wood, linoleum, rubber, or plastic is so prepared that a part of it can be covered with ink. The ink is then transferred to a sheet of paper or other material which is pressed against the prepared surface.

In relief printing, the printing surface stands up from the rest of the surrounding printing plate area. Ink is rolled over the raised surface and then paper is pressed against it. The best

known and most widely used example of this method is letterpress printing; other examples are flexography, in which a rubber plate is used, linoleum and wood block printing, and relief engraving on metal or plastic.

In lithography, the printing plate surface is smooth, with both image and nonimage areas on the same level. Lithography is based on the principle that grease and water do not mix. The image areas of the plate are coated with a substance to which the greasy printing ink will stick. On the press, the plate is moistened with water before each inking, so that only the image areas take up the greasy ink from the inking roller. The inked image is transferred from the plate to a rubber blanket and then to the surface to be printed. The lithographic method can be used to produce practically all items printed by any other method. It is especially satisfactory for printing on rough-textured surfaces because of the flexibility of the rubber blanket.

In gravure printing, the material to be printed is etched into the surface of the printing plate. The whole surface is covered with ink and then wiped off, leaving ink only in the sunken or etched areas. When paper or other material is firmly pressed against the surface the ink is sucked out and appears on the paper. Copper and steel plate engraving also uses this technique.

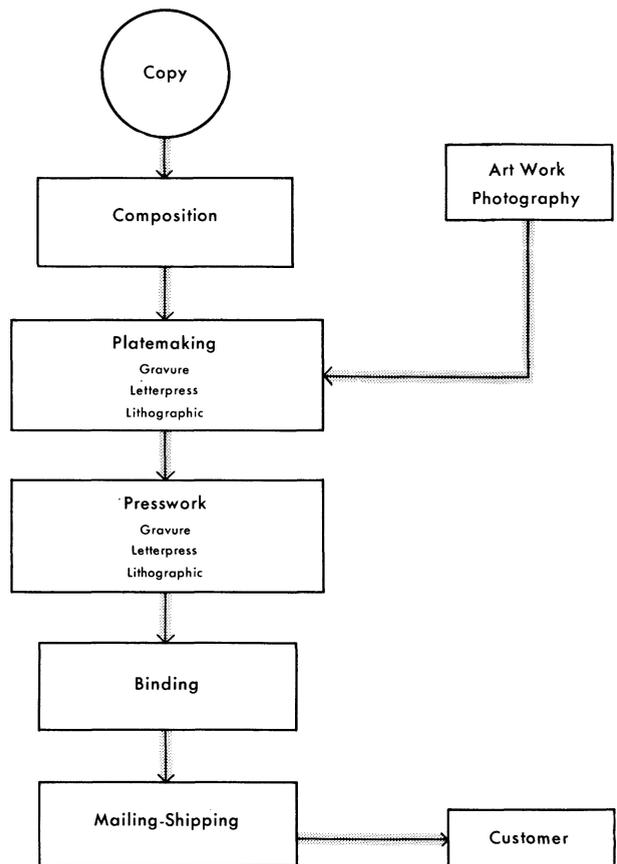
Screen printing is a process in which inks, or other materials such as paint, varnish, and liquid plastic are forced by the action of a flexible blade through a stencil mounted on a finely woven screen, generally silk or stainless steel. The shape of the stencil openings determines the design to be printed. This process may be applied to a wide variety of surfaces such as conventional paper, cardboard, wood, glass, metal, plastic, and textiles. Screen printing is used on irregular shaped surfaces and cylindrical surfaces as well as on flat surfaces.

Printing Occupations

Regardless of the printing method used, most printing work goes through several stages: Layout, composition, platemaking, and presswork. (See chart 27.) Additional processing in a bindery is needed for materials such as books and

CHART 27

SIMPLIFIED VIEW OF THE FLOW OF PRINTING WORK



magazines. The completed materials are then prepared for mailing or shipping.

Production of printed materials involves workers in a wide variety of occupations, as previously indicated. A large group of printing employees are printing craftsmen who in early 1963 numbered about 341,000. Printing craftsmen usually specialize in one area of printing operations, for example, type composition, photography, platemaking, presswork, or binding. Their training, moreover, is largely confined to only one of the basic printing processes—letterpress, lithographic, or gravure.

The largest group of printing craftsmen is made up of composing room workers, with nearly 180,000 employed in early 1963. This group includes hand compositors, imposers, operators of a variety of typesetting machines, and, frequently,

proofreaders. Other large groups of skilled printing workers are lithographic craftsmen such as cameramen, artists, strippers, platemakers, and lithographic pressmen; and the letterpress and gravure pressmen. Bookbinders, photoengravers, and electrotypers and stereotypers are other important workers in printing occupations. (These groups are described in detail later in this chapter.) Steel and copper plate engravers, who cut or etch lettering and designs into plates by hand or machine, are also employed in small commercial printing shops specializing in this work.

A small group of skilled workers employed in large plants are maintenance machinists who repair and adjust typesetting machines, printing presses, or bindery equipment.

In the skilled occupations, practically all the workers are men. However, many of the less skilled jobs, especially in the binderies, are held by women. Printing establishments also employ a great many persons as executives, salesmen, accountants, engineers, stenographers, clerks, and laborers. Newspapers and other publishers employ a considerable number of reporters and editors. These occupations are discussed elsewhere in this *Handbook*. (See index for page numbers.)

Because of the increasingly complex and highly mechanized printing equipment in use today, there is a growing need for technically trained people in all areas of printing management and production. For example, an increasing number of production technicians are being employed throughout the printing industry. These men are responsible for seeing that the standards established for each printing job are met. To do this they must be thoroughly familiar with the printing processes and the many technical instruments used in the plant to judge and control the quality of the printing.

The mailroom, chiefly in newspaper and periodical plants, is another area of employment closely related to printing production. Here workers address, bundle, and tie the printed matter for distribution. Modern mailroom processes are mechanized to a considerable extent. Mailers operate addressing, stamping, stacking, bundling, and tying machines.

Training and Other Qualifications

In the printing crafts, apprenticeship provides the most common method of entry. With some exceptions, it is the only means by which one may be trained to become a journeyman (skilled worker) in a unionized shop. Formal apprenticeship is also required for journeyman status in many larger establishments not covered by union contracts.

At the beginning of 1963 about 13,000 registered apprentices were in training in the skilled printing crafts. A registered apprentice is an employee who, under an expressed or an implied agreement, receives instruction in an apprenticeship occupation for a stipulated term and who is employed in an apprenticeship program registered with a State apprenticeship agency or the U.S. Department of Labor's Bureau of Apprenticeship and Training. In addition, perhaps 8,000 to 10,000 apprentices were in nonregistered programs. A substantial number of persons were also learning a printing trade while working as helpers, particularly in small printing shops or lettershops, or through a combination of work experience and schooling.

Printing apprenticeships usually last from 4 to 6 years, depending on the occupation and the shop or area practices. The apprenticeship program covers all phases of the particular trade and generally includes classroom or correspondence study in related technical subjects in addition to training on the job. As new printing methods have been developed and introduced, they have been incorporated into the duties of the traditional printing crafts and included in the apprentice training programs. Apprenticeship applicants are generally required to be between 18 and 30 years of age and must pass a physical examination. However, in many printing crafts there is no maximum age limit for entry into an apprenticeship.

In selecting applicants for printing craft jobs, most employers require a high school education or its equivalent. A knowledge of spelling, punctuation, the fundamentals of grammar, and basic mathematics is essential for some of the printing trades. A knowledge of the basic principles of chemistry and physics is becoming increasingly important because of the growing

use of photographic processes in printing. An artistic sense is also an asset since the finished product should be pleasing in balance and design. Most printing crafts require men with good eyesight, about average physical strength, and a high degree of manual dexterity. Mental alertness, speed with accuracy, neatness, patience, and the ability to work with others are also necessary. The ability to distinguish colors is important in areas of work where color is used. Many employers require applicants to take one or more of the aptitude tests developed for printing industry occupations by the U. S. Department of Labor. These tests are given in the local offices of State employment services. Apprentices are often chosen from among the young men already employed in various unskilled jobs in printing establishments who demonstrate the mechanical aptitudes essential for the printing crafts.

About 4,000 schools—high schools, vocational schools, technical institutes, and colleges—offer courses in printing. These courses may help a young person to be selected for apprenticeships or other job openings in the printing and publishing industries.

Employment Outlook

There will be many thousands of opportunities for young men to enter the skilled printing trades during the remainder of the 1960's and in the longer run. These openings will occur as a result of the expected moderate growth in the employment of skilled printing workers and because of the need to replace craftsmen who retire, die, or transfer to other fields of work. Retirements and deaths alone may result in about 5,000 to 6,000 job openings each year during the next 10 to 15 years.

A continued rise in the volume of printed material is expected because of population growth, the increasingly high level of education, the expansion of American industry, and the trend toward greater use of printed materials for information, packaging, advertising, and various industrial and commercial purposes. However, as in the past, employment in the skilled printing trades as a whole is not expected to increase as fast as the total output of printed matter because of new and improved printing equipment and methods.

Technological advances in printing methods will continue to be introduced, involving type composition, platemaking, and camera work. Among these are developments in color scanning, photocomposition, "cold type" composition, and the use of electronic devices and controls for engraving and printing. Research is being expanded in several other areas, including those involving electronic or magnetic principles. These technological advances will affect not only printing methods, but also the skills of printing craftsmen. For example, the introduction of phototypesetting machines makes it necessary for compositors to know or acquire photographic skills.

As in the past, there will be differences in the rates of growth among the various printing crafts. For example, employment of skilled composing room workers, the largest group of printing craftsmen, is expected to remain relatively stable, despite the continuing increase in the volume of printing. Composing room occupations are the most likely to be affected by changes in printing equipment and by competitive printing methods. Employment of pressmen, however, is expected to increase because of the growth in the number and size of presses.

Earnings and Working Conditions

Earnings of production workers in the printing and publishing industry, including the unskilled and semiskilled workers and printing craftsmen, are among the highest in manufacturing industries. In 1962, production workers in this industry averaged \$108.01 a week, or \$2.82 an hour, compared with \$96.56 a week, or \$2.39 an hour for production workers in all manufacturing in the same month.

Earnings of individual printing craftsmen vary from one occupation to another. Generally, the wage rates in large cities are higher than in small communities. Wage rates also differ by type of printing establishment. The following tabulation shows the average union minimum hourly wage rates for daywork for selected printing occupations in 54 large cities on July 1, 1962. These rates are the minimum basic rates for the individual occupational classifications. They do not include overtime, other special payments, or bonuses.

	Average union hourly rate, July 1, 1962	
	Newspaper ¹	Book and job
Bookbinders		\$3. 37
Compositors, hand.....	\$3. 59	3. 57
Electrotypers.....		3. 81
Photoengravers.....	3. 89	4. 20
Pressmen (journeymen).....	3. 54	-----
Pressmen (cylinder).....		3. 53
Pressmen (platen).....		3. 20
Stereotypers.....	3. 54	3. 91
Mailers.....	3. 24	3. 08

¹ Average day rates.

A standard workweek of 37½ hours was specified in labor-management contracts covering about 2 out of 5 of the organized printing trades workers, although standard workweeks of 36¼ hours and 35 hours were also in effect. A 40-hour workweek was standard in other establishments in the industry. Time and a half is generally paid for overtime. Work on Sundays and holidays is customarily paid for at time and one-half or double-time rates in most printing establishments. In newspaper plants, however, the craftsmen's workweek often includes Sundays and time and one-half or double time is paid for these days only when they are not part of the employee's regular shift. Night-shift workers generally receive pay differentials above the standard day rates.

The starting wage rates of apprentices are generally from 40 to 50 percent of the basic rate for journeymen in the shop. Wages are increased periodically, usually every 6 months, until in the final year or half year of training, the apprentice receives from 80 to 95 percent of the journeyman rate. Apprentices with prior experience, civilian or military, or in exceptional cases, technical school training, can obtain credit which will start them above the beginning apprentice pay rate and also reduce the length of time required to become a journeyman, if they satisfactorily pass examinations provided for situations of this nature. In some of the crafts, apprentices may be upgraded when they show exceptional progress.

The annual earnings of printing craftsmen depend not only on their hourly rate of pay, but also on how regularly they are employed. The printing industry has fewer seasonal fluctuations than most other manufacturing industries and this is one of the reasons why it offers steadier employment and higher average annual earnings.

Paid vacations are generally provided for printing craftsmen. The most common provision in labor-management agreements is 2 weeks' vacation with pay after 1 year's employment. Many agreements, however, provide for 3 weeks' vacation with pay after 1 or more years of employment, and an increasing number provide for 4 weeks with pay after 20 or 25 years. Other major benefits, such as paid holidays, retirement pay, life and disability insurance, hospitalization, and severance pay are also common. In addition, a number of printing trade unions have for many years operated their own programs providing their members with one or more types of benefits, such as life insurance, retirement, sickness, or disability payments.

The injury-frequency rate in the printing industry is somewhat lower than the average for all manufacturing industries.

A large proportion of the printing craft workers are members of unions affiliated with the AFL-CIO. The two largest printing craft unions are the International Typographical Union and the International Printing Pressmen and Assistants' Union of North America. Other printing craft unions include the International Photoengravers' Union of North America, International Stereotypers' and Electrotypers' Union of North America, International Brotherhood of Bookbinders, and the International Mailers Union. The majority of unionized lithographic workers are in plants under contract with the Amalgamated Lithographers of America, an unaffiliated union which organizes on a plantwide basis and, therefore, includes both printing craftsmen and other lithographic workers.

Where To Go for More Information

Information on opportunities for apprenticeship or other types of printing employment in a particular locality may be obtained from various sources. Applicants may apply directly to the printing establishments in their areas. The names and locations of local printers can usually be obtained from the classified section of the local telephone directory. In addition, the local unions and employer associations in the printing industry can often provide information regarding apprenticeship openings. In union shops, applicants may apply directly to the joint union

management coordinating committee. In recent years, there has been an increasing use of local offices of the State employment services as information exchanges for apprenticeship openings. Some of these offices provide services such as screening applicants and giving aptitude tests. However, the final selection is made by the employer, the joint apprenticeship committee, or the union.

General information on the printing industry may be obtained by writing to the following organizations.

American Newspaper Publishers Association,
750 Third Ave., New York, N.Y., 10017.

Book Manufacturers' Institute, Inc.,
25 West 43d St., New York, N.Y., 10036.

Education Council of the Graphic Arts Industry, Inc.,
1411 K St. NW., Washington, D.C., 20005.

Gravure Technical Institute,
30 Rockefeller Plaza, New York, N.Y., 10020.

Lithographers and Printers National Association,
Inc.,

1025 Connecticut Ave. NW., Washington, D.C., 20036.

Printing Industry of America, Inc.,

20 Chevy Chase Circle NW., Washington, D.C., 20015.

(See sections on individual printing occupations for names of labor organizations and trade associations which can provide more information on specific printing trades.)

Composing Room Occupations

The printing process begins in a composing room where manuscript copy is set in type, chiefly by typesetting machines, but also by hand. Machine- and hand-set type, and other materials, such as photoengravings, are assembled there and prepared for the pressroom.

In early 1963, more than half of all printing craftsmen—nearly 180,000—were employed in composing room occupations. These occupations offer good opportunities for young men willing to spend several years learning a skilled craft. Workers in these occupations usually have year-round employment and very good earnings. The two principal composing room occupations are those of hand compositor and typesetting machine operator. A skilled worker in a closely related occupation is the *proofreader* (D.O.T. 1-10.07) who compares a trial printing or "proof" with the original copy from which the type was set and marks necessary corrections on this proof to guide the compositor in making changes.

Skilled composing room workers are employed in newspaper plants, commercial printing shops, in periodical and book printing establishments, and in typographic composition shops which specialize in typesetting. They work in almost every community throughout the country, but employment is concentrated in larger commercial and industrial cities, such as New York, Chicago, Philadelphia, Los Angeles, Boston, Washington, D.C., San Francisco, Detroit, St. Louis, Baltimore, and Cleveland.

Nature of Work

Hand compositors (typesetters) (D.O.T. 4-44.010) make up the oldest composing room occupation. An important function of workers in this occupation is to set type by hand for fine printing—advertisements, title pages of books and, in some cases, the complete text of books. This work requires highly skilled craftsmen with artistic ability because type must be arranged and spaced to produce a well balanced and pleasing effect. Hand compositors also set type for small jobs when setting type by machine is impractical.

In setting type by hand, the compositor, reading from the manuscript copy, first sets each line of type in a "composing stick" (a device which holds type in place) letter by letter and line by line. When this stick is full, he slides the completed lines onto a shallow metal tray called a "galley." Then he assembles and arranges machine- and hand-set type and any needed engravings into pages. In the final step the completed pages are put into proper sequence for folding in the bindery, and locked into forms called "chases" before they are sent to the pressroom or platemaking department. After printing is completed, the hand compositor breaks down the type forms and distributes the individual pieces of type to the proper storage compartments for reuse. In large plants, and in many typographic composition shops, the compositors who specialize in page makeup are called *imposers* (D.O.T. 4-44.220). These craftsmen (also called

lockup men, stonemen, or stonehands) place the pages in the correct order on an imposing stone or table to be locked, by wedges, into a chase. The pages must be placed in such order that, when folded, the printed pages will have the proper numerical sequence.

Typesetting machine operators are craftsmen who operate semiautomatic machines which set type much more rapidly than the hand compositors.

Linotype (or Intertype) machine operators (D.O.T. 4-44.110) reading from the copy clipped to the machine's copy board, select letters and other characters by operating a keyboard which has 90 keys. As they press the keys, the letters, in forms of metal molds called matrices, are assembled into lines of words. A space-band key provides the necessary spacing between words. As they complete each line, the operators touch a lever and the machine automatically casts the line of type into a solid metal strip called a "slug." The slugs are then deposited in a galley and are later assembled into the type forms from which either the printing impressions or the plates are made. Nearly all newspaper plants, large commercial shops, and typesetting shops use these machines and operators to set type. In the smaller plants, the typesetting machine operator maintains and repairs as well as operates the typesetting machine. In the larger plants, maintenance machinists are employed to make all but minor adjustments to the machines.

Other typesetting machine operators work on Monotype machines. One machine is called the Monotype keyboard and the other is the Monotype caster.

Monotype keyboard operators (D.O.T. 4-44.120) operate keyboards quite similar to those on a typewriter, but which include about four times as many keys. The keyboard machine produces a perforated paper tape which is later fed into the casting machine. The keyboard operator must be able to handle complicated copy, such as statistical tables.

Monotype caster operators (D.O.T. 6-49.310) operate the casting machines which automatically cast and assemble the type, guided by the perforations in the paper tape prepared by the keyboard machine. As the rolls of perforated tape are fed into the machines, the proper

matrices for casting letters are automatically selected by means of the perforations in the tape. Molten metal is forced into the matrix to form the individual character. The Monotype casting machine, as the name suggests, casts type one letter or character at a time. This permits some corrections to be made by hand without the need to reset an entire line. The principal duties of caster operators are to insert the tape, adjust and tend the machine while it is operating, and do necessary maintenance and repair work. Only one caster operator is employed to every two or three keyboard operators. Composition service shops are the largest employers of both Monotype keyboard and caster operators.

Phototypesetting machine operators set type on machines which may be similar in appearance, or method of operation, or both, to those which cast type in hot metal. In phototypesetting, however, a photographic process replaces the function of the hot metal, and the final product is a film or photographic paper print of the type rather than a metal slug. In one type of machine, as the operator presses the keys, the individual matrices or mats, which contain small film negatives, are assembled and photographed on film, character by character, to form a line of type. In other phototypesetting machines, a perforated paper tape, or a magnetic sound tape, is produced as the operator presses the keys. These tapes are fed into a phototypesetting machine which "reads" the tapes and photographs the individual characters indicated on the tape.

Some typesetters operate photolettering machines which produce lines or individual characters in large-size type such as that used for newspaper headlines and for advertisements. As in phototypesetting, a photographic process is involved, and the final product is on film or paper.

In addition to machine operation, the phototypesetter must be familiar with the fundamentals of photography, including darkroom procedures, because he has to develop the film on which the type has been photographed. He also assembles and arranges developed film into pages. This process, called "stripping," corresponds to page makeup in the hot metal type process. The operator also makes minor repairs on the phototypesetting machine. Since much of this equipment has electronic controls, the operator needs

a basic working knowledge of the principles of electronics.

Typesetting machine operators also set type by the "cold type" method. The type is set on paper using machines that are similar to typewriters. These machines automatically space letters and lines. "Cold type" composition may be set directly on a paper or even a metal sheet from which the plate is to be made, or the cold type images may be cut from paper and pasted on layout sheets. The process of assembling and pasting this type on layout sheets is called pasteup, and is somewhat similar to hand composition. The worker who assembles and pastes all the materials for a page is called a paste-make-up man. Cold type composition is frequently used by shops which set type for display advertising, and in shops printing business forms.

Typesetters also operate teletypesetting machines. These are machines with keyboards quite similar to those of typewriters. They are fitted with reels of tape which are perforated as the keys are struck. The perforated tapes are next inserted in line casting machines which set the type as directed by the perforations. After the tape has been punched, it may be sent by teletype to other cities where it is automatically reperfected and used to control the operation of a linecasting machine.

Training and Other Qualifications

Most compositors acquire their skills through apprenticeship training. In union shops, apprentices are often selected from among the helpers. Some compositors acquire their skills while working as helpers for several years (particularly in small shops and in the smaller communities) or through a combination of trade school and helper experience.

Generally, apprenticeship covers a 6-year period of progressively advanced training, supplemented by classroom instruction or correspondence courses. However, this period may be shortened by as much as 2 to 2½ years for apprentices who have had previous experience or schooling or who show the ability to learn the trade more rapidly. The time and emphasis spent upon any particular phase of training varies from plant to plant, depending upon the type of printing establishment.

A typical apprenticeship program for compositors includes instruction in elementary hand composition, page makeup, lockup, and lineup, and proofreading. After basic training as a hand compositor, the apprentice receives intensive training in one or more specialized fields, such as the operation of typesetting machines, including phototypesetting and teletypesetting machines, as well as specialized work in hand composition and photocomposition.

Applicants for apprenticeship generally must be high school graduates and in good physical condition. They are sometimes given aptitude tests. Important qualifications include training in English, especially spelling, and in mathematics. Printing and typing courses in vocational or high schools are good preparation for apprenticeship applicants, and a general interest in electronics and photography is becoming increasingly useful. Artistic ability is an asset for a compositor in layout work.

Apprentices are paid according to a predetermined wage scale, which increases as the apprenticeship period advances. At the beginning of 1963, there were 4,987 registered apprentices in training for skilled composing room jobs.

Employment Outlook

There will continue to be many opportunities for young men to enter the skilled composing room occupations during the 1960's and in the longer run. There will be about 3,000 to 4,000 job opportunities for new workers to enter this large occupational group each year just to replace those skilled workers who retire or die.

In spite of the anticipated expansion in the volume of printing in the United States during the next 10 to 15 years, employment of compositors is expected to remain relatively stable. Changing technology will limit the employment growth of these craftsmen. For example, a technological development which may reduce employment needs for typesetters is the tape operated linecasting machine, described earlier.

Technological changes also will significantly affect the educational and skill requirements for typesetters. The greater use of phototypesetting, for example, requires typesetters to have photo-



New typesetting equipment requires operator to have both typesetting and photographic skills

graphic skills. Since much of the new typesetting equipment is operated by electronic systems, a knowledge of the application of electronic principles to the operation of this equipment is becoming increasingly important for the typesetter.

Earnings and Working Conditions

As is true for most printing crafts, wages of skilled composing room workers are relatively high compared with skilled workers generally. However, there is considerable variation in wage rates from place to place and from firm to firm. The average union minimum hourly wage rate

for hand compositors on day shift in 54 large cities was \$3.59 in newspaper plants and \$3.57 in book and job shops on July 1, 1962. Union minimum wage rates for hand compositors in book and job shops ranged from \$2.69 an hour in Springfield, Mass., to \$4.10 in San Francisco. In newspaper establishments, the union minimum wage rates for day-shift hand compositors ranged from \$2.89 an hour in Springfield, Mass., to \$3.94 in San Francisco.

Working conditions for compositors vary from plant to plant. Some heat and noise are made by hot metal typesetting machines. In general, the newer plants are well lighted and clean, and many are air conditioned. Composing room jobs require about average physical strength. Hand compositors are required to stand for long periods of time, and to do some lifting. Young men with some types of physical handicaps, such as deafness, have been able to enter the trade and do the work satisfactorily. Many compositors work at night on the second or third shift for which they generally receive additional pay.

A substantial proportion of compositors are members of the International Typographical Union.

Where To Go for More Information

- International Typographical Union,
P.O. Box 157, Colorado Springs, Colo., 80900.
- International Typographic Composition Association,
Inc.,
Washington Bldg., 15th and New York Ave. NW.,
Washington, D.C., 20005.
- Lithographers and Printers National Association,
Inc.,
1025 Connecticut Ave. NW., Washington, D.C., 20036.
- Printing Industry of America, Inc.,
20 Chevy Chase Circle NW., Washington D.C., 20015.

See page 386 for additional sources of information.

Photoengravers

(D.O.T. 4-47.100 through .300)

Nature of Work

Photoengravers make metal printing plates of illustrations and other copy that cannot be set up in type. On these plates the printing

surfaces stand out in relief above the nonprinting spaces, as do the letters and the accompanying type. Similarly, gravure photoengravers, a specialized type of photoengraver, make



Photoengraver cuts away (routs) metal from nonprinting areas of a plate

gravure plates in which the image is etched below the surface for use in reproducing pictures and type.

In making a photoengraving plate for the letterpress process, the entire job may be done either by one man or by a number of skilled workers, each specializing in a particular operation. Such specialized workers are cameramen, printers, etchers, finishers, routers, blockers, and provers. In the large shops, the work is almost always divided among a number of these specialists.

A *cameraman* starts the process of making a photoengraving plate by photographing the material to be reproduced. Plates made from line drawings are called line plates and those from photographs are called halftone plates. After the cameraman develops the negative, the *printer* prints the image on a metal plate by coating the plate with a solution sensitive to light and then exposing it and the negative to arc lights. The image areas are protected by chemical means so that when the plate is placed in an acid bath by the *etcher*, only the nonimage areas are etched away, leaving the image areas standing out in relief.

A number of other photoengraving operations are then performed. The *finisher* carefully inspects and touches up the plate with handtools;

the *router* cuts away metal from the nonprinting part of the plate to prevent it from touching the inking rollers during printing; the *blocker* mounts the engraving on a suitable base to make it reach the right height; and the *prover* prints a sample copy on a proof press.

The operations involved in gravure photoengraving are much like those in letterpress photoengraving except that the image areas, rather than the background, are etched away.

Where Employed

More than 17,000 journeymen photoengravers were employed in early 1963. The great majority of photoengravers (about 12,000) are employed in commercial service shops where the main business is making photoengravings for use by others. Newspaper and rotogravure shops employ several thousand photoengravers. In addition, book and periodical shops and the U.S. Government Printing Office also employ photoengravers. Many craftsmen have their own shops. Photoengravers' jobs are highly concentrated in the largest printing centers, particularly New York, Chicago, Philadelphia, and Los Angeles.

Gravure photoengravers work mainly in independent gravure plants. Most of them work for the small number of big firms which handle a large proportion of all gravure work. A few large newspaper and commercial plants also have departments where this work is done. Gravure plants are concentrated in a few States, particularly New York, New Jersey, Illinois, and Ohio.

Training and Other Qualifications

The most common way to become a photoengraver is through apprenticeship training. The apprenticeship program generally covers a 5- or 6-year period and includes at least 800 hours of related classroom instruction. Besides the care and use of tools, the apprentice is taught to cut and square negatives, make combination plates, inspect negatives for defects, mix chemicals, sensitize metal, and to operate machines used in the photoengraving process.

Apprenticeship applicants must be at least 18 years of age and generally must have a high school education or its equivalent, preferably with courses in chemistry and physics and train-

ing in art. Credit for previous experience acquired in photoengraving work may shorten the required apprenticeship time. Many employers require a physical examination for prospective photoengravers; the condition of the applicant's eyes is particularly important because a photoengraver's duties involve constant close work and color discrimination.

Employment Outlook

In spite of the anticipated continued expansion in printing output, the greater use of photographs and other illustrations, and the increasing use of color, only a small increase is expected in the number of photoengravers during the 1960's and in the longer run. Wider use of phototype-setting and more rapid and less expensive etching techniques may result in more work for photoengravers, but the introduction of photographically and electrically made plates will limit the growth of employment of these workers. On the average, employment growth and replacement needs together probably will result in only a few hundred openings for new workers each year during the next 10 to 15 years.

Earnings and Working Conditions

Photoengravers are among the highest paid printing craftsmen. The union minimum hourly wage rate for photoengravers, including those in gravure, book, and job shops, in 54 large cities ranged from \$3.11 in New Orleans to \$4.74 in New York on July 1, 1962.

The great majority of photoengravers are union members. Nearly all photoengravers are represented by the International Photo Engravers' Union of North America.

Where To Go for More Information

- American Photoengravers Association,
166 West Van Buren St., Chicago, Ill., 60604.
- International Photo Engravers' Union of North America,
3605 Potomac St., St. Louis, Mo., 63116.
- Lithographers and Printers National Association,
Inc.,
1025 Connecticut Ave. NW., Washington, D.C., 20036.
- Printing Industry of America, Inc.,
20 Chevy Chase Circle NW., Washington, D.C., 20015.

See page 386 for additional sources of information.

Electrotypers and Stereotypers

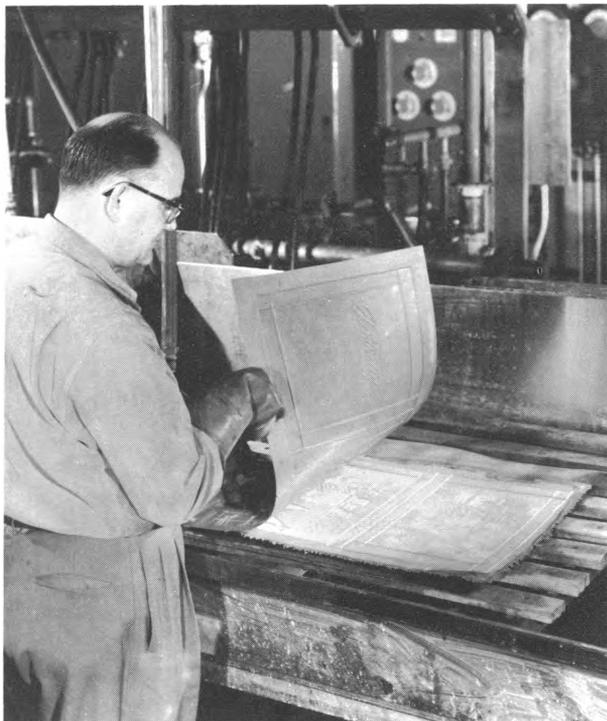
Nature of Work

Electrotypers (D.O.T. 4-45.010) and *stereotypers* (D.O.T. 4-45.210) make duplicate press plates of metal, rubber, and plastic for letterpress printing. These plates are made from the metal type forms prepared in the composing room. Electrotypers are used mainly in book and magazine work. Stereotypes, which are less durable, are used chiefly in newspaper work. Electrotyping and stereotyping are necessary because most volume printing requires the use of duplicate printing plates. When a large edition of a book or magazine is printed, several plates must be used to replace those which become too worn to make clear impressions. Also, by means of duplicate plates, printers can use several presses at the same time, and thus finish a big run quickly. This is especially important in publishing daily newspapers. Furthermore, the rotary presses used in many big plants require

curved plates which can be made by either electrotyping or stereotyping processes from the flat type forms.

Several steps are required to produce a fine metal plate ready for use in the pressroom. In electrotyping, the first step is making a wax or plastic mold of the type form, coating it with special chemical solutions, and then suspending it in an electrolytic solution containing metal. This leaves a metallic shell on the coated mold, which is then stripped from the mold, backed with metal or plastic, and carefully finished.

The stereotyping process is much simpler, quicker, and less expensive than electrotyping, but it does not yield as durable or as fine a plate. Stereotypers make molds or mats of papier mache (a strong material composed of paper pulp) instead of wax or plastic. This involves placing the moist mat (in newspaper printing, usually a dry mat) on the type form, and covering it with a cork blanket and sheet



Electrotypist removes completed shell from mold

of fiberboard. The covered form is then run under heavy power-driven steel rollers to impress the type and photoengraving on the mat. After the paper mold has been dried, it is placed in a stereotype casting machine which casts a composition lead plate on the mold. In many of the larger plants, stereotype plates are cast in automatic machines.

In many of the larger plants, electrotypers and stereotypers perform only one phase of the work, such as casting, molding, finishing, or blocking. However, journeymen must know how to handle all the tasks involved in their respective trades.

Many electrotypers work in large plants which print books and periodicals. Stereotypers generally work in newspaper plants, but some are employed in large commercial printing plants. Electrotypers and stereotypers are also employed in independent service shops which do this work for printing firms.

Training and Other Qualifications

Nearly all electrotypers and stereotypers learn their trades through apprenticeship. Electrotyping and stereotyping are separate crafts, and

there is little transferability between the two. The apprenticeship program in each trade covers all phases of the work and almost always includes classes in related technical subjects as well as training on the job. Apprenticeship training for electrotypers and stereotypers usually covers a 5- or 6-year period of reasonably continuous employment.

Apprenticeship applicants must be at least 18 years of age and, in most instances, must have a high school education or its equivalent. If possible, this education should include mechanical training and courses in chemistry. Physical examinations and aptitude tests are often given to prospective apprentices. The emphasis placed upon different phases of training varies from plant to plant, however, depending upon the type of printing establishment.

Employment Outlook

During the 1960's and in the longer run, there will be some opportunities for new workers to become electrotypers and stereotypers, because of retirements, deaths, or transfers of workers to other occupations. However, the total number of electrotypers and stereotypers, is expected to decline, continuing the trend between 1950 and 1960, when employment of these printing craftsmen dropped by more than 20 percent.

This decline will occur, in spite of the anticipated increase in the total volume of printing, because of technological changes. For example, the increasing use of automatic plate composition eliminates many steps in platemaking, and plastic and rubber plates are increasingly being made outside electrotyping and stereotyping shops.

Earnings and Working Conditions

On July 1, 1962, the union minimum hourly wage rates for electrotypers and stereotypers in 54 large cities averaged \$3.75 or more an hour. Union minimum hourly wage rates for electrotypers in book and job plants ranged from \$2.70 an hour in Erie, Pa., to \$4.29 an hour in New York. In newspaper plants, rates for day-shift stereotypers ranged from \$2.89 an hour in Springfield, Mass., to \$4.39 an hour in Chicago.

Much of the work requires little physical effort since the preparation of duplicate printing plates

is highly mechanized. However, there is some lifting of relatively heavy, hot press plates.

Nearly all electrotypers and stereotypers are members of the International Stereotypers' and Electrotypers' Union of North America.

Where To Go for More Information

International Stereotypers' and Electrotypers'
Union of North America,
752 Old South Building, Boston, Mass., 02108.

International Association of Electrotypers and
Stereotypers, Inc.,
758 Leader Building, Cleveland, Ohio, 44114.
Lithographers and Printers National Association,
Inc.,
1025 Connecticut Ave. NW., Washington, D.C., 20036.
Printing Industry of America, Inc.,
20 Chevy Chase Circle NW., Washington, D.C., 20015.

See page 386 for additional sources of information.

Printing Pressmen and Assistants

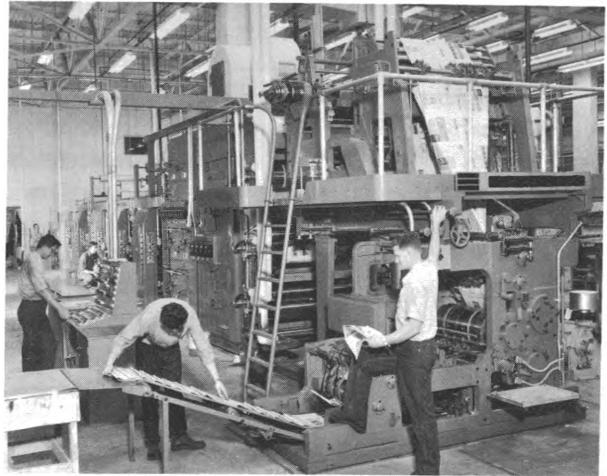
(D.O.T. 4-48.010, .020, .030, and .060; 6-49.410, .420, and .430)

Nature of Work

The actual printing operation is performed in the pressroom. Printing pressmen "makeready" (prepare) type forms and press plates for final printing and tend the presses while they are in operation.

The object of makeready, which is one of the most delicate and difficult parts of the pressman's work, is to insure printing impressions that are distinct and uniform. This is accomplished by such means as placing pieces of paper of exactly the right thickness underneath low areas of the press plates to level them, and by attaching pieces of tissue paper to the surface of the cylinder or flat platen which makes the impression. Pressmen also have to make many other adjustments—for example, those needed to control margins and the flow of ink to the inking roller. In some shops, they are responsible not only for tending the presses but also for oiling and cleaning them and making some minor repairs. On the larger presses, pressmen have assistants and helpers.

Pressmen's work may differ greatly from one shop to another, mainly because of differences in the kinds and sizes of presses used. Small commercial shops generally have small and relatively simple presses that are often fed paper by hand. At the other extreme are the enormous web-rotary presses used by the big newspaper and magazine printing plants. These giant presses are fed paper in big rolls called "webs." They print the paper on both sides by means of a series of cylinders; cut, assemble, and fold



Printing pressman and assistants operate modern color press

the pages; and, finally, count the finished newspaper sections which emerge from the press ready for the mailing room. These steps are accomplished automatically by means of many different mechanisms, each of which calls for constant attention while a run is being made. Presses of this kind are operated by crews of journeymen and less skilled workers under the direction of a *pressman-in-charge*.

Although the basic duties of *lithographic (offset) pressmen* are similar to those of letterpress and gravure pressmen, a number of differences exist, principally because of the specialized character of lithographic presses. (See p. 396 for further details.)

The duties of *press assistants* range from feeding sheets of paper into hand-fed presses to

helping pressmen makeready and operate large and complicated rotary presses. Workers whose main responsibility is feeding are often called *press feeders*. The ratio of assistants to pressman differs from one establishment to another, depending on the size of the plant, the type of press used, and other factors. Many shops are too small to have pressroom assistants.

Training and Other Qualifications

As in the other printing crafts, the most common way of learning the pressman's trade is through apprenticeship. Some workers have been able to learn the skills of the trade while working as helpers or press assistants or through a combination of work experience in the pressroom and vocational or technical school training.

The length of apprenticeship and the content of training depend largely on the kind of press used in the plant. The apprenticeship period in commercial shops is 2 years for press assistants and 4 years for pressmen. In newspaper establishments the apprenticeship period is 5 years. The apprenticeship period for pressmen operating web presses is generally 5 years. On-the-job training includes the care of pressroom equipment, makeready, running the job, press tending and maintenance, and working with various types of inks and papers. In addition to on-the-job instruction, the apprenticeship involves related classroom or correspondence schoolwork. At the beginning of 1963, about 3,100 registered apprentices were in training and perhaps 4,000 others were in unregistered programs.

Individual companies generally choose apprentices from among press assistants and others already employed in the plant. Young men may often work for 2 or 3 years in the pressroom before they are selected to begin 2- to 4-year training periods leading to journeyman status. A high school education or its equivalent is generally required. Because of technical developments in the printing industry, a year of chemistry and a year of physics should be included. Mechanical aptitude is important in making press adjustments and repairs. An ability to visualize color is essential for work on color presses, which are used increasingly. Physical

strength and endurance are necessary for work on some kinds of presses, where the pressmen have to lift heavy type forms and press plates and stand for long periods.

Employment Outlook

Employment of pressmen is expected to increase moderately during the remainder of the 1960's and in the longer run. Although the total amount of printing is expected to increase and the growing use of color will require larger presses, continued improvements in the speed and efficiency of printing presses may slow somewhat the rate of employment growth in this skilled craft.

The need to replace workers who retire, die, or transfer to other fields of work will also result in job opportunities for new workers. Retirements and deaths alone may result in about 1,000 job openings each year.

Earnings and Working Conditions

The earnings of pressmen depend upon the kind of press operated, the type of printing plant, and the geographical area of employment. A survey of union minimum hourly wage rates for daywork in 54 large cities shows that the average minimum hourly rate in effect on July 1, 1962, for newspaper pressmen-in-charge was \$3.87; for newspaper pressmen (journeymen), \$3.54; for book and job cylinder pressmen, \$3.53; for book and job platen pressmen, \$3.20; and for book and job press assistants and feeders, \$2.92.

Pressrooms are unavoidably noisy; also, there are the usual occupational hazards associated with machinery. Pressmen often have to lift heavy type forms and printing press plates. At times, they work under pressure to meet deadlines, especially in the printing of newspapers and magazines. Many pressmen work night shifts for which the rate of pay is higher than the basic day rate.

A majority of pressroom workers are covered by union agreements. Practically all of the organized letterpress and gravure pressmen are members of the International Printing Pressmen and Assistants' Union of North America.

Where To Go for More Information

International Printing Pressmen and Assistants'
Union of North America,
Pressmen's Home, Tenn., 37850.
Lithographers and Printers National Association,
Inc.,
1025 Connecticut Ave. NW., Washington, D.C., 20036.

Printing Industry of America, Inc.,
20 Chevy Chase Circle NW., Washington, D.C., 20015.

See page 386 for additional sources of information.

Lithographic Occupations

Nature of Work

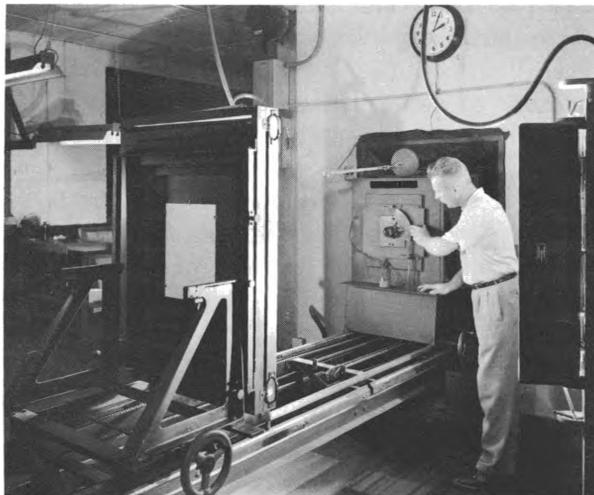
Lithography (offset printing) is one of the most rapidly growing methods of printing. Practically all items printed by other processes are also produced by lithography—including books, calendars, maps, posters, labels, office forms, sheet music, and even newspapers. Lithography has special advantages when the copy to be reproduced includes photographs, drawings, or paintings, since the rubber blanket which transfers the image from the plate to the surface to be printed permits greater flexibility in the type of paper that can be used.

Several operations are involved in lithography, and each is performed by a specialized group of workers. The main groups of lithographic workers are cameramen, artists and letterers, strippers, platemakers, and pressmen.

The *cameraman* (D.O.T. 4-46.200) starts the process of making a lithographic plate by photographing the copy. He is generally classified as a line cameraman (black and white), halftone cameraman (black and white), or color separation photographer.

After the negatives have been made, they frequently need retouching to lighten or darken certain parts. Thus, it is often necessary for a *lithographic artist* (D.O.T. 4-46.700) to make corrections by sharpening or reshaping images on the negatives. Highly skilled workers perform this work by hand, using chemicals, dyes, and special tools.

To qualify as journeymen, these artists must be adept in one or more of the various retouching methods. Like cameramen, they are customarily assigned to only one phase of the work and may then be known, for example, as dot etchers, retouchers, or letterers, depending on their particular job.



Cameraman adjusts lens in camera before making printing plate

The *stripper* (D.O.T. 4-47.300) makes layouts on paper, glass, or film. He arranges and pastes film or prints of type, pictures, and other art work on the layout sheets called flats or "strip-ups," from which photographic impressions are made for the lithographic press plates. The job of the stripper in the lithographic process corresponds to that of the imposer in the letterpress process.

In photolithography, employees in the plate-making department expose press plates to photographic films which are made by the cameramen and corrected by artists. The *platemaker* (D.O.T. 4-46.300) may cover the surface of the metal plate with a coating of photosensitive chemicals, or the metal plate may come to him with the photosensitive layer applied. The platemaker exposes the sensitized plate through the negative or positive to strong arc lights; this is commonly done in a vacuum printing frame. When a large number of the same images are to be exposed

on a single plate, however, the operation is done in a photocomposing machine. The plate is then developed and chemically treated to bring out the image.

The *lithographic pressman* (D.O.T. 4-48.070) makes ready and tends the lithographic printing presses. He installs the plate on the press, adjusts the pressure for proper printing, cares for and adjusts the rubber blanket which takes the impression from the plate and transfers it to the paper, adjusts water and ink rollers for correct operation, mixes inks, and operates the presses. Basically, the duties of these workers are similar to those of letterpress and gravure pressmen. Some differences exist, however, because of the chemical means used to separate image and non-image areas on lithographic presses. In large plants, press feeders and helpers are employed; their duties are similar to those of assistant and helpers to letterpress and gravure pressmen. (See p. 393.)

Training and Other Qualifications

A 4- or 5-year apprenticeship covering the basic lithographic process is usually required to become an all-round lithographic craftsman. Training emphasis is on the specific occupation in which journeyman status is being sought, although generally, an attempt is made to make the apprentice familiar with all lithographic operations.

Usually, apprenticeship applicants must be in good physical condition, high school graduates, and at least 18 years of age. Aptitude tests are sometimes given to prospective apprentices. Vocational school training, and training in photography and art are helpful in learning these crafts.

Employment Outlook

A moderate rise in the number of lithographic workers is expected during the remainder of the 1960's and in the longer run. In addition, the need to replace workers who retire, die, or transfer to other fields of work will also provide some job openings. Employment growth and replacement needs together are expected to provide about

1,500 to 2,000 job opportunities for new workers, on the average, each year during the next 10 to 15 years.

Offset printing has expanded considerably in recent years, particularly in the commercial printing field, and a large number of letterpress concerns have established offset departments. In early 1963 an estimated 55,000 journeymen lithographic workers were employed. Offset printing employment should show continued growth because of the greater use of photographs, drawings, and illustrations in printed matter, and because of the more widespread use of color in many printed products. However, new technological developments, particularly in the camera, platemaking, and press departments, probably will slow the anticipated increase in lithographic employment.

Earnings and Working Conditions

Union minimum hourly wage rates for lithographic occupations vary within each occupation, depending upon the degree of skill required, the type and size of equipment, and the part of the country in which the worker is employed. For example, according to information on minimum union hourly wage rates in 46 selected cities compiled by the National Association of Photo Lithographers, during 1962, wage rates for dot etchers or process artists and letterers ranged from \$3.42 an hour in Des Moines to \$4.56 an hour in San Francisco. Rates for cameramen, which are generally below those for skilled artists, ranged from \$3.04 an hour in Hannibal, Mo., to \$4.50 an hour in San Francisco. In many plants, top-grade cameramen earn as much as the highly skilled artists, and cameramen who do multi-color work are paid more than those who do only black and white work. Minimum hourly rates of photocomposition operators ranged from \$3.17 an hour in Tulsa, Okla., to \$4.40 an hour in San Francisco, and vacuum frame platemakers' hourly rates ranged from \$2.99 an hour in Hannibal, Mo., to \$4.40 an hour in San Francisco. The wide range of rates for lithographic pressmen—from \$2.36 an hour for Multilith machine operators and operators of small presses in

Michigan City to \$5.49 an hour for first pressmen on large four-color presses in Boston—is due to the many different types and sizes of presses operated.

Many lithographic plants are modern, air-conditioned, and well lighted. Much of the work requires little physical effort since it involves the handling of lightweight materials.

A substantial proportion of all lithographic workers are members of the Amalgamated Lithographers of America (Ind.). A considerable number of offset pressmen and other offset workers belong to the International Printing Pressmen and Assistants' Union of North America.

Where To Go for More Information

Amalgamated Lithographers of America (Ind.),
233 West 49th St., New York, N.Y., 10019.

International Printing Pressmen and Assistants'
Union of North America.
Pressmen's Home, Tenn., 37850.

Lithographers and Printers National Association,
1025 Connecticut Ave. NW., Washington, D.C., 20036.

Lithographic Technical Foundation, Inc.,
131 East 39th St., New York, N.Y., 10016.

National Association of Photo-Lithographers,
230 West 41st St., New York, N.Y., 10036.

Printing Industry of America, Inc.,
20 Chevy Chase Circle NW., Washington, D.C., 20015.

See page 386 for additional sources of information.

Bookbinders and Related Workers

Nature of Work

Many printed items such as books, magazines, pamphlets, and calendars must be folded, sewed, stapled, or bound after they leave the printing shops. Much of this work is done by skilled *bookbinders* (D.O.T. 4-49.010 through .040) who numbered about 22,000 in early 1963. Many bookbinders are employed in shops whose chief business is bookbinding. However, a considerable number are employed in the bindery departments of large book, periodical, and commercial printing plants and of large libraries.

There are several different kinds of binderies. Edition and pamphlet binderies bind books, magazines, and pamphlets printed in large quantities. Trade or job binderies do bindery work on contract for printers, publishers, or other customers. Blankbook and looseleaf binderies bind various types of blank books such as ledgers and book-keeping and accounting volumes. They also produce loose leaf binders, and bind books in loose leaf form.

Edition binding—making books in quantity from big, flat printed sheets of paper—is by far the most complicated. The first step in the process is to fold the printed sheets into one or more units of four pages, known as “signatures,” so that the sheets will be in the right order. The next steps are to insert any illustrations that have been printed separately, to gather and assemble the



Bindery workers assemble material on gathering machine

signatures in proper order, and to sew them together. The resulting book bodies are shaped with power presses and trimming machines, and fabric strips are glued to the backs for reinforcements. Covers are glued or pasted onto the book bodies,

after which the books undergo a variety of finishing operations and, frequently, are wrapped in paper jackets. Machines are used extensively throughout the process.

Skilled bookbinders seldom perform all the different edition bindery tasks, although many journeymen have had training in all of them. In large shops, skilled bookbinders may be assigned to one or a few operations, most often to the operation of complicated machines.

In many binderies, especially large ones, much of the work is done by workers trained in only one operation or in a small number of relatively simple, related tasks. Most of these workers, often classified as bindery workers or bindery hands, are women (hence the common designation, bindery women). Their work closely resembles assembly line factory work. About 54,000 women and men were employed in these operations in early 1963.

Training and Other Qualifications

A 4- or 5-year apprenticeship which includes on-the-job training as well as related classroom instruction is generally required to qualify as a skilled bookbinder. Apprenticeship programs may vary considerably among the various types of bookbinding shops. When large quantities of books are bound on a mass production (edition) basis, emphasis is on the most modern machine methods. In fine hand binding, emphasis is mainly on hand methods, including artistic designing and decorating of leather covers. For many years, hand bookbinding has been declining in importance.

Apprenticeship applicants usually must have a high school education and be at least 18 years of age. Mechanical aptitude is helpful to the person entering this trade. In the course of the apprenticeship, trainees learn, among other things, to assemble signatures, renovate old, worn bindings, and use various binding machines such as punches, folders, perforators, stitchers, and power cutters.

For the less skilled bindery occupations, the training period may last from several months to 2 years. In union shops, apprenticeship programs for women bindery workers generally last 2 years. These formal programs include classroom instruction as well as on-the-job training.

Employment Outlook

Replacement of skilled bookbinders who retire, die, or leave the industry for other employment will result in a few hundred job opportunities each year. However, some decrease in the total number of these skilled workers is expected during the remainder of the 1960's and in the longer run, in spite of the anticipated expansion of bound printed materials.

Continued mechanization of bookbinding operations and the declining demand for fine hand bookbinding will tend to limit the growth of this trade. On the other hand, these same trends should result in increased employment for the less skilled bindery workers, most of whom are women. Because there is considerable turnover among these employees, there will be a relatively large number of openings for women workers. Seasonal fluctuations in employment are more common in bindery work than in other printing occupations.

Earnings and Working Conditions

Wage rates for skilled bookbinders tend to be below the average of other printing crafts. A survey of union minimum hourly wage rates in 54 large cities, as of July 1, 1962, showed that the minimum hourly wage rate for bookbinders in book and job establishments was generally more than \$2.60 an hour and as high as \$4.08 in the San Francisco-Oakland area. The wage rates for bindery women are considerably lower and are among the lowest for printing industry workers. They ranged from \$1.50 an hour in Memphis and Little Rock to \$2.61 in the San Francisco-Oakland area.

The majority of bindery workers are union members. Most skilled bookbinders are represented by the International Brotherhood of Bookbinders.

Where To Go for More Information

International Brotherhood of Bookbinders,
815 16th St. NW., Washington, D.C., 20006.

Lithographers and Printers National Association,
Inc.,
1025 Connecticut Ave. NW., Washington, D.C., 20036.
Printing Industry of America, Inc.,
20 Chevy Chase Circle NW., Washington, D.C., 20015.

See page 386 for additional sources of information.